VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

Cross-Reference to Related Applications

[0001] This application is a continuation application of U.S. patent application Ser. No. 14/330,096, filed July 14, 2014, which is a continuation of U.S. patent application Ser. No. 13/914,996, filed Jun. 11, 2013, which issued as U.S. Pat. No. 8,802,107 on Aug. 12, 2014, which is a continuation application of U.S. patent application Ser. No. 13/329,770, filed Dec. 19, 2011, which issued as U.S. Pat. No. 8,481,046 on Jul. 9, 2013, which is a continuation application of U.S. patent application Ser. No. 12/833,417, filed Jul. 9, 2010, which issued as U.S. Pat. No. 8,092,803 on Jan. 10, 2012, which is a continuation application of U.S. patent application Ser. No. 12/560,885, filed Sep. 16, 2009, which issued as U.S. Pat. No. 7,807,164 on Oct. 5, 2010, which is a divisional application of U.S. patent application Ser. No. 11/818,463, filed Jun. 14, 2007, which issued as U.S. Pat. No. 7,608,261 on Oct. 27, 2009, which claims the benefit under 35 U.S.C. § 119(e) of U.S. Provisional Application No. 60/814,484, filed 16 Jun. 2006, which applications are each hereby incorporated by reference.

BACKGROUND OF INVENTION

Field of the Invention

[0002] The present invention is directed to pharmaceutical formulations suitable for intravitreal administration comprising agents capable of inhibiting vascular endothelial growth factor (VEGF), and to methods for making and using such formulations. The invention includes liquid pharmaceutical formulations having increased stability, as well as formulations that may be lyophilize and reconstituted for intravitreal administration.

Statement of Related Art

[0003] Vascular endothelial growth factor (VEGF) expression is nearly ubiquitous in human cancer, consistent with its role as a key mediator of tumor neoangiogenesis. Blockade of VEGF function, by binding to the molecule or its VEGFR-2 receptor, inhibits growth of implanted tumor cells in multiple different xenograft models (see, for example, Gerber et al. (2000) Cancer Res. 60:6253-6258). A soluble VEGF-specific fusion protein antagonist, termed a "VEGF trap" has been described (Kim et al. (2002) Proc. Natl. Acad. Sci. USA 99:11399-404; Holash et al. (2002) Proc.

Natl. Acad. Sci. USA 99:11393-8), which applications are specifically incorporated by reference in their entirety.

[0004] Ophthalmic formulations are known, see for example, U.S. 7,033,604 and 6,777,429. An ophthalmic formulation of a VEGF antibody is described in US 6,676,941.

[0005] Lyophilization (freeze drying under controlled conditions) is commonly used for long-term storage of proteins. The lyophilized protein is substantially resistant to degradation, aggregation, oxidation, and other degenerative processes while in the freeze-dried state (see, for example, U.S. 6,436,897).

BRIEF SUMMARY OF THE INVENTION

[0006] Stable formulations of a VEGF-specific fusion protein antagonist are provided. Pharmaceutically acceptable formulations are provided that comprise a VEGF "trap" antagonist with a pharmaceutically acceptable carrier. In specific embodiments, liquid and lyophilized formulations are provided.

[0007] In a first aspect, a stable liquid ophthalmic formulation of a VEGF-specific fusion protein antagonist is provided, comprising a fusion protein that comprises a receptor component consisting essentially of an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component (also termed a "VEGF trap"). In a specific embodiment of the VEGF-specific fusion protein antagonist, the first VEGF receptor is Flt1 and the second VEGF receptor is Flk1 or Flt4. In a more specific embodiment the fusion protein has the amino acid sequence of SEQ ID NO:2 or SEQ ID NO:4. Preferably, the VEGF antagonist is a dimer comprising two fusion proteins of SEQ ID NO:4.

[0008] In one aspect, a stable liquid ophthalmic formulation is provided that comprises 1-100 mg/ml VEGF-specific fusion protein antagonist, 0.01-5% of one or more organic co-solvent(s), 30-150 mM of one or more tonicity agent(s), 5-40 mM of a buffering agent, and optionally, 1.0-7.5% of a stabilizing agent, pH between about 5.8-7.0.

[0009] In one or more specific embodiments, the organic co-solvent may be polysorbate, for example, polysorbate 20 or polysorbate 80, polyethylene glycol (PEG), for example, PEG 3350, or propylene glycol, or a combination thereof; the tonicity agent may be, for example, sodium chloride or potassium chloride; the stabilizing agent may be sucrose, sorbitol, glycerol, trehalose, or mannitol; and the buffering agent may be, for example, phosphate buffer. In a specific embodiment,

the phosphate buffer is a sodium phosphate buffer.

[0010] In various embodiments, the organic co-solvent is polysorbate and/or PEG, the stabilizing agent is sucrose, the buffering agent is phosphate buffer, and the tonicity agent is sodium chloride.

[0011] More specifically, the stable liquid ophthalmic formulation comprises about 40-50 mg/ml of the VEGF antagonist (SEQ ID NO:4), about 10 mM phosphate buffer, 0.01-3% polysorbate and/or PEG, 40-135 mM sodium chloride, and optionally 5.0% sucrose, pH about 6.2-6.3.

[0012] In a specific preferred embodiment, the stable liquid ophthalmic formulation comprises about 50 mg/ml of the VEGF antagonist (SEQ ID NO:4), 10 mM sodium phosphate buffer, 50 mM sodium chloride, 0.1% polysorbate, and 5% sucrose, pH about 6.2-6.3.

[0013] In a specific preferred embodiment, the stable liquid ophthalmic formulation comprises about 50 mg/ml of the VEGF antagonist (SEQ ID NO:4), 10 mM sodium phosphate buffer, 50 mM sodium chloride, 3% PEG, and 5% sucrose, pH about 6.2-6.3.

[0014] In a specific preferred embodiment, the stable liquid ophthalmic formulation comprises about 40 mg/ml of the VEGF antagonist (SEQ ID NO:4), 10 mM sodium phosphate buffer, 40 mM sodium chloride, 0.03% polysorbate, and 5% sucrose, pH about 6.2-6.3.

[0015] In a specific preferred embodiment, the stable liquid ophthalmic formulation comprises about 40 mg/ml of the VEGF antagonist (SEQ ID NO:4), 10 mM sodium phosphate buffer, 135 mM sodium chloride, and 0.03% polysorbate, pH about 6.2-6.3.

[0016] In another aspect, a stable liquid ophthalmic formulation is provided that comprises 1-100 mg/ml VEGF-specific fusion protein antagonist; 0.01-5% of one or more organic co-solvent(s); 5-40 mM of a buffering agent; and optionally 30-150 mM of one or more tonicity agent(s) and/or 1.0-7.5% of a stabilizing agent; having a pH between about 5.8-7.0.

[0017] In various embodiments, the VEGF antagonist (SEQ ID NO:4) is present at a concentration of about 10 to about 80 mg/ml. In various embodiments, the VEGF antagonist (SEQ ID NO:4) is present at a concentration of about 10, about 20, about 30, about 40, about 50, about 60, about 70, or about 80 mg/ml. In a preferred embodiment, the VEGF antagonist (SEQ ID NO:4) is present at a concentration of about 40 mg/ml.

[0018] In another embodiment, the stabilizing agent is selected from one or more of sucrose, sorbitol, glycerol, trehalose, and mannitol.

[0019] In another embodiment, the organic co-solvent is selected from one or more of polysorbate, for example, polysorbate 20 or polysorbate 80, polyethylene glycol (PEG), for example, PEG 3350, and propylene glycol.

[0020] In another embodiment, the buffer is a phosphate buffer, for example, sodium phosphate.

[0021] In another embodiment, the tonicity agent is a salt, for example, sodium chloride.

[0022] In one embodiment, the stable liquid ophthalmic formulation comprises 10 mM sodium phosphate buffer, about 0.03 to about 0.1% polysorbate and/or about 3% PEG or propylene glycol, about 40 mM sodium chloride, and about 5% sucrose. In a specific embodiment, the stable liquid ophthalmic formulation comprises 10 mM sodium phosphate buffer, about 0.03% polysorbate, about 40 mM sodium chloride, and about 5% sucrose. In another specific embodiment, the pH of the formulation is about 6.2 to about 6.3. In another specific embodiment, the pH is achieved by mixing mono- and dibasic sodium phosphate to the desired pH without acid/base titration.

[0023] In a specific embodiment, the stable liquid ophthalmic formulation consists essentially of a VEGF antagonist (SEQ ID NO:4) at 40 mg/ml, 10 mM sodium phosphate buffer, polysorbate at 0.03%, sodium chloride at 40 mM, and sucrose at 5%, pH 6.2-6.3.

[0024] In another aspect, a stable liquid ophthalmic formulation is provided that comprises about 10 to about 80 mg/ml VEGF antagonist, about 10 mM sodium phosphate buffer, about 0.03% polysorbate, and about 135 mM sodium chloride, pH 6.2 to 6.3.

[0025] In various embodiments, the VEGF antagonist (SEQ ID NO:4) is present at a concentration of about 10 to about 80 mg/ml. In various embodiments, the VEGF antagonist (SEQ ID NO:4) is present at a concentration of about 10, about 20, about 30, about 40, about 50, about 60, about 70, or about 80 mg/ml. In a specific embodiment, the VEGF antagonist (SEQ ID NO:4) is present at a concentration of about 40 mg/ml.

[0026] In one embodiment, the stable liquid ophthalmic formulation comprises 40 mg/ml of VEGF antagonist (SEQ ID NO:4), 10 mM sodium phosphate buffer, 0.03% polysorbate, and 135 mM sodium chloride at pH 6.2-6.3. In a specific embodiment, the stable liquid ophthalmic formulation consists essentially of 40 mg/ml of VEGF antagonist (SEQ ID NO:4), 10 mM sodium phosphate buffer, 0.03% polysorbate, and 135 mM sodium chloride at pH 6.2-6.3.

[0027] In another aspect, a lyophilizable formulation of a VEGF antagonist is provided, wherein upon lyophilization followed by reconstitution, a stable liquid ophthalmic formulation as described

herein is obtained.

[0028] In another aspect, a lyophilizable formulation of a vascular endothelial growth factor (VEGF)-specific fusion protein antagonist is provided, comprising 5-50 mg/ml of the VEGF antagonist, 5-25 mM buffer, such as phosphate buffer, 0.01 to 0.15% of one or more of an organic co-solvent, such as polysorbate, propylene glycol and/or PEG, and optionally 1-10% of a stabilizing agent such as sucrose, sorbitol, trehalose, glycerol, or mannitol, pH about 5.8-7.0. In various embodiments, the VEGF antagonist (SEQ ID NO:4) is present at about 5, about 10, about 20, about 30, or about 40 mg/ml. In a specific embodiment, the lyophilizable ophthalmic formulation of the invention comprises 20 mg/ml of the VEGF antagonist, 10 mM sodium phosphate buffer, 0.03% polysorbate, 0.1% PEG, and 2.5% sucrose, pH about 6.2-6.3. In further embodiments, the lyophilizable formulation further comprises sodium chloride. In a specific embodiment, the sodium chloride is present at a concentration of about 20 mM. In another specific embodiment, the sodium chloride is present at a concentration of about 67.5 mM.

[0029] In another specific embodiment, the lyophilizable ophthalmic formulation of the invention comprises 20 mg/ml of the VEGF antagonist, 5 mM sodium phosphate buffer, 0.015% polysorbate, 20 mM sodium chloride, and 2.5% sucrose, pH about 6.2-6.3.

[0030] In another embodiment, the lyophilizable ophthalmic formulation comprises 5 mg/ml, 10 mg/ml, or 40 mg/ml VEGF antagonist, 5 mM sodium phosphate buffer, 0.015% polysorbate, 20 mM sodium chloride, and 2.5% sucrose, at pH 6.2-6.3. In a specific embodiment, the lyophilizable ophthalmic formulation consists essentially of 5 mg/ml, 10 mg/ml, or 40 mg/ml VEGF antagonist (SEQ ID NO:4), 5 mM sodium phosphate buffer, 0.015% polysorbate, 20 mM sodium chloride, and 2.5% sucrose, at pH 6.2-6.3.

[0031] In another specific embodiment, the lyophilizable ophthalmic formulation comprises 20 mg/ml of the VEGF antagonist, 5 mM sodium phosphate buffer, 0.015% polysorbate, and 67.5 mM sodium chloride, pH about 6.2-6.3. In a more specific embodiment, the lyophilizable ophthalmic formulation consists essentially of 20 mg/ml of the VEGF antagonist (SEQ ID NO:4), 5 mM sodium phosphate buffer, 0.015% polysorbate, and 67.5 mM sodium chloride, pH 6.2-6.3.

[0032] In another specific embodiment, the lyophilizable ophthalmic formulation comprises 5 mg/ml, 10 mg/ml, or 40 mg/ml VEGF antagonist, 5 mM sodium phosphate buffer, 0.015% polysorbate, and 67.5 mM sodium chloride, pH about 6.2-6.3. In a more specific embodiment, the lyophilizable ophthalmic formulation consists essentially of 5 mg/ml, 10 mg/ml, or 40 mg/ml VEGF

antagonist (SEQ ID NO:4), 5 mM sodium phosphate buffer, 0.015% polysorbate, and 67.5 mM sodium chloride, pH about 6.2-6.3.

[0033] Generally, the reconstituted formulation is about 2 times the concentration of the pre-lyophilized formulation, e.g., a 20 mg fusion protein/ml pre-lyophilized formulation is reconstituted to a final formulation of 40 mg fusion protein/ml.

[0034] Generally, the lyophilized formulation is reconstituted with sterile water suitable for injection. In one embodiment, the reconstitution liquid is bacteriostatic water.

[0035] In another aspect, the invention features a method of producing a lyophilized formulation of a VEGF-specific fusion protein antagonist, comprising subjecting the lyophilizable formulation of the invention to lyophilization to generate a lyophilized formulation. The lyophilized formulation may be lyophilized by any method known in the art for lyophilizing a liquid.

[0036] In another related aspect, the invention features a method of producing a reconstituted lyophilized formulation of a VEGF antagonist, comprising reconstituting the lyophilized formulation of the invention to a reconstituted formulation. In one embodiment, the reconstituted formulation is twice the concentration of the pre-lyophilized formulation, e.g., the method of the invention comprises: (a) producing a pre-lyophilized formulation of a VEGF-specific fusion protein antagonist, (b) subjecting the pre-lyophilized formulation of step (a) to lyophilization; and (c) reconstituting the lyophilized formulation of step (b).

[0037] The invention further features ophthalmic formulations provided in a pre-filled syringe or vial, particularly suitable for intravitreal administration.

[0038] Other objects and advantages will become apparent from a review of the ensuing detailed description.

DETAILED DESCRIPTION OF THE INVENTION

[0039] The present invention is not limited to particular methods, and experimental conditions described, as such methods and conditions may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting unless indicated, since the scope of the present invention will be limited only by the appended claims.

[0040] Unless stated otherwise, all technical and scientific terms and phrases used herein have the same meaning as commonly understood by one of ordinary skill in the art to which the invention belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, the preferred methods and materials are now described. All publications mentioned herein are incorporated herein by reference.

General Description

[0041] Safe handling and administration of formulations comprising proteins represent significant challenges to pharmaceutical formulators. Proteins possess unique chemical and physical properties that present stability problems: a variety of degradation pathways exist for proteins, implicating both chemical and physical instability. Chemical instability includes deamination, aggregation, clipping of the peptide backbone, and oxidation of methionine residues. Physical instability encompasses many phenomena, including, for example, aggregation and/or precipitation.

[0042] Chemical and physical stability can be promoted by removing water from the protein. Lyophilization (freeze-drying under controlled conditions) is commonly used for long-term storage of proteins. The lyophilized protein is substantially resistant to degradation, aggregation, oxidation, and other degenerative processes while in the freeze-dried state. The lyophilized protein may be reconstituted with water optionally containing a bacteriostatic preservative (e.g., benzyl alcohol) prior to administration.

Definitions

[0043] The term "carrier" includes a diluent, adjuvant, excipient, or vehicle with which a composition is administered. Carriers can include sterile liquids, such as, for example, water and oils, including oils of petroleum, animal, vegetable or synthetic origin, such as, for example, peanut oil, soybean oil, mineral oil, sesame oil and the like.

[0044] The term "excipient" includes a non-therapeutic agent added to a pharmaceutical composition to provide a desired consistency or stabilizing effect. Suitable pharmaceutical excipients include, for example, starch, glucose, lactose, sucrose, gelatin, malt, rice, flour, chalk, silica gel, sodium stearate, glycerol monostearate, talc, sodium chloride, dried skim milk, glycerol, propylene, glycol, water, ethanol and the like.

[0045] The term "lyophilized" or "freeze-dried" includes a state of a substance that has been subjected to a drying procedure such as lyophilization, where at least 90% of moisture has been

removed.

VEGF Antagonists

[0046] A VEGF antagonist is a compound capable of blocking or inhibiting the biological action of vascular endothelial growth factor (VEGF), and includes fusion proteins capable of trapping VEGF. In a preferred embodiment, the VEGF antagonist is the fusion protein of SEQ ID NO:2 or 4; more preferably, SEQ ID NO:4. In specific embodiments, the VEGF antagonist is expressed in a mammalian cell line such as a CHO cell and may be modified post-translationally. In a specific embodiment, the fusion protein comprises amino acids 27-457 of SEQ ID NO:4 and is glycosylated at Asn residues 62, 94, 149, 222 and 308. Preferably, the VEGF antagonist is a dimer composed of two fusion proteins of SEQ ID NO:4.

[0047] The VEGF antagonist of the methods and formulations of the invention can be prepared by any suitable method known in the art, or that comes to be known. The VEGF antagonist is preferably substantially free of protein contaminants at the time it is used to prepare the pharmaceutically acceptable formulation. By "substantially free of protein contaminants" is meant, preferably, that at least 90 % of the weight of protein of the VEGF-specific fusion protein antagonist preparation used for making a formulation is VEGF fusion protein antagonist protein, more preferably at least 95%, most preferably at least 99%. The fusion protein is preferably substantially free of aggregates. "Substantially free of aggregates" means that at least 90% of the weight of fusion protein is not present in an aggregate at the time the fusion protein is used to prepare the pharmaceutically effective formulation. Unless stated otherwise, the phosphates employed are sodium phosphates and a desired buffering pH is achieved by mixing appropriate amounts of mono- and dibasic sodium phosphate.

Stable Liquid Ophthalmic Formulations

[0048] In one aspect, the invention provides a stable pharmaceutically acceptable formulation comprising a VEGF antagonist, wherein the formulation is a liquid formulation suitable for ophthalmic use. Preferably, the liquid formulation comprises a pharmaceutically effective amount of the VEGF antagonist. The formulation can also comprise one or more pharmaceutically acceptable carriers, buffers, tonicity agents, stabilizers, and/or excipients. An example of a pharmaceutically acceptable liquid formulation comprises a VEGF antagonist in a pharmaceutically effective amount, a buffer, an organic co-solvent such as polysorbate, a tonicity agent such as NaCl, and optionally, a

stabilizer such as sucrose or trehalose.

[0049] Stability is determined in a number of ways at specified time points, including determination of pH, visual inspection of color and appearance, determination of total protein content by methods known in the art, e.g., UV spectroscopy, and purity is determined by, for example, SDS-PAGE, size-exclusion HPLC, bioassay determination of activity, isoelectric focusing, and isoaspartate quantification. In one example of a bioassay useful for determining VEGF antagonist activity, a BAF/3 VEGFR1/EPOR cell line is used to determine VEGF165 binding by the VEGF antagonist of the invention.

[0050] Liquid formulations can be stored in an oxygen-deprived environment. Oxygen-deprived environments can be generated by storing the formulations under an inert gas such as, for example, nitrogen or argon. Liquid formulations are preferably stored at about 5°C.

Ophthalmic Lyophilized Formulations

[0051] In one aspect of the invention, an ophthalmically acceptable formulation comprising a VEGF antagonist is provided, wherein the formulation is a lyophilizable formulation. Lyophilizable formulations can be reconstituted into solutions, suspensions, emulsions, or any other suitable form for administration or use. Lyophilizable formulations are typically first prepared as liquids, then frozen and lyophilized. The total liquid volume before lyophilization can be less, equal to, or more than, the final reconstituted volume of the lyophilized formulation. The lyophilization process is well known to those of ordinary skill in the art, and typically includes sublimation of water from a frozen formulation under controlled conditions.

[0052] Lyophilized formulations can be stored at a wide range of temperatures. Lyophilized formulations may be stored below 25°C, for example, refrigerated at 2-8°C, or at room temperature (e.g., approximately 25°C). Preferably, lyophilized formulations are stored below about 25°C, more preferably, at about 4-20°C; below about 4°C; below about -20°C; about -40°C; about -70°C, or about -80°C. Stability of the lyophilized formulation may be determined in a number of ways known to the art, for example, by visual appearance of the cake and/or by moisture content.

[0053] Lyophilized formulations are typically reconstituted for use by addition of an aqueous solution to dissolve the lyophilized formulation. A wide variety of aqueous solutions can be used to reconstitute a lyophilized formulation. Preferably, lyophilized formulations are reconstituted using water. Lyophilized formulations are preferably reconstituted with a solution consisting essentially of

water (e.g., USP WFI, or water for injection) or bacteriostatic water (e.g., USP WFI with 0.9% benzyl alcohol). However, solutions comprising buffers and/or excipients and/or one or more pharmaceutically acceptable carries can also be used.

[0054] Freeze-dried or lyophilized formulations are typically prepared from liquids, that is, from solutions, suspensions, emulsions, and the like. Thus, the liquid that is to undergo freeze-drying or lyophilization preferably comprises all components desired in a final reconstituted liquid formulation. As a result, when reconstituted, the freeze-dried or lyophilized formulation will render a desired liquid formulation upon reconstitution.

EXAMPLES

[0055] Before the present methods are described, it is to be understood that this invention is not limited to particular methods, and experimental conditions described, as such methods and conditions may vary. It is also to be understood that the terminology used herein is for the purpose of describing particular embodiments only, and is not intended to be limiting, since the scope of the present invention will be limited only to the appended claims.

[0056] As used in this specification and the appended claims, the singular forms "a", "an", and "the" include plural references unless the context clearly dictates otherwise. Thus for example, a reference to "a method" includes one or more methods, and/or steps of the type described herein and/or which will become apparent to those persons skilled in the art upon reading this disclosure and so forth.

[0057] Unless defined otherwise, all technical and scientific terms used herein have the same meaning as commonly understood by one of ordinary skill in the art to which this invention belongs. Although any methods and materials similar or equivalent to those described herein can be used in the practice or testing of the present invention, the preferred methods and materials are now described. All publications mentioned herein are incorporated herein by reference in their entirety.

Example 1. Stability of 50 mg/ml VEGF Trap Liquid Formulation Stored at 5°C in 3 ml Glass Vials.

[0058] An ophthalmic liquid formulation containing 50 mg/ml VEGF Trap (SEQ ID NO:4), 10 mM phosphate, 50 mM NaCl, 0.1% polysorbate 20, 5% sucrose, and pH 6.25, was stored at 5 °C in 3 ml glass vials and samples tested at 3, 6, 9, 12, 18 and 24 months. Stability was determined by SE-

HPLC. The results are shown in Table 1. Turbidity was measured at OD_{405} nm; and percent recovered protein and purity by size exclusion HPLC.

Table 1. Stability of 50 mg/ml VEGF Trap Protein (VGFT-SS065)

Months	Visual Appearance	Turbidity (OD_{405} nm)	pH	% VEGF Trap Recovered	% VEGF Trap Native Configuration
0	Pass	0.00	6.2	100	98.8
3	Pass	0.00	6.2	101	98.7
6	Pass	0.01	6.3	100	98.3
9	Pass	0.01	6.3	101	98.3
12	Pass	0.01	6.3	104	98.4
18	Pass	0.01	6.3	96	98.1
24	Pass	0.01	6.3	105	98.1

Example 2. Stability of 50 mg/ml VEGF Trap Liquid Formulation Stored at 5°C in 3 ml Glass Vials.

[0059] A liquid formulation containing 50 mg/ml VEGF Trap (SEQ ID NO:4), 10 mM phosphate, 50 mM NaCl, 3% polyethylene glycol 3350, 5% sucrose, and pH 6.25, was stored at 5 °C in 3 nil glass vials and samples tested at 3, 6, 9, 12, 18 and 24 months. Stability results are shown in Table 2. Turbidity, percent recovered protein and purity was determined as described above.

Table 2. Stability of 50 mg/ml VEGF Trap Protein (VGFT-SS065)

Months	Visual Appearance	Turbidity	pH	% VEGF Trap Recovered	% VEGF Trap Native Configuration
0	Pass	0.00	6.2	100	98.9
3	Pass	0.00	6.1	104	98.5
6	Pass	0.01	6.3	99	98.3
9	Pass	0.00	6.3	102	97.6
12	Pass	0.01	6.3	103	98.0
18	Pass	0.00	6.3	113	97.7
24	Pass	0.00	6.2	106	97.6

Example 3. Stability of 40 mg/ml VEGF Trap Liquid Formulation Stored at 5°C in 3 ml Glass Vials.

[0060] A liquid formulation containing 40 mg/ml VEGF Trap (SEQ ID NO:4), 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, and pH 6.3, was stored at 5 °C in 3 ml glass vials

and samples tested at 0.5, 1, 2, 3, and 4 months. Stability results are shown in Table 3. Turbidity, percent recovered protein and purity was determined as described above.

Table 3. Stability of 40 mg/ml VEGF Trap Protein (VGFT-SS207)

Months	Visual Appearance	Turbidity	pH	% VEGF Trap Recovered	% VEGF Trap Native Configuration
0	Pass	0.00	6.3	100	99.5
0.5	Pass	0.00	6.3	99	99.4
1	Pass	0.00	6.2	98	99.5
2	Pass	0.00	6.2	95	99.2
3	Pass	0.01	6.4		
4	Pass	0.01	6.3		

Example 4. Stability of 40 mg/ml VEGF Trap Liquid Formulation Stored at 5°C in Pre-filled Glass Syringe.

[0061] A liquid formulation containing 40 mg/ml VEGF trap (SEQ ID NO:4), 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, and pH 6.3, was stored at 5 °C in 1 ml prefilled luer glass syringe with 4023/50 FluroTec coated plunger and samples tested at 0.5, 1, 2, 3, and 4 months. Stability results are shown in Table 4. Turbidity, percent recovered protein and purity was determined as described above.

Table 4. Stability of 40 mg/ml VEGF Trap Protein (VGFT-SS207)

Months	Visual Appearance	Turbidity	pH	% VEGF Trap Recovered	% VEGF Trap Native Configuration
0	Pass	0.00	6.3	100	99.4
0.5	Pass	0.00	6.3	100	99.3
1	Pass	0.00	6.3	100	99.4
2	Pass	0.00	6.3	97	99.1
3	Pass	0.01	6.4		
4	Pass	0.01	6.3		

Example 5. Stability of 40 mg/ml VEGF Trap Liquid Formulation Stored at 5°C in 3 ml Glass Vials.

[0062] A liquid formulation containing 40 mg/ml VEGF trap (SEQ ID NO:4), 10 mM phosphate, 135 mM NaCl, 0.03% polysorbate 20, and pH 6.3, was stored at 5 °C in 3 ml glass vials and samples

tested at 0.5, 1, 2, 3, and 4 months. Stability results are shown in Table 5. Turbidity, percent recovered protein and purity was determined as described above.

Table 5. Stability of 40 mg/ml VEGF Trap Protein (VGFT-SS203)

Months	Visual Appearance	Turbidity	pH	% VEGF Trap Recovered	% VEGF Trap Native Configuration
0	Pass	0.00	6.3	100	99.3
0.5	Pass	0.00	6.2	87	99.2
1	Pass	0.00	6.2	88	99.1
2	Pass	0.00	6.3	103	99.2
3	Pass	0.00	6.3	88	99.0
4	Pass	0.00	6.2	85	98.9
5	Pass	0.00	6.3	84	99.0

Example 6. Stability of 40 mg/ml VEGF Trap Liquid Formulation Stored at 5°C in 1 ml Pre-filled Glass Syringe.

[0063] A liquid formulation containing 40 mg/ml VEGF trap (SEQ ID NO:4), 10 mM phosphate, 135 mM NaCl, 0.03% polysorbate 20, and pH 6.3, was stored at 5 °C in 1 ml prefilled glass luer syringe with 4023/50 FluroTec coated plunger and samples tested at 0.5, 1, 2, 3, 4, and 5 months. Stability results are shown in Table 6. Turbidity, percent recovered protein and purity was determined as described above.

Table 6. Stability of 40 mg/ml VEGF Trap Protein (VGFT-SS203)

Months	Visual Appearance	Turbidity	pH	% VEGF Trap Recovered	% VEGF Trap Native Configuration
0	Pass	0.00	6.3	100	99.2
0.5	Pass	0.01	6.3	101	99.2
1	Pass	0.00	6.3	101	99.2
2	Pass	0.00	6.3	-	-
3	Pass	0.01	6.3	102	99.1
4	Pass	0.01	6.3	103	98.8
5	Pass	0.00	6.3	99	98.9

Example 7. Stability of Lyophilized 20 mg/ml VEGF Trap Formulation Stored at 5°C in 3 ml Glass Vials and Reconstituted to 40 mg/ml.

[0064] 0.8 ml of a liquid formulation containing 20 mg/ml VEGF trap (SEQ ID NO:4), 5 mM

phosphate, 20 mM NaCl, 0.015% polysorbate 20, 2.5% sucrose, and pH 6.3, were lyophilized in 3 ml glass vials. Samples were stored at 5°C and tested at 1, and 2 months. VEGF trap was reconstituted to a final concentration of 40 mg/ml VEGF Trap (final volume of 0.4 ml). Stability results are shown in Table 7 (t = time in months; * = visual appearance; **=reconstitution time). Turbidity, percent recovered protein and purity was determined as described above.

Table 7. Stability of Lyophilized 20 mg/ml VEGF Trap Protein (VGFT-SS216)

t	Vis. App.*	Recon. Time** (min)	Vis. App.* Reconst'd Liquid	Turbidity	pH	% VEGF Trap Recovered	% VEGF Trap Native Config.
0	Pass	0.6	Pass	0.00	6.3	100	99.5
1	Pass	0.6	Pass	0.01	6.3	106	99.4
2	Pass	0.4	Pass	0.01	6.2	103	99.3

Example 8. Stability of Lyophilized 20 mg/ml VEGF Trap Formulation Stored at 5°C in 3 ml Glass Vials.

[0065] 0.8 ml of a liquid formulation containing 20 mg/ml VEGF trap (SEQ ID NO:4), 5 mM phosphate, 67.5 mM NaCl, 0.015% polysorbate 20, and pH 6.3, were lyophilized in 3 ml glass vials. Samples were stored at 5°C and tested at 1, 2, and 3 months. VEGF trap was reconstituted to a final concentration of 40 mg/ml VEGF trap (final volume of 0.4 ml). Stability results are shown in Table 8 (t = time in months; * = visual appearance; **=reconstitution time).

Table 8. Stability of Lyophilized 20 mg/ml VEGF Trap Protein (VGFT-SS216)

t	Vis. App.*	Recon. Time** (min)	Vis. App. Reconst'd Liquid	Turbidity	pH	% VEGF Trap Recovered	% VEGF Trap Native Config.
0	Pass	0.7	Pass	0.00	6.3	100	99.0
1	Pass	0.7	Pass	0.01	6.2	105	98.9
2	Pass	0.4	Pass	0.01	6.2	103	98.9

WE CLAIM:

1. A prefilled glass syringe suitable for intravitreal administration containing a stable ophthalmic formulation comprising a vascular endothelial growth factor (VEGF) antagonist, an organic co-solvent, a buffer, and a stabilizing agent, wherein the VEGF antagonist is a protein produced in a Chinese Hamster Ovary (CHO) cell.

2. The prefilled glass syringe of claim 1, wherein 90% or more of the weight of the protein is not present as an aggregate.

3. The prefilled glass syringe of claim 2, wherein the protein is a fusion protein comprising the immunoglobulin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component.

4. The prefilled glass syringe of claim 3, wherein the first VEGF receptor is the human Flt1 and the second VEGF receptor is the human Flk1 or the human Flt4.

5. The prefilled glass syringe of claim 4, wherein the fusion protein comprises an amino acid sequence of SEQ ID NO:4.

6. The prefilled glass syringe of claim 5, wherein the VEGF antagonist is a dimer of the fusion protein.

7. The prefilled syringe of claim 1, wherein the organic co-solvent is selected from the group consisting of polysorbate 20, polysorbate 80, polyethylene glycol (PEG), PEG3350, and propylene glycol.

8. The prefilled syringe of claim 1, wherein the stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.

9. The prefilled syringe of claim 1, wherein the buffer comprises phosphate.

10. The prefilled syringe of claim 4 comprising (a) 1-100 mg/ml of the VEGF antagonist; (b) 0.01-5% of the organic co-solvent; (c) 5-40 mM of the buffer; and (d) 1.0-10% of the stabilizing agent.

11. The prefilled syringe of claim 11, wherein the organic co-solvent is polysorbate 20, the buffer is phosphate, and the stabilizing agent is sucrose.

ABSTRACT

[0066] Ophthalmic formulations of a vascular endothelial growth factor (VEGF)-specific fusion protein antagonist are provided suitable for intravitreal administration to the eye. The ophthalmic formulations include a stable liquid formulation and a lyophilizable formulation. Preferably, the protein antagonist has an amino acid sequence of SEQ ID NO:4.

Electronically Filed September 25, 2019

NOTIFICATION OF PRIOR SEQUENCE LISTING Address to: Mail Stop Patent Application Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450		
	Attorney Docket	REGN-024CON9
	First Named Inventor	FURFINE, ERIC
	Application Number	To Be Assigned
	Filing Date	
	Confirmation Number	To Be Assigned
	Group Art Unit	
	Examiner Name	
	Title: "VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION"	

Sir:

The above-identified patent application contains sequences of nucleic acid and polypeptides. A sequence listing was prepared for parent application, **16/159,269,** filed **October 12, 2018**, in paper and computer-readable format. The sequence information in the paper or compact disk copy of the sequence listing (required by 1.821(c)) of this application is identical to the sequence information in the computer-readable format of the above-identified other application. No new matter has been added. Therefore, please transfer to this application, in accordance with 37 CFR § 1.821(e), the fully compliant computer readable copy from applicants' other application. A paper (.pdf) copy of this sequence listing is enclosed.

Applicants respectfully submit that the present patent application is now in compliance with 37 CFR §§ 1.821 - 1.825. The Commissioner is hereby authorized to charge any underpayment of fees associated with this communication, including any necessary fees for extensions of time, or credit any overpayment to Deposit Account No. 50-0815, order number REGN-024CON8.

Respectfully submitted,

BOZICEVIC, FIELD & FRANCIS LLP

Dated: September 25, 2019

By: /Karl Bozicevic, Reg. No. 28,807/
Karl Bozicevic, Reg. No. 28,807

BOZICEVIC, FIELD & FRANCIS LLP
201 Redwood Shores Parkway, Suite 200
Redwood City, California 94065
Telephone: (650) 327-3400
Direct: (650) 833-7735
Facsimile: (650) 327-3231

SEQUENCE LISTING

<110> Regeneron Pharmaceuticals, Inc.

<120> VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

<130> 5050F

<150> US 13/914,996
<151> 2013-06-11

<150> US 13/329,770
<151> 2011-06-11

<150> US 12/833,417
<151> 2010-07-09

<150> US 12/560,885
<151> 2009-09-16

<150> US 11/818,463
<151> 2007-06-14

<150> US 60/814,484
<151> 2006-06-16

<160> 4

<170> PatentIn version 3.5

<210> 1
<211> 1453
<212> DNA
<213> Artificial sequence

<220>
<223> Synthetic

<400> 1
aagcttgggc tgcaggtcga tcgactctag aggatcgatc cccgggcgag ctcgaattcg 60

caaccaccat ggtcagctac tgggacaccg gggtcctgct gtgcgcgctg ctcagctgtc 120

tgcttctcac aggatctagt tccggaggta gacctttcgt agagatgtac agtgaaatcc 180

ccgaaattat acacatgact gaaggaaggg agctcgtcat tccctgccgg gttacgtcac 240

ctaacatcac tgttacttta aaaaagtttc cacttgacac tttgatccct gatggaaaac 300

gcataatctg ggacagtaga aagggcttca tcatatcaaa tgcaacgtac aaagaaatag 360

ggcttctgac ctgtgaagca acagtcaatg ggcatttgta taagacaaac tatctcacac 420

atcgacaaac caatacaatc atagatgtgg ttctgagtcc gtctcatgga attgaactat 480

ctgttggaga aaagcttgtc ttaaattgta cagcaagaac tgaactaaat gtggggattg 540

acttcaactg ggaataccct tcttcgaagc atcagcataa gaaacttgta aaccgagacc 600

taaaaaccca gtctgggagt gagatgaaga aatttttgag caccttaact atagatggtg 660

taacccggag tgaccaagga ttgtacacct gtgcagcatc cagtgggctg atgaccaaga 720

agaacagcac atttgtcagg gtccatgaaa agggcccggg cgacaaaact cacacatgcc 780

caccgtgccc agcacctgaa ctcctggggg gaccgtcagt cttcctcttc cccccaaaac 840

ccaaggacac cctcatgatc tcccggaccc ctgaggtcac atgcgtggtg gtggacgtga 900

gccacgaaga ccctgaggtc aagttcaact ggtacgtgga cggcgtggag gtgcataatg 960

ccaagacaaa gccgcgggag gagcagtaca acagcacgta ccgtgtggtc agcgtcctca 1020

ccgtcctgca ccaggactgg ctgaatggca aggagtacaa gtgcaaggtc tccaacaaag 1080

ccctcccagc ccccatcgag aaaaccatct ccaaagccaa agggcagccc cgagaaccac 1140

aggtgtacac cctgccccca tcccgggatg agctgaccaa gaaccaggtc agcctgacct 1200

gcctggtcaa aggcttctat cccagcgaca tcgccgtgga gtgggagagc aatgggcagc 1260

cggagaacaa ctacaagacc acgcctcccg tgctggactc cgacggctcc ttcttcctct 1320

atagcaagct caccgtggac aagagcaggt ggcagcaggg gaacgtcttc tcatgctccg 1380

tgatgcatga ggctctgcac aaccactaca cgcagaagag cctctccctg tctccgggta 1440

aatgagcggc cgc 1453

<210> 2
<211> 458
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 2

Met Val Ser Tyr Trp Asp Thr Gly Val Leu Leu Cys Ala Leu Leu Ser
1 5 10 15

Cys Leu Leu Leu Thr Gly Ser Ser Ser Gly Gly Arg Pro Phe Val Glu
20 25 30

Met Tyr Ser Glu Ile Pro Glu Ile Ile His Met Thr Glu Gly Arg Glu
35 40 45

Leu Val Ile Pro Cys Arg Val Thr Ser Pro Asn Ile Thr Val Thr Leu
50 55 60

Lys Lys Phe Pro Leu Asp Thr Leu Ile Pro Asp Gly Lys Arg Ile Ile
65 70 75 80

Trp Asp Ser Arg Lys Gly Phe Ile Ile Ser Asn Ala Thr Tyr Lys Glu
85 90 95

Ile Gly Leu Leu Thr Cys Glu Ala Thr Val Asn Gly His Leu Tyr Lys

```
            100                 105                 110

Thr Asn Tyr Leu Thr His Arg Gln Thr Asn Thr Ile Ile Asp Val Val
        115                 120                 125

Leu Ser Pro Ser His Gly Ile Glu Leu Ser Val Gly Glu Lys Leu Val
    130                 135                 140

Leu Asn Cys Thr Ala Arg Thr Glu Leu Asn Val Gly Ile Asp Phe Asn
145                 150                 155                 160

Trp Glu Tyr Pro Ser Ser Lys His Gln His Lys Lys Leu Val Asn Arg
                165                 170                 175

Asp Leu Lys Thr Gln Ser Gly Ser Glu Met Lys Lys Phe Leu Ser Thr
            180                 185                 190

Leu Thr Ile Asp Gly Val Thr Arg Ser Asp Gln Gly Leu Tyr Thr Cys
        195                 200                 205

Ala Ala Ser Ser Gly Leu Met Thr Lys Lys Asn Ser Thr Phe Val Arg
    210                 215                 220

Val His Glu Lys Gly Pro Gly Asp Lys Thr His Thr Cys Pro Pro Cys
225                 230                 235                 240

Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe Leu Phe Pro Pro
                245                 250                 255

Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys
            260                 265                 270

Val Val Val Asp Val Ser His Glu Asp Pro Glu Val Lys Phe Asn Trp
        275                 280                 285

Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu
    290                 295                 300

Glu Gln Tyr Asn Ser Thr Tyr Arg Val Val Ser Val Leu Thr Val Leu
305                 310                 315                 320

His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn
                325                 330                 335

Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser Lys Ala Lys Gly
            340                 345                 350
```

Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Asp Glu
355 360 365

Leu Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr
370 375 380

Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn
385 390 395 400

Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser Phe Phe
405 410 415

Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn
420 425 430

Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr
435 440 445

Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
450 455

<210> 3
<211> 1377
<212> DNA
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 3
atggtcagct actgggacac cggggtcctg ctgtgcgcgc tgctcagctg tctgcttctc 60

acaggatcta gttccggaag tgataccggt agacctttcg tagagatgta cagtgaaatc 120

cccgaaatta tacacatgac tgaaggaagg gagctcgtca ttccctgccg ggttacgtca 180

cctaacatca ctgttacttt aaaaaagttt ccacttgaca ctttgatccc tgatggaaaa 240

cgcataatct gggacagtag aaagggcttc atcatatcaa atgcaacgta caaagaaata 300

gggcttctga cctgtgaagc aacagtcaat gggcatttgt ataagacaaa ctatctcaca 360

catcgacaaa ccaatacaat catagatgtg gttctgagtc cgtctcatgg aattgaacta 420

tctgttggag aaaagcttgt cttaaattgt acagcaagaa ctgaactaaa tgtggggatt 480

gacttcaact gggaataccc ttcttcgaag catcagcata agaaacttgt aaaccgagac 540

ctaaaaaccc agtctgggag tgagatgaag aaatttttga gcaccttaac tatagatggt 600

gtaacccgga gtgaccaagg attgtacacc tgtgcagcat ccagtgggct gatgaccaag 660

aagaacagca catttgtcag ggtccatgaa aaggacaaaa ctcacacatg cccaccgtgc 720

ccagcacctg aactcctggg gggaccgtca gtcttcctct tccccccaaa acccaaggac 780

accctcatga tctcccggac ccctgaggtc acatgcgtgg tggtggacgt gagccacgaa 840

gaccctgagg tcaagttcaa ctggtacgtg gacggcgtgg aggtgcataa tgccaagaca 900

aagccgcggg aggagcagta caacagcacg taccgtgtgg tcagcgtcct caccgtcctg 960

caccaggact ggctgaatgg caaggagtac aagtgcaagg tctccaacaa agccctccca 1020

gcccccatcg agaaaaccat ctccaaagcc aaagggcagc cccgagaacc acaggtgtac 1080

accctgcccc catcccggga tgagctgacc aagaaccagg tcagcctgac ctgcctggtc 1140

aaaggcttct atcccagcga catcgccgtg gagtgggaga gcaatgggca gccggagaac 1200

aactacaaga ccacgcctcc cgtgctggac tccgacggct ccttcttcct ctacagcaag 1260

ctcaccgtgg acaagagcag gtggcagcag gggaacgtct tctcatgctc cgtgatgcat 1320

gaggctctgc acaaccacta cacgcagaag agcctctccc tgtctccggg taaatga 1377

<210> 4
<211> 458
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 4

Met Val Ser Tyr Trp Asp Thr Gly Val Leu Leu Cys Ala Leu Leu Ser
1 5 10 15

Cys Leu Leu Leu Thr Gly Ser Ser Ser Gly Ser Asp Thr Gly Arg Pro
20 25 30

Phe Val Glu Met Tyr Ser Glu Ile Pro Glu Ile Ile His Met Thr Glu
35 40 45

Gly Arg Glu Leu Val Ile Pro Cys Arg Val Thr Ser Pro Asn Ile Thr
50 55 60

Val Thr Leu Lys Lys Phe Pro Leu Asp Thr Leu Ile Pro Asp Gly Lys
65 70 75 80

Arg Ile Ile Trp Asp Ser Arg Lys Gly Phe Ile Ile Ser Asn Ala Thr
85 90 95

Tyr Lys Glu Ile Gly Leu Leu Thr Cys Glu Ala Thr Val Asn Gly His
100 105 110

Leu Tyr Lys Thr Asn Tyr Leu Thr His Arg Gln Thr Asn Thr Ile Ile
115 120 125

```
Asp Val Val Leu Ser Pro Ser His Gly Ile Glu Leu Ser Val Gly Glu
    130                 135                 140

Lys Leu Val Leu Asn Cys Thr Ala Arg Thr Glu Leu Asn Val Gly Ile
145                 150                 155                 160

Asp Phe Asn Trp Glu Tyr Pro Ser Ser Lys His Gln His Lys Lys Leu
                165                 170                 175

Val Asn Arg Asp Leu Lys Thr Gln Ser Gly Ser Glu Met Lys Lys Phe
            180                 185                 190

Leu Ser Thr Leu Thr Ile Asp Gly Val Thr Arg Ser Asp Gln Gly Leu
        195                 200                 205

Tyr Thr Cys Ala Ala Ser Ser Gly Leu Met Thr Lys Lys Asn Ser Thr
    210                 215                 220

Phe Val Arg Val His Glu Lys Asp Lys Thr His Thr Cys Pro Pro Cys
225                 230                 235                 240

Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe Leu Phe Pro Pro
                245                 250                 255

Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys
            260                 265                 270

Val Val Val Asp Val Ser His Glu Asp Pro Glu Val Lys Phe Asn Trp
        275                 280                 285

Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu
    290                 295                 300

Glu Gln Tyr Asn Ser Thr Tyr Arg Val Val Ser Val Leu Thr Val Leu
305                 310                 315                 320

His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn
                325                 330                 335

Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser Lys Ala Lys Gly
            340                 345                 350

Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Asp Glu
        355                 360                 365

Leu Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr
    370                 375                 380
```

```
Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn
385                 390                 395                 400

Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser Phe Phe
                405                 410                 415

Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn
            420                 425                 430

Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr
        435                 440                 445

Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
    450                 455
```

PTO/AIA/01 (05-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	VEGF ANTAGONIST FORMULATIONS FOR INTRAVITREAL ADMINISTRATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 13/914,996

filed on June 11, 2013.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Eric FURFINE Date (Optional): 30 Jan 2014

Signature: _____

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	VEGF ANTAGONIST FORMULATIONS FOR INTRAVITREAL ADMINISTRATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 13/914,996 filed on June 11, 2013.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Daniel DIX Date (Optional): Jan 23, 2014

Signature: Daniel A. Dix

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	VEGF ANTAGONIST FORMULATIONS FOR INTRAVITREAL ADMINISTRATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

- ☐ The attached application, or
- ☒ United States application or PCT international application number 13/914,996 filed on June 11, 2013.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Kenneth GRAHAM Date (Optional): 19 Feb 2014

Signature: Kenneth B Graham

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/01 (06-12)
Approved for use through 01/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

DECLARATION (37 CFR 1.63) FOR UTILITY OR DESIGN APPLICATION USING AN APPLICATION DATA SHEET (37 CFR 1.76)

Title of Invention	VEGF ANTAGONIST FORMULATIONS FOR INTRAVITREAL ADMINISTRATION

As the below named inventor, I hereby declare that:

This declaration is directed to:

☐ The attached application, or

☒ United States application or PCT international application number 13/914,996 filed on June 11, 2013.

The above-identified application was made or authorized to be made by me.

I believe that I am the original inventor or an original joint inventor of a claimed invention in the application.

I hereby acknowledge that any willful false statement made in this declaration is punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

WARNING:

Petitioner/applicant is cautioned to avoid submitting personal information in documents filed in a patent application that may contribute to identity theft. Personal information such as social security numbers, bank account numbers, or credit card numbers (other than a check or credit card authorization form PTO-2038 submitted for payment purposes) is never required by the USPTO to support a petition or an application. If this type of personal information is included in documents submitted to the USPTO, petitioners/applicants should consider redacting such personal information from the documents before submitting them to the USPTO. Petitioner/applicant is advised that the record of a patent application is available to the public after publication of the application (unless a non-publication request in compliance with 37 CFR 1.213(a) is made in the application) or issuance of a patent. Furthermore, the record from an abandoned application may also be available to the public if the application is referenced in a published application or an issued patent (see 37 CFR 1.14). Checks and credit card authorization forms PTO-2038 submitted for payment purposes are not retained in the application file and therefore are not publicly available.

LEGAL NAME OF INVENTOR

Inventor: Kelly FRYE Date (Optional): 12-16-13

Signature: Kelly J Frye

Note: An application data sheet (PTO/SB/14 or equivalent), including naming the entire inventive entity, must accompany this form or must have been previously filed. Use an additional PTO/AIA/01 form for each additional inventor.

This collection of information is required by 35 U.S.C. 115 and 37 CFR 1.63. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 1 minute to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

The application data sheet is part of the provisional or nonprovisional application for which it is being submitted. The following form contains the bibliographic data arranged in a format specified by the United States Patent and Trademark Office as outlined in 37 CFR 1.76.
This document may be completed electronically and submitted to the Office in electronic format using the Electronic Filing System (EFS) or the document may be printed and included in a paper filed application.

Secrecy Order 37 CFR 5.2:

☐ Portions or all of the application associated with this Application Data Sheet may fall under a Secrecy Order pursuant to 37 CFR 5.2 (Paper filers only. Applications that fall under Secrecy Order may not be filed electronically.)

Inventor Information:

Inventor 1

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Eric		FURFINE	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	Concord	State/Province	MA	Country of Residence i	US

Mailing Address of Inventor:

Address 1	315 Harrington Avenue		
Address 2			
City	Concord	State/Province	MA
Postal Code	01742	Country i	US

Inventor 2

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Daniel		DIX	

Residence Information (Select One) ◉ US Residency ○ Non US Residency ○ Active US Military Service

City	LaGrangeville	State/Province	NY	Country of Residence i	US

Mailing Address of Inventor:

Address 1	55 Memory Trail		
Address 2			
City	LaGrangeville	State/Province	NY
Postal Code	12540	Country i	US

Inventor 3

Legal Name

Prefix	Given Name	Middle Name	Family Name	Suffix
	Kenneth		GRAHAM	

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service		
City	Pleasant Valley	**State/Province**	NY	**Country of Residence** i	US

Mailing Address of Inventor:

Address 1	c/o Regeneron Pharmaceuticals, Inc.		
Address 2	777 Old Saw Mill River Road		
City	Tarrytown	**State/Province**	NY
Postal Code	10591	**Country** i	US

Inventor 4

Legal Name

Prefix	**Given Name**	**Middle Name**	**Family Name**	**Suffix**
	Kelly		FRYE	

Residence Information (Select One)	◉ US Residency	○ Non US Residency	○ Active US Military Service		
City	Mendham	**State/Province**	NJ	**Country of Residence** i	US

Mailing Address of Inventor:

Address 1	3 McVickers Lane		
Address 2			
City	Mendham	**State/Province**	NJ
Postal Code	07945	**Country** i	US

All Inventors Must Be Listed - Additional Inventor Information blocks may be generated within this form by selecting the **Add** button. Add

Correspondence Information:

Enter either Customer Number or complete the Correspondence Information section below.
For further information see 37 CFR 1.33(a).

☐ **An Address is being provided for the correspondence Information of this application.**

Customer Number	96387		
Email Address		Add Email	Remove Email

Application Information:

Title of the Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION		
Attorney Docket Number	REGN-024CON9	**Small Entity Status Claimed**	☐
Application Type			
Subject Matter			
Total Number of Drawing Sheets (if any)		**Suggested Figure for Publication (if any)**	

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

Filing By Reference:

Only complete this section when filing an application by reference under 35 U.S.C. 111(c) and 37 CFR 1.57(a). Do not complete this section if application papers including a specification and any drawings are being filed. Any domestic benefit or foreign priority information must be provided in the appropriate section(s) below (i.e., "Domestic Benefit/National Stage Information" and "Foreign Priority Information").

For the purposes of a filing date under 37 CFR 1.53(b), the description and any drawings of the present application are replaced by this reference to the previously filed application, subject to conditions and requirements of 37 CFR 1.57(a).

Application number of the previously filed application	Filing date (YYYY-MM-DD)	Intellectual Property Authority or Country

Publication Information:

☐ Request Early Publication (Fee required at time of Request 37 CFR 1.219)

☐ **Request Not to Publish.** I hereby request that the attached application not be published under 35 U.S.C. 122(b) and certify that the invention disclosed in the attached application **has not and will not** be the subject of an application filed in another country, or under a multilateral international agreement, that requires publication at eighteen months after filing.

Representative Information:

Representative information should be provided for all practitioners having a power of attorney in the application. Providing this information in the Application Data Sheet does not constitute a power of attorney in the application (see 37 CFR 1.32).
Either enter Customer Number or complete the Representative Name section below. If both sections are completed the customer Number will be used for the Representative Information during processing.

Please Select One:	◉ Customer Number	○ US Patent Practitioner	○ Limited Recognition (37 CFR 11.9)
Customer Number	96387		

Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	
					Remove
Registration Number					
Prefix	**Given Name**	Middle Name	**Family Name**	Suffix	
					Remove
Registration Number					

Additional Representative Information blocks may be generated within this form by selecting the **Add** button.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, 365(c), or 386(c) or indicate National Stage entry from a PCT application. Providing benefit claim information in the Application Data Sheet constitutes the specific reference required by 35 U.S.C. 119(e) or 120, and 37 CFR 1.78.
When referring to the current application, please leave the "Application Number" field blank.

Prior Application Status	Pending	Remove

Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
	Continuation of	16159269	2018-10-12

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
16159269	Continuation of	15879294	2018-01-24	10400025	2019-09-03

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15879294	Continuation of	15095606	2016-04-11	9914763	2018-03-13

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
15095606	Continuation of	14330096	2014-07-14	9340594	2016-05-17

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
14330096	Continuation of	13914996	2013-06-11	8802107	2014-08-12

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13914996	Continuation of	13329770	2011-12-19	8481046	2013-07-09

Prior Application Status	Patented	Remove

Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
13329770	Continuation of	12833417	2010-07-09	8092803	2012-01-10

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12833417	Continuation of	12560885	2009-09-16	7807164	2010-10-05

Prior Application Status	Patented			Remove	
Application Number	Continuity Type	Prior Application Number	Filing Date (YYYY-MM-DD)	Patent Number	Issue Date (YYYY-MM-DD)
12560885	Division of	11818463	2007-06-14	7608261	2009-10-27

Prior Application Status	Pending		Remove
Application Number	Continuity Type	Prior Application Number	Filing or 371(c) Date (YYYY-MM-DD)
11818463	Claims benefit of provisional	60814484	2006-06-16

Additional Domestic Benefit/National Stage Data may be generated within this form by selecting the **Add** button.

Foreign Priority Information:

This section allows for the applicant to claim priority to a foreign application. Providing this information in the application data sheet constitutes the claim for priority as required by 35 U.S.C. 119(b) and 37 CFR 1.55. When priority is claimed to a foreign application that is eligible for retrieval under the priority document exchange program (PDX) the information will be used by the Office to automatically attempt retrieval pursuant to 37 CFR 1.55(i)(1) and (2). Under the PDX program, applicant bears the ultimate responsibility for ensuring that a copy of the foreign application is received by the Office from the participating foreign intellectual property office, or a certified copy of the foreign priority application is filed, within the time period specified in 37 CFR 1.55(g)(1).

Application Number	Country[i]	Filing Date (YYYY-MM-DD)	Access Code[i] (if applicable)

Additional Foreign Priority Data may be generated within this form by selecting the **Add** button.

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications

☐ This application (1) claims priority to or the benefit of an application filed before March 16, 2013 and (2) also contains, or contained at any time, a claim to a claimed invention that has an effective filing date on or after March 16, 2013.
NOTE: By providing this statement under 37 CFR 1.55 or 1.78, this application, with a filing date on or after March 16, 2013, will be examined under the first inventor to file provisions of the AIA.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

Authorization or Opt-Out of Authorization to Permit Access:

When this Application Data Sheet is properly signed and filed with the application, applicant has provided written authority to permit a participating foreign intellectual property (IP) office access to the instant application-as-filed (see paragraph A in subsection 1 below) and the European Patent Office (EPO) access to any search results from the instant application (see paragraph B in subsection 1 below).

Should applicant choose not to provide an authorization identified in subsection 1 below, applicant **must opt-out** of the authorization by checking the corresponding box A or B or both in subsection 2 below.

NOTE: This section of the Application Data Sheet is **ONLY** reviewed and processed with the **INITIAL** filing of an application. After the initial filing of an application, an Application Data Sheet cannot be used to provide or rescind authorization for access by a foreign IP office(s). Instead, Form PTO/SB/39 or PTO/SB/69 must be used as appropriate.

1. Authorization to Permit Access by a Foreign Intellectual Property Office(s)

A. Priority Document Exchange (PDX) - Unless box A in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the European Patent Office (EPO), the Japan Patent Office (JPO), the Korean Intellectual Property Office (KIPO), the State Intellectual Property Office of the People's Republic of China (SIPO), the World Intellectual Property Organization (WIPO), and any other foreign intellectual property office participating with the USPTO in a bilateral or multilateral priority document exchange agreement in which a foreign application claiming priority to the instant patent application is filed, access to: (1) the instant patent application-as-filed and its related bibliographic data, (2) any foreign or domestic application to which priority or benefit is claimed by the instant application and its related bibliographic data, and (3) the date of filing of this Authorization. See 37 CFR 1.14(h)(1).

B. Search Results from U.S. Application to EPO - Unless box B in subsection 2 (opt-out of authorization) is checked, the undersigned hereby **grants the USPTO authority** to provide the EPO access to the bibliographic data and search results from the instant patent application when a European patent application claiming priority to the instant patent application is filed. See 37 CFR 1.14(h)(2).

The applicant is reminded that the EPO's Rule 141(1) EPC (European Patent Convention) requires applicants to submit a copy of search results from the instant application without delay in a European patent application that claims priority to the instant application.

2. Opt-Out of Authorizations to Permit Access by a Foreign Intellectual Property Office(s)

☐ A. Applicant **DOES NOT** authorize the USPTO to permit a participating foreign IP office access to the instant application-as-filed. If this box is checked, the USPTO will not be providing a participating foreign IP office with any documents and information identified in subsection 1A above.

☐ B. Applicant **DOES NOT** authorize the USPTO to transmit to the EPO any search results from the instant patent application. If this box is checked, the USPTO will not be providing the EPO with search results from the instant application.

NOTE: Once the application has published or is otherwise publicly available, the USPTO may provide access to the application in accordance with 37 CFR 1.14.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

Applicant Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Applicant 1

If the applicant is the inventor (or the remaining joint inventor or inventors under 37 CFR 1.45), this section should not be completed. The information to be provided in this section is the name and address of the legal representative who is the applicant under 37 CFR 1.43; or the name and address of the assignee, person to whom the inventor is under an obligation to assign the invention, or person who otherwise shows sufficient proprietary interest in the matter who is the applicant under 37 CFR 1.46. If the applicant is an applicant under 37 CFR 1.46 (assignee, person to whom the inventor is obligated to assign, or person who otherwise shows sufficient proprietary interest) together with one or more joint inventors, then the joint inventor or inventors who are also the applicant should be identified in this section.

Clear

◯ Assignee	◯ Legal Representative under 35 U.S.C. 117	◯ Joint Inventor
◉ Person to whom the inventor is obligated to assign.	◯ Person who shows sufficient proprietary interest	

If applicant is the legal representative, indicate the authority to file the patent application, the inventor is:

Name of the Deceased or Legally Incapacitated Inventor:	

If the Applicant is an Organization check here. ☒

Organization Name	REGENERON PHARMACEUTICALS, INC.

Mailing Address Information For Applicant:

Address 1	777 Old Saw Mill River Road		
Address 2			
City	Tarrytown	**State/Province**	NY
Country[i]	US	Postal Code	10591
Phone Number		Fax Number	
Email Address			

Additional Applicant Data may be generated within this form by selecting the Add button.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

Assignee Information including Non-Applicant Assignee Information:

Providing assignment information in this section does not substitute for compliance with any requirement of part 3 of Title 37 of CFR to have an assignment recorded by the Office.

Assignee 1

Complete this section if assignee information, including non-applicant assignee information, is desired to be included on the patent application publication. An assignee-applicant identified in the "Applicant Information" section will appear on the patent application publication as an applicant. For an assignee-applicant, complete this section only if identification as an assignee is also desired on the patent application publication.

If the Assignee or Non-Applicant Assignee is an Organization check here. ☒

Organization Name	REGENERON PHARMACEUTICALS, INC.

Mailing Address Information For Assignee including Non-Applicant Assignee:

Address 1	777 Old Saw Mill River Road		
Address 2			
City	Tarrytown	**State/Province**	NY
Country i	US	Postal Code	10591
Phone Number		Fax Number	
Email Address			

Additional Assignee or Non-Applicant Assignee Data may be generated within this form by selecting the Add button.

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	REGN-024CON9
	Application Number	
Title of Invention	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION	

Signature:

NOTE: This Application Data Sheet must be signed in accordance with 37 CFR 1.33(b). **However, if this Application Data Sheet is submitted with the INITIAL filing of the application and either box A or B is not checked in subsection 2 of the "Authorization or Opt-Out of Authorization to Permit Access" section, then this form must also be signed in accordance with 37 CFR 1.14(c).**

This Application Data Sheet **must** be signed by a patent practitioner if one or more of the applicants is a **juristic entity** (e. g., corporation or association). If the applicant is two or more joint inventors, this form must be signed by a patent practitioner, **all** joint inventors who are the applicant, or one or more joint inventor-applicants who have been given power of attorney (e.g., see USPTO Form PTO/AIA/81) on behalf of **all** joint inventor-applicants.

See 37 CFR 1.4(d) for the manner of making signatures and certifications.

Signature	/Karl Bozicevic/			Date (YYYY-MM-DD)	
First Name	Karl	Last Name	Bozicevic	Registration Number	28807

Additional Signature may be generated within this form by selecting the Add button.

Electronic Patent Application Fee Transmittal

Application Number:	
Filing Date:	
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Filer:	Karl Bozicevic/Savanna Fuentes
Attorney Docket Number:	REGN-024CON9

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPLICATION FILING	1011	1	300	300
UTILITY SEARCH FEE	1111	1	660	660
UTILITY EXAMINATION FEE	1311	1	760	760
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1720**

Electronic Acknowledgement Receipt

EFS ID:	37271097
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Savanna Fuentes
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	25-SEP-2019
Filing Date:	
Time Stamp:	15:25:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1720
RAM confirmation Number	E20199OF26173888
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		REGN-024CON9_appln_as_fld.pdf	766509 8daf0d517068c168f5c827e98848eb344ea0df38	yes	16
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Specification		1	14	
	Claims		15	15	
	Abstract		16	16	
Warnings:					
Information:					
2	Sequence Listing	REGN-024CON9_2019-09-25_seq_list_trans.pdf	27330 79ba1c9d69ec9e1329ed321746872e5b576033c2	no	1
Warnings:					
Information:					
3	Sequence Listing	REGN-024CON9_seq_list.pdf	181040 4a3a95a26c9d81af7c0116a5a4962deb6916ae54	no	7
Warnings:					
Information:					
4	Oath or Declaration filed	REGN-024CON9_declaration.pdf	551390 8a857f03087a869974574de3cf74617f361f334f	no	4
Warnings:					
Information:					
5	Application Data Sheet	WebADS.pdf	178339 465e74dcdb0baa16e06ff6cedecc8819abfd8072	no	9

Warnings:					
Information:					
6	Fee Worksheet (SB06)	fee-info.pdf	34950 fb8cd9d008900464f7fe57633c9636787991 6a21	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	1739558	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PRELIMINARY AMENDMENT Under 37 CFR § 1.115	Attorney Docket No.	REGN-024CON9
	Confirmation No.	3381
	First Named Inventor	Eric Furfine
	Application Number	16/582,486
	Filing Date	September 25, 2019
Address to: Mail Stop Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Group Art Unit	
	Examiner Name	
	Title: "*VEGF Antagonist Formulations Suitable for Intravitreal Administration*"	

Sir:

Prior to the examination of the above-referenced application on the merits, please enter the amendments below.

Electronic Patent Application Fee Transmittal

Application Number:	16582486
Filing Date:	
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Filer:	Karl Bozicevic/Savanna Fuentes
Attorney Docket Number:	REGN-024CON9

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	4	100	400
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	1	460	460
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**860**

Electronic Acknowledgement Receipt

EFS ID:	37285085
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Savanna Fuentes
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	26-SEP-2019
Filing Date:	
Time Stamp:	13:31:38
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$860
RAM confirmation Number	E20199PD31535139
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		REGN-024CON9_2019-09-26_prelim_amend.pdf	65629 ba426ebf4c1e29e00a696651131101bd3844c11b	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	7	8
	Claims	2	6
	Preliminary Amendment	1	1

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32020 11a9bb7d4d6f71dd163c0e9b9b9b9c0a9ad1ff02	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	97649		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS UNDER 37 CFR § 1.115

Formal Matters

Claims 12-35 are pending after entry of the amendments set forth herein.

Claims 1-11 are canceled without prejudice.

New claims 12-35 are supported in the original application.

No new matter has been added.

Statement under 37 C.F.R. §§1.56 and 1.2

Applicant(s) hereby advise the Examiner of the status of a co-pending application in compliance with the Applicant's(s') duty to disclose under 37 C.F.R. §§1.56 and 1.2 (see also MPEP §2001.06(b)) as discussed in *McKesson Info. Soln. Inc., v. Bridge Medical Inc.*, 487 F.3d 897; 82 USPQ2d 1865 (Fed. Cir. 2007).

Applicants wish to bring to the Examiner's attention co-pending U.S. Patent Application No. 16/159,269, filed October 12, 2018. No actions have been mailed to date.

Applicants wish to bring to the Examiner's attention U.S. Patent Nos. 7,608,261; 8,092,803; 8,481,046; 8,802,107; 9,340,594; 9,914,763; 9,580,489; and 7,807,164 which are all issued patents to which the above-referenced patent application claims priority.

The Applicant(s) wish to bring to the Examiner's attention that a Notice of Allowance was mailed on August 21, 2019 in co-pending U.S. Patent Application No. 16/159,269 , filed October 12, 2018

This document is (These documents are) available on PAIR, and thus is (are) not provided with this communication. Please inform the undersigned if there is any difficulty in obtaining the document(s) from PAIR.

CONCLUSION

Applicant(s) submit(s) that all of the claims are in condition for allowance, which action is requested. If the Examiner finds that a telephone conference would expedite the prosecution of this application, please telephone the undersigned at the number provided.

The Commissioner is hereby authorized to charge any underpayment of fees up to a strict limit of $3,000.00 beyond that authorized on the credit card, but not more than $3,000.00 in additional fees due with any communication for the above referenced patent application, including but not limited to any necessary fees for extensions of time, or credit any overpayment of any amount to Deposit Account No. 50-0815, order number REGN-024CON9.

Respectfully submitted,
BOZICEVIC, FIELD & FRANCIS LLP

Date: September 26, 2019

By: /Karl Bozicevic, Reg. No. 28,807/
Karl Bozicevic, Reg. No. 28,807

BOZICEVIC, FIELD & FRANCIS LLP
201 Redwood Shores Parkway, Suite 200
Redwood City, CA 94065
Telephone: (650) 327-3400
Facsimile: (650) 327-3231

AMENDMENTS TO THE CLAIMS

1.-11. (**Cancelled**)

12. A vial comprising:

a vascular endothelial growth factor (VEGF) antagonist;

polysorbate;

a buffer; and

sucrose;

wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and

wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5°C for two months as measured by size exclusion chromatography.

13. The vial of claim 12 wherein the polysorbate is polysorbate 20.

14. The vial of claim 13 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.

15. The vial of claim 14 wherein about 99% or more of the weight of the fusion protein is in native conformation.

16. A vial comprising:

a vascular endothelial growth factor (VEGF) antagonist;

0.01% polysorbate 20 or polysorbate 80;

a buffer; and

sucrose, trehalose, mannitol or glucose;

wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1,

and a multimerizing component; and

wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5°C for two months as measured by size exclusion chromatography.

17. The vial of claim 16 wherein the concentration of vascular endothelial growth factor (VEGF) antagonist is about 40 mg/ml.

18. The vial of claim 17 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.

19. The vial of claim 18 wherein about 99% or more of the weight of the fusion protein is in native conformation.

20. The vial of claim 12 comprising

vascular endothelial growth factor (VEGF) antagonist;

30-150 mM NaCl;

0.03% polysorbate 20;

5% sucrose; and

a buffer;

wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and

wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5°C for two months as measured by size exclusion chromatography

21. The vial of claim 20 comprising about 40 mg/ml of the vascular endothelial growth factor (VEGF) antagonist.

22. The vial of claim 21 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ

ID NO:4.

23. The vial of claim 22 wherein about 99% or more of the weight of the fusion protein is in native conformation.

24. A formulation comprising:

a vascular endothelial growth factor (VEGF) antagonist;

polysorbate;

a buffer; and

sucrose;

wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and

wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5°C for two months as measured by size exclusion chromatography.

25. The formulation of claim 24 wherein the polysorbate is polysorbate 20.

26. The formulation of claim 25 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.

27. The formulation of claim 26 wherein about 99% or more of the weight of the fusion protein is in native conformation.

28. A formulation comprising:

a vascular endothelial growth factor (VEGF) antagonist;

0.01% polysorbate 20 or polysorbate 80;

a buffer; and

sucrose, trehalose, mannitol or glucose;

wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO)

cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and

wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5°C for two months as measured by size exclusion chromatography.

29. The formulation of claim 28 wherein the concentration of vascular endothelial growth factor (VEGF) antagonist is about 40 mg/ml.

30. The formulation of claim 29 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.

31. The formulation of claim 30 wherein about 99% or more of the weight of the fusion protein is in native conformation.

32. The formulation of claim 24 comprising

vascular endothelial growth factor (VEGF) antagonist;

30-150 mM NaCl;

0.03% polysorbate 20;

5% sucrose; and

a buffer;

wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and

wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5°C for two months as measured by size exclusion chromatography

33. The formulation of claim 32 comprising about 40 mg/ml of the vascular endothelial growth factor (VEGF) antagonist.

34. The formulation of claim 33 wherein the vascular endothelial growth factor (VEGF)

antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.

35. The formulation of claim 34 wherein about 99% or more of the weight of the fusion protein is in native conformation.

RAW SEQUENCE LISTING

Loaded by SCORE, no errors detected.

Application Serial Number: 16582486
Source: OPAP
Date Processed by SCORE: 10/01/2019

ENTERED

SEQUENCE LISTING

<110> Regeneron Pharmaceuticals, Inc.

<120> VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

<130> 5050F

<140> US 16/582,486
<141> 2019-09-25

<150> US 16/159,269
<151> 2018-10-12

<150> US 15/879,294
<151> 2018-01-24

<150> US 15/095,606
<151> 2016-04-11

<150> US 13/914,996
<151> 2013-06-11

<150> US 13/329,770
<151> 2011-06-11

<150> US 12/833,417
<151> 2010-07-09

<150> US 12/560,885
<151> 2009-09-16

<150> US 11/818,463
<151> 2007-06-14

<150> US 60/814,484
<151> 2006-06-16

<160> 4

<170> PatentIn version 3.5

<210> 1
<211> 1453
<212> DNA
<213> Artificial sequence

<220>
<223> Synthetic

<400> 1

aagcttgggc tgcaggtcga tcgactctag aggatcgatc cccgggcgag ctcgaattcg
60

caaccaccat ggtcagctac tgggacaccg gggtcctgct gtgcgcgctg ctcagctgtc
120

tgcttctcac aggatctagt tccggaggta gacctttcgt agagatgtac agtgaaatcc
180

ccgaaattat acacatgact gaaggaaggg agctcgtcat tccctgccgg gttacgtcac
240

ctaacatcac tgttacttta aaaaagtttc cacttgacac tttgatccct gatggaaaac
300

gcataatctg ggacagtaga aagggcttca tcatatcaaa tgcaacgtac aaagaaatag
360

ggcttctgac ctgtgaagca acagtcaatg ggcatttgta taagacaaac tatctcacac
420

atcgacaaac caatacaatc atagatgtgg ttctgagtcc gtctcatgga attgaactat
480

ctgttggaga aaagcttgtc ttaaattgta cagcaagaac tgaactaaat gtggggattg
540

acttcaactg ggaataccct tcttcgaagc atcagcataa gaaacttgta aaccgagacc
600

taaaaaccca gtctgggagt gagatgaaga aatttttgag caccttaact atagatggtg
660

taacccggag tgaccaagga ttgtacacct gtgcagcatc cagtgggctg atgaccaaga
720

agaacagcac atttgtcagg gtccatgaaa agggcccggg cgacaaaact cacacatgcc
780

caccgtgccc agcacctgaa ctcctggggg gaccgtcagt cttcctcttc cccccaaaac
840

ccaaggacac cctcatgatc tcccggaccc ctgaggtcac atgcgtggtg gtggacgtga
900

gccacgaaga ccctgaggtc aagttcaact ggtacgtgga cggcgtggag gtgcataatg
960

ccaagacaaa gccgcgggag gagcagtaca acagcacgta ccgtgtggtc agcgtcctca
1020

ccgtcctgca ccaggactgg ctgaatggca aggagtacaa gtgcaaggtc tccaacaaag

1080

ccctcccagc ccccatcgag aaaaccatct ccaaagccaa agggcagccc cgagaaccac
1140

aggtgtacac cctgccccca tcccgggatg agctgaccaa gaaccaggtc agcctgacct
1200

gcctggtcaa aggcttctat cccagcgaca tcgccgtgga gtgggagagc aatgggcagc
1260

cggagaacaa ctacaagacc acgcctcccg tgctggactc cgacggctcc ttcttcctct
1320

atagcaagct caccgtggac aagagcaggt ggcagcaggg gaacgtcttc tcatgctccg
1380

tgatgcatga ggctctgcac aaccactaca cgcagaagag cctctccctg tctccgggta
1440

aatgagcggc cgc
1453

<210> 2
<211> 458
<212> PRT
<213> Artificial Sequence

<220>
<223> Synthetic

<400> 2

Met Val Ser Tyr Trp Asp Thr Gly Val Leu Leu Cys Ala Leu Leu Ser
1 5 10 15

Cys Leu Leu Leu Thr Gly Ser Ser Ser Gly Gly Arg Pro Phe Val Glu
20 25 30

Met Tyr Ser Glu Ile Pro Glu Ile Ile His Met Thr Glu Gly Arg Glu
35 40 45

Leu Val Ile Pro Cys Arg Val Thr Ser Pro Asn Ile Thr Val Thr Leu
50 55 60

Lys Lys Phe Pro Leu Asp Thr Leu Ile Pro Asp Gly Lys Arg Ile Ile
65 70 75 80

Trp Asp Ser Arg Lys Gly Phe Ile Ile Ser Asn Ala Thr Tyr Lys Glu
85 90 95

Ile Gly Leu Leu Thr Cys Glu Ala Thr Val Asn Gly His Leu Tyr Lys
100 105 110

Thr Asn Tyr Leu Thr His Arg Gln Thr Asn Thr Ile Ile Asp Val Val
115 120 125

Leu Ser Pro Ser His Gly Ile Glu Leu Ser Val Gly Glu Lys Leu Val
130 135 140

Leu Asn Cys Thr Ala Arg Thr Glu Leu Asn Val Gly Ile Asp Phe Asn
145 150 155 160

Trp Glu Tyr Pro Ser Ser Lys His Gln His Lys Lys Leu Val Asn Arg
165 170 175

Asp Leu Lys Thr Gln Ser Gly Ser Glu Met Lys Lys Phe Leu Ser Thr
180 185 190

Leu Thr Ile Asp Gly Val Thr Arg Ser Asp Gln Gly Leu Tyr Thr Cys
195 200 205

Ala Ala Ser Ser Gly Leu Met Thr Lys Lys Asn Ser Thr Phe Val Arg
210 215 220

Val His Glu Lys Gly Pro Gly Asp Lys Thr His Thr Cys Pro Pro Cys
225 230 235 240

Pro Ala Pro Glu Leu Leu Gly Gly Pro Ser Val Phe Leu Phe Pro Pro
245 250 255

Lys Pro Lys Asp Thr Leu Met Ile Ser Arg Thr Pro Glu Val Thr Cys
260 265 270

Val Val Val Asp Val Ser His Glu Asp Pro Glu Val Lys Phe Asn Trp
275 280 285

Tyr Val Asp Gly Val Glu Val His Asn Ala Lys Thr Lys Pro Arg Glu
290 295 300

Glu Gln Tyr Asn Ser Thr Tyr Arg Val Val Ser Val Leu Thr Val Leu
305 310 315 320

His Gln Asp Trp Leu Asn Gly Lys Glu Tyr Lys Cys Lys Val Ser Asn
325 330 335

Lys Ala Leu Pro Ala Pro Ile Glu Lys Thr Ile Ser Lys Ala Lys Gly
340 345 350

Gln Pro Arg Glu Pro Gln Val Tyr Thr Leu Pro Pro Ser Arg Asp Glu
355 360 365

Leu Thr Lys Asn Gln Val Ser Leu Thr Cys Leu Val Lys Gly Phe Tyr
370 375 380

Pro Ser Asp Ile Ala Val Glu Trp Glu Ser Asn Gly Gln Pro Glu Asn
385 390 395 400

Asn Tyr Lys Thr Thr Pro Pro Val Leu Asp Ser Asp Gly Ser Phe Phe
405 410 415

Leu Tyr Ser Lys Leu Thr Val Asp Lys Ser Arg Trp Gln Gln Gly Asn
420 425 430

Val Phe Ser Cys Ser Val Met His Glu Ala Leu His Asn His Tyr Thr
435 440 445

Gln Lys Ser Leu Ser Leu Ser Pro Gly Lys
450 455

<210> 3
<211> 1377
<212> DNA
<213> Artificial Sequence

<220>

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
16/582,486	09/25/2019		2580	REGN-024CON9	24	4

CONFIRMATION NO. 3381

96387
Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

FILING RECEIPT

OC000000111753398

Date Mailed: 10/10/2019

Receipt is acknowledged of this non-provisional utility patent application. The application will be taken up for examination in due course. Applicant will be notified as to the results of the examination. Any correspondence concerning the application must include the following identification information: the U.S. APPLICATION NUMBER, FILING DATE, NAME OF FIRST INVENTOR, and TITLE OF INVENTION. Fees transmitted by check or draft are subject to collection.

Please verify the accuracy of the data presented on this receipt. If an error is noted on this Filing Receipt, please submit a written request for a corrected Filing Receipt, including a properly marked-up ADS showing the changes with strike-through for deletions and underlining for additions. If you received a "Notice to File Missing Parts" or other Notice requiring a response for this application, please submit any request for correction to this Filing Receipt with your reply to the Notice. When the USPTO processes the reply to the Notice, the USPTO will generate another Filing Receipt incorporating the requested corrections provided that the request is grantable.

Inventor(s)

Eric FURFINE, Concord, MA;
Daniel DIX, LaGrangeville, NY;
Kenneth GRAHAM, Pleasant Valley, NY;
Kelly FRYE, Mendham, NJ;

Applicant(s)

REGENERON PHARMACEUTICALS, INC., Tarrytown, NY

Assignment For Published Patent Application

REGENERON PHARMACEUTICALS, INC., Tarrytown, NY

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of 16/159,269 10/12/2018
which is a CON of 15/879,294 01/24/2018 PAT 10400025
which is a CON of 15/095,606 04/11/2016 PAT 9914763
which is a CON of 14/330,096 07/14/2014 PAT 9340594
which is a CON of 13/914,996 06/11/2013 PAT 8802107
which is a CON of 13/329,770 12/19/2011 PAT 8481046
which is a CON of 12/833,417 07/09/2010 PAT 8092803
which is a CON of 12/560,885 09/16/2009 PAT 7807164
which is a DIV of 11/818,463 06/14/2007 PAT 7608261
which claims benefit of 60/814,484 06/16/2006

Foreign Applications for which priority is claimed (You may be eligible to benefit from the **Patent Prosecution Highway** program at the USPTO. Please see http://www.uspto.gov for more information.) - None.
Foreign application information must be provided in an Application Data Sheet in order to constitute a claim to foreign priority. See 37 CFR 1.55 and 1.76.

Permission to Access Application via Priority Document Exchange: Yes

Permission to Access Search Results: Yes

Applicant may provide or rescind an authorization for access using Form PTO/SB/39 or Form PTO/SB/69 as appropriate.

If Required, Foreign Filing License Granted: 10/08/2019
The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 16/582,486**
Projected Publication Date: 01/16/2020
Non-Publication Request: No
Early Publication Request: No
Title

VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

Preliminary Class

Statement under 37 CFR 1.55 or 1.78 for AIA (First Inventor to File) Transition Applications: No

PROTECTING YOUR INVENTION OUTSIDE THE UNITED STATES

Since the rights granted by a U.S. patent extend only throughout the territory of the United States and have no effect in a foreign country, an inventor who wishes patent protection in another country must apply for a patent in a specific country or in regional patent offices. Applicants may wish to consider the filing of an international application under the Patent Cooperation Treaty (PCT). An international (PCT) application generally has the same effect as a regular national patent application in each PCT-member country. The PCT process **simplifies** the filing of patent applications on the same invention in member countries, but **does not result** in a grant of "an international patent" and does not eliminate the need of applicants to file additional documents and fees in countries where patent protection is desired.

Almost every country has its own patent law, and a person desiring a patent in a particular country must make an application for patent in that country in accordance with its particular laws. Since the laws of many countries differ in various respects from the patent law of the United States, applicants are advised to seek guidance from specific foreign countries to ensure that patent rights are not lost prematurely.

Applicants also are advised that in the case of inventions made in the United States, the Director of the USPTO must issue a license before applicants can apply for a patent in a foreign country. The filing of a U.S. patent application serves as a request for a foreign filing license. The application's filing receipt contains further information and guidance as to the status of applicant's license for foreign filing.

Applicants may wish to consult the USPTO booklet, "General Information Concerning Patents" (specifically, the section entitled "Treaties and Foreign Patents") for more information on timeframes and deadlines for filing foreign

patent applications. The guide is available either by contacting the USPTO Contact Center at 800-786-9199, or it can be viewed on the USPTO website at http://www.uspto.gov/web/offices/pac/doc/general/index.html.

For information on preventing theft of your intellectual property (patents, trademarks and copyrights), you may wish to consult the U.S. Government website, http://www.stopfakes.gov. Part of a Department of Commerce initiative, this website includes self-help "toolkits" giving innovators guidance on how to protect intellectual property in specific countries such as China, Korea and Mexico. For questions regarding patent enforcement issues, applicants may call the U.S. Government hotline at 1-866-999-HALT (1-866-999-4258).

LICENSE FOR FOREIGN FILING UNDER

Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

GRANTED

The applicant has been granted a license under 35 U.S.C. 184, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" followed by a date appears on this form. Such licenses are issued in all applications where the conditions for issuance of a license have been met, regardless of whether or not a license may be required as set forth in 37 CFR 5.15. The scope and limitations of this license are set forth in 37 CFR 5.15(a) unless an earlier license has been issued under 37 CFR 5.15(b). The license is subject to revocation upon written notification. The date indicated is the effective date of the license, unless an earlier license of similar scope has been granted under 37 CFR 5.13 or 5.14.

This license is to be retained by the licensee and may be used at any time on or after the effective date thereof unless it is revoked. This license is automatically transferred to any related applications(s) filed under 37 CFR 1.53(d). This license is not retroactive.

The grant of a license does not in any way lessen the responsibility of a licensee for the security of the subject matter as imposed by any Government contract or the provisions of existing laws relating to espionage and the national security or the export of technical data. Licensees should apprise themselves of current regulations especially with respect to certain countries, of other agencies, particularly the Office of Defense Trade Controls, Department of State (with respect to Arms, Munitions and Implements of War (22 CFR 121-128)); the Bureau of Industry and Security, Department of Commerce (15 CFR parts 730-774); the Office of Foreign AssetsControl, Department of Treasury (31 CFR Parts 500+) and the Department of Energy.

NOT GRANTED

No license under 35 U.S.C. 184 has been granted at this time, if the phrase "IF REQUIRED, FOREIGN FILING LICENSE GRANTED" DOES NOT appear on this form. Applicant may still petition for a license under 37 CFR 5.12, if a license is desired before the expiration of 6 months from the filing date of the application. If 6 months has lapsed from the filing date of this application and the licensee has not received any indication of a secrecy order under 35 U.S.C. 181, the licensee may foreign file the application pursuant to 37 CFR 5.15(b).

SelectUSA

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The U.S. offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to promote and facilitate business investment. SelectUSA provides information assistance to the international investor community; serves as an ombudsman for existing and potential investors; advocates on behalf of U.S. cities, states, and regions competing for global investment; and counsels U.S. economic development organizations on investment attraction best practices. To learn more about why the United States is the best country in the world to develop technology, manufacture products, deliver services, and grow your business, visit http://www.SelectUSA.gov or call +1-202-482-6800.

PATENT APPLICATION FEE DETERMINATION RECORD

Substitute for Form PTO-875

Application or Docket Number: 16/582,486

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY FEE($)
BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A	N/A			N/A	300
SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A	N/A			N/A	660
EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A	N/A			N/A	760
TOTAL CLAIMS (37 CFR 1.16(i))	24 minus 20 =	* 4			OR	x 100 =	400
INDEPENDENT CLAIMS (37 CFR 1.16(h))	4 minus 3 =	* 1				x 460 =	460
APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).						0.00
MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))							0.00
* If the difference in column 1 is less than zero, enter "0" in column 2.			TOTAL			TOTAL	2580

APPLICATION AS AMENDED - PART II

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT A	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	SMALL ENTITY RATE($)	SMALL ENTITY ADDITIONAL FEE($)	OR	OTHER THAN SMALL ENTITY RATE($)	OTHER THAN SMALL ENTITY ADDITIONAL FEE($)
AMENDMENT B	Total (37 CFR 1.16(i))	*	Minus	**	=	x =		OR	x =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	x =		OR	x =	
	Application Size Fee (37 CFR 1.16(s))									
	FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							OR		
						TOTAL ADD'L FEE		OR	TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.

** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".

*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".

The "Highest Number Previously Paid For" (Total or Independent) is the highest found in the appropriate box in column 1.

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
16/582,486	September 25, 2019

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 96387

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Regeneron Pharmaceuticals, Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	/Frank R. Cottingham/	Date (Optional)	November 4, 2019
Name	Frank R. Cottingham		
Title	Executive Director, Assistant General Counsel, Patents, Regeneron Pharmaceuticals, Inc.		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Furfine, Eric

Application No./Patent No.: 16/582,486 Filed/Issue Date: September 25, 2019

Titled: VEGF Antagonist Formulations Suitable for Intravitreal Administration

Regeneron Pharmaceuticals, Inc., a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 050903, Frame 0067, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Karl Bozicevic, Reg No. 28,807/	November 13, 2019
Signature	Date
Karl Bozicevic	28,807
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	37740745
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Savanna Fuentes
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	13-NOV-2019
Filing Date:	25-SEP-2019
Time Stamp:	14:58:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	5050US11_POA.pdf	169026 8ed3fe4af0a2a5c3f7e7ebdef668dafb5a6f3421	no	1

Warnings:

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	REGN-024CON9_2019-11-13_373c.pdf	118278 7fd62850bb87a94bd9ba1e6bd6a867a54334f577	no	3
Warnings:					
Information:					
		Total Files Size (in bytes):	287304		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9

CONFIRMATION NO. 3381

96387
Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

POA ACCEPTANCE LETTER

OC000000112701608

Date Mailed: 11/19/2019

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 11/13/2019.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sleutchit/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9

CONFIRMATION NO. 3381

96387
Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

PUBLICATION NOTICE

OC000000114012824

Title:VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

Publication No.US-2020-0017572-A1
Publication Date:01/16/2020

NOTICE OF PUBLICATION OF APPLICATION

The above-identified application will be electronically published as a patent application publication pursuant to 37 CFR 1.211, et seq. The patent application publication number and publication date are set forth above.

The publication may be accessed through the USPTO's publically available Searchable Databases via the Internet at www.uspto.gov. The direct link to access the publication is currently http://www.uspto.gov/patft/.

The publication process established by the Office does not provide for mailing a copy of the publication to applicant. A copy of the publication may be obtained from the Office upon payment of the appropriate fee set forth in 37 CFR 1.19(a)(1). Orders for copies of patent application publications are handled by the USPTO's Public Records Division. The Public Records Division can be reached by telephone at (571) 272-3150 or (800) 972-6382, by facsimile at (571) 273-3250, by mail addressed to the United States Patent and Trademark Office, Public Records Division, Alexandria, VA 22313-1450 or via the Internet.

In addition, information on the status of the application, including the mailing date of Office actions and the dates of receipt of correspondence filed in the Office, may also be accessed via the Internet through the Patent Electronic Business Center at www.uspto.gov using the public side of the Patent Application Information and Retrieval (PAIR) system. The direct link to access this status information is currently https://portal.uspto.gov/pair/PublicPair. Prior to publication, such status information is confidential and may only be obtained by applicant using the private side of PAIR.

Further assistance in electronically accessing the publication, or about PAIR, is available by calling the Patent Electronic Business Center at 1-866-217-9197.

Office of Data Managment, Application Assistance Unit (571) 272-4000, or (571) 272-4200, or 1-888-786-0101

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	
				Examiner Name	
Sheet	1	of	2	Attorney Docket Number	REGN-024CON

U.S. PATENT DOCUMENTS					
Examiner Initial*	Cite No.	Patent Number Number-Kind Code (*if known*)	Issue Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	**6100071**	2000-08-08	Davis-Smyth et al.	
	2	**6897294**	2005-05-24	Davis-Smyth et al.	
	3	**7052691**	2006-05-30	Sleeman et al.	

U.S. PATENT APPLICATION PUBLICATIONS					
Examiner Initial*	Cite No.	Publication Number **Number-Kind Code** (*if known*)	Publication Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	**20050281831**	2005-12-22	Davis-Smyth et al.	
	2	**20060217311**	2006-09-28	Dix et al.	
	3	**20080085276**	2008-04-10	Wiegand et al.	
	4	**20140012227**	2014-01-09	Sigg et al.	

FOREIGN PATENT DOCUMENTS						
Examiner Initial*	Cite No.	Foreign Document Number Country Code-Number-Kind Code (*if known*)	Publication Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
	1	WO 97/04801	1997-02-13	Genentech, Inc.		
	2	JPH11510170	1999-09-07	Genentech, Inc.	See WO 97/04801 for English Equivalent	X
	3	WO 99/62536	1999-12-09	Celtrix Pharmaceuticals, Inc.		
	4	JP 10273450	1998-10-13	Toagosei Co. Ltd.	See WO 99/62536 for English Equivalent	X
	5	WO 99/62536	1999-12-09	Celtrix Pharmaceuticals, Inc.		
	6	JP2002516871	2002-06-11	Celtrix Pharmaceuticals, Inc.	See WO 99/62536 for English Equivalent	X
	7	WO 2004/091658	2004-10-28	Genentech, Inc.		
	8	WO 2005/000895	2005-01-06	Regeneron Pharmaceuticals, Inc.		
	9	WO 2005011734	2005-02-10	Regeneron Pharmaceuticals, Inc.		
	10	WO 2005/020972	2005-03-10	Eyetech Pharmaceuticals, Inc.		
	11	WO 2006/047325	2006-05-04	Genentech, Inc.		
	12	WO 2006/088650	2006-08-24	Regeneron Pharmaceuticals, Inc.		
	13	WO 2006/104852	2006-10-05	Regeneron Pharmaceuticals, Inc.		

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	
				Examiner Name	
Sheet	2	of	2	Attorney Docket Number	REGN-024CON

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	1	FRASER, Hamis M., et al., "Single Injections of Vascular Endothelial Growth Factor Trap Block Ovulation in the Macaque and Produced Prolonged, Dose-Related Suppression of Ovarian Function," (2004) J. Clin. Endocrin. & Metabol. 90(2):1114-1122	
	2	ANONYMOUS: "Lucentis in the treatment of neovascular (wet) age-related macular degeneration (AMD)", 1 January 2007, pages 1-54	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :		(11) International Publication Number:
A61K 38/00	A2	WO 99/62536
		(43) International Publication Date: 9 December 1999 (09.12.99)

(21) International Application Number: PCT/US99/12173

(22) International Filing Date: 28 May 1999 (28.05.99)

(30) Priority Data:
09/089,062 1 June 1998 (01.06.98) US

(71) Applicant *(for all designated States except US)*: CELTRIX PHARMACEUTICALS, INC. [US/US]; Suite 600, 2033 Gateway Place, San Jose, CA 95110 (US).

(72) Inventors; and
(75) Inventors/Applicants *(for US only)*: DANKO, Stephen [US/US]; San Francisco, CA (US). PASSMORE, David [US/US]; Menlo Park, CA (US). OGAWA, Yasushi [US/US]; Pacifica, CA (US).

(74) Agents: BUFFINGER, Nicholas et al.; Morrison & Foerster LLP, 755 Page Mill Road, Palo Alto, CA 94304–1018 (US).

(81) Designated States: AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).

Published
Without international search report and to be republished upon receipt of that report.

(54) Title: PHARMACEUTICAL FORMULATIONS FOR IGF/IGFBP

(57) Abstract

New pharmaceutical formulations for IGF/IGFBP complex are disclosed. IGF/IGFBP complex, preferably rhIGF–I/IGFBP–3 complex is formulated with bulking agents and optionally buffer salts, but without added osmolyte salts. Also disclosed are lyophilized formulations for IGF/IGFBP complex.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AL	Albania	**ES**	Spain	**LS**	Lesotho	**SI**	Slovenia
AM	Armenia	**FI**	Finland	**LT**	Lithuania	**SK**	Slovakia
AT	Austria	**FR**	France	**LU**	Luxembourg	**SN**	Senegal
AU	Australia	**GA**	Gabon	**LV**	Latvia	**SZ**	Swaziland
AZ	Azerbaijan	**GB**	United Kingdom	**MC**	Monaco	**TD**	Chad
BA	Bosnia and Herzegovina	**GE**	Georgia	**MD**	Republic of Moldova	**TG**	Togo
BB	Barbados	**GH**	Ghana	**MG**	Madagascar	**TJ**	Tajikistan
BE	Belgium	**GN**	Guinea	**MK**	The former Yugoslav Republic of Macedonia	**TM**	Turkmenistan
BF	Burkina Faso	**GR**	Greece			**TR**	Turkey
BG	Bulgaria	**HU**	Hungary	**ML**	Mali	**TT**	Trinidad and Tobago
BJ	Benin	**IE**	Ireland	**MN**	Mongolia	**UA**	Ukraine
BR	Brazil	**IL**	Israel	**MR**	Mauritania	**UG**	Uganda
BY	Belarus	**IS**	Iceland	**MW**	Malawi	**US**	United States of America
CA	Canada	**IT**	Italy	**MX**	Mexico	**UZ**	Uzbekistan
CF	Central African Republic	**JP**	Japan	**NE**	Niger	**VN**	Viet Nam
CG	Congo	**KE**	Kenya	**NL**	Netherlands	**YU**	Yugoslavia
CH	Switzerland	**KG**	Kyrgyzstan	**NO**	Norway	**ZW**	Zimbabwe
CI	Côte d'Ivoire	**KP**	Democratic People's Republic of Korea	**NZ**	New Zealand		
CM	Cameroon			**PL**	Poland		
CN	China	**KR**	Republic of Korea	**PT**	Portugal		
CU	Cuba	**KZ**	Kazakstan	**RO**	Romania		
CZ	Czech Republic	**LC**	Saint Lucia	**RU**	Russian Federation		
DE	Germany	**LI**	Liechtenstein	**SD**	Sudan		
DK	Denmark	**LK**	Sri Lanka	**SE**	Sweden		
EE	Estonia	**LR**	Liberia	**SG**	Singapore		

PHARMACEUTICAL FORMULATIONS FOR IGF/IGFBP

TECHNICAL FIELD

The invention relates generally to the field of formulation of therapeutic proteins, and particularly to formulations for complexes of insulin-like growth factor I (IGF-I) and insulin-like growth factor binding protein 3 (IGFBP-3).

BACKGROUND ART

Growth factors are polypeptides that stimulate a wide variety of biological responses (*e.g.* DNA synthesis, cell division, expression of specific genes, etc.) in a defined population of target cells. A number of different growth factor families have been identified, including the transforming growth factor beta family (TGF-βs), epidermal growth factor and transforming growth factor alpha (the TGF-αs), the platelet-derived growth factors (PDGFs), the fibroblast growth factor family (FGFs) and the insulin-like growth factor family (IGFs), which includes IGF-I and IGF-II.

IGF-I and IGF-II (the "IGFs") are related in amino acid sequence and structure, with each polypeptide having a molecular weight of approximately 7.5 kilodaltons (kDa). IGF-I mediates the major effects of growth hormone, and is thus the primary mediator of growth after birth. IGF-I has also been implicated in the actions of various other growth factors, since the treatment of cells with such growth factors leads to increased production of IGF-I. In contrast, IGF-II is believed to have a major role in fetal growth. Both IGF-I and IGF-II have insulin-like activities (hence their names), and are mitogenic (stimulate cell division) for the cells in neural tissue.

Almost all IGF circulates in a non-covalently associated complex of IGF-I, insulin-like growth factor binding protein 3 (IGFBP-3) and a larger protein subunit termed the acid labile subunit (ALS), such that very little free IGF-I is detectable. The ternary complex is composed of equimolar amounts of each of the three components. ALS has no direct IGF-binding activity and appears to bind only to the IGF/IGFBP-3 complex (Baxter et al., *J. Biol. Chem.* **264**(20):11843-11848, 1989), although some reports suggest that IGFBP-3 can bind to rat ALS in the absence of IGF (Lee et al., *Endocrinology* **136**:4982-4989, 1995). The ternary complex of IGF/IGFBP-3/ALS has a molecular weight of approximately 150 kDa. This ternary complex is thought to act "as a reservoir and a buffer for IGF-I and IGF-

II preventing rapid changes in the concentration of free IGF" (Blum *et al.* (1991), "Plasma IGFBP-3 Levels as Clinical Indicators" in MODERN CONCEPTS OF INSULIN-LIKE GROWTH FACTORS, pp. 381-393, E.M. Spencer, ed., Elsevier , New York). While there is essentially no excess (unbound) IGFBP-3 in circulation, a substantial excess of free ALS does exist (Baxter, *J. Clin. Endocrinol. Metab.* **67**:265-272, 1988).

The complex of IGF-I and IGFBP-3 ("binary complex" or "IGF-I/IGFBP-3") is considerably different from uncomplexed IGF-I, both physically and chemically. The binary complex is approximately 5 times larger than uncomplexed IGF-I, has a different overall pI, and has a different overall hydrophobicity. These differences cause the binary complex to behave quite differently than IGF-I.

Due to its wide range of activities, IGF-I has been developed as a treatment for a variety of conditions, including amyotrophic lateral sclerosis (commonly known as Lou Gehrig's disease) and diabetes. Unfortunately, the administration of IGF-I is accompanied by a variety of undesirable side effects, including hypoglycemia, edema (which can cause Bell's palsy, carpal tunnel syndrome, and a variety of other deleterious conditions), hypophosphatemia (low serum phosphorus), and hypernatermia (excessive serum sodium). Administration of IGF-I as a complex of IGF-I and IGFBP-3 can reduce or eliminate these undesirable side effects (Adams et al., 1996, *Prog. Growth Factor Res.* **6**:2-4)

While administration of IGF-I/IGFBP-3 complex may be desirable, the complex, like many proteins, has very limited stability (shelf life) in most formulations. A variety of purportedly stable formulations have been disclosed for IGF-I, either alone or in combination with another proteins (*e.g.*, growth hormone), but the formulations thus disclosed for IGF-I/IGFBP-3 have been unsatisfactory due to poor stability of the proteins. These formulations for binary complex require that the protein be frozen, frequently at very low temperatures (*e.g.*, -70° C). Freezers, particularly the ultra-low temperature freezers required to maintain –70° C, are uncommon outside of research facilities and are also very expensive. Accordingly, formulations which can be stored at normal refrigerator temperatures or higher while still providing a long shelf life are critical to the commercial development of IGF-I/IGFBP for use as a therapeutic.

A variety of formulations have been disclosed for IGF, particularly IGF-I. For example, U.S. Patent No. 5,681, 814 discloses an IGF-I formulation for use in subcutaneous administration which comprises IGF-I, 2-50 mg/ml of an osmolyte (*e.g.*,

sodium chloride), 1-15 mg/ml of a preservative (*e.g.* benzyl alcohol or phenol) in a buffered in solution at pH 5-5.5. International Patent Application No. WO 97/07816 discloses a liquid IGF-I formulation which comprises IGF-I and mannitol in a buffered solution. However, due to the substantial physico/chemical differences between IGF-I and IGF/IGFBP-3, there is no reasonable expectation that IGF-I formulations will be suitable for IGFBP-3.

It should be noted that, while IGFBP-3 is the most abundant of the IGF binding proteins ("IGFBPs"), at least five other distinct IGFBPs have been identified in various tissues and body fluids. Although these proteins bind IGFs, they originate from separate genes and have distinct amino acid sequences. Unlike IGFBP-3, other circulating IGFBPs are not saturated with IGFs. IGFBP-3 is the only IGFBP which can form the 150 kDa ternary complex with IGF and ALS. However, some of the other IGFBPs have also been suggested for use in combination with IGF-I as therapeutics.

However, despite the advantages of administering IGF-I as a complex with IGFBP-3, little has been disclosed regarding formulations useful for pharmaceutical applications. Bagi et al. (*J. Bone Mineral Res.* **9**(8):1301-1311, 1994) disclose the administration of IGF-I/IGFBP-3 to ovariectomized rats. The IGF-I/IGFBP-3 complex was formulated in simple phosphate buffered saline (PBS). Celtrix Pharmaceuticals, Inc. has disclosed the use of IGF-I/IGFBP-3 formulated in acetate buffer (pH 5.5) with 105 mM sodium chloride (NaCl) as the osmolyte. However, this formulation is not ideal for a commercial pharmaceutical formulation, as it does not permit lyophilization of the product.

Lyophilization (freeze drying under controlled conditions) is commonly used for long term storage of proteins. The lyophilized protein is substantially resistant to degradation, aggregation, oxidation, and other degenerative processes while in the freeze dried state. The lyophilized protein is normally reconstituted with water optionally containing a bacteriostatic preservative (*e.g.*, benzyl alcohol). Unfortunately, many preservatives (*e.g.*, benzyl alcohol) are not compatible with proteins, or at least reduce stability. However, the addition of a preservative is currently recommended for drugs which will be administered for periods of 24 hours or more, and this recommendation may become a requirement for drugs sold in the U.S.

Acceptable commercial lyophilized pharmaceutical products must form an acceptable "lyo cake" (mass of lyophilized product). Preferably the lyo cake has a smooth

surface and uniform appearance. Lyophilized protein alone rarely makes an acceptable lyo cake, so suitable bulking agents must be added. Generally, carbohydrates such as mannitol, sorbitol, and sucrose are used as bulking agents in lyophilized pharmaceutical products. Additionally, a buffering agent is normally added, particularly in pharmaceutical formulations for proteins such as growth factors and cytokines. The buffering agent is used to control the pH of the formulation when it is in a liquid state (*i.e.*, before lyophilization and after reconstitution) because proteins are normally particularly sensitive to pH fluctuations or extremes.

Accordingly, there is a need in the art for pharmaceutically acceptable formulations that provide high stability for IGF-I/IGFBP-3 drug products.

DISCLOSURE OF THE INVENTION

The inventors have created novel formulations for IGF-I/IGFBP-3 which provide long term stability for IGF-I/IGFBP-3 complex. The formulations of the instant invention are pharmaceutically acceptable.

The inventors have surprisingly found that pharmaceutical formulations of IGF-I/IGFBP-3 complex with very low levels of osmolyte salts are more stable than formulations with high levels of added salts. Additionally, the inventors have found the surprising and unexpected result that omission of pH buffer salts further increases the stability of IGF-I/IGFBP-3 formulations.

In a further surprising and unexpected discovery, the inventors have found that IGF-I/IGFBP-3 formulations with high protein concentrations and having low osmolyte salts and no added pH buffer salts have high stability.

In one embodiment, the formulations of the invention comprise IGF-I/IGFBP-3 complex, a bulking agent, and pH buffer salt. No added osmolyte salt is present in the formulations of this embodiment.

In a further embodiment, the formulations of the instant invention comprise IGF-I/IGFBP-3 complex and a bulking agent. No added osmolyte salts or pH buffer salts are present in the formulations of this embodiment. The formulations of this embodiment are particularly advantageous because they allow the preparation of pharmaceutical formulations which contain very high protein concentrations.

The formulations of the instant invention may be liquid formulations or lyophilized formulations. Optionally, they may also contain a non-ionic surfactant. Liquid formulations may optionally contain a preservative for reducing or eliminating bacterial growth.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 shows the amino acid sequence (single letter amino acid code) of mature human IGFBP-3 (Ala_5) variant.

BEST MODE FOR CARRYING OUT THE INVENTION

The inventors have made a number of surprising and unexpected discoveries which allow the production of commercially and pharmaceutically acceptable, stable IGF/IGFBP formulations. The inventors have found the surprising and unexpected result that elimination of added osmolyte salts increases the stability of IGF-I/IGFBP-3 formulations. Further, and more unexpectedly, the inventors have found that elimination of pH buffer salts increases the stability of IGF-I/IGFBP-3 formulations. The inventors have also surprisingly found that formulations having low levels of osmolyte salts and no added pH buffer salts have increased stability in the presence of benzyl alcohol, a commonly used pharmaceutical preservative which frequently promotes aggregation of proteins. Formulations having low osmolyte salts with or without an added pH buffer can be created with high concentrations of IGF-I/IGFBP complex without substantial loss of protein.

Definitions

"Insulin-like growth factor" or "IGF " comprises a family of factors, including, but not limited to, IGF-I and IGF-II. The IGFs are polypeptides with molecular weights of about 7.5 kDa. IGF includes naturally occurring IGF-I or IGF-II, analogs or variants thereof (*e.g.*,variants in which one or more of IGF-I's tyrosine residues (*i.e.*, residues 24, 31, or 60) are replaced with non-aromatic residues (*i.e.*, other than tyrosine, phenylalanine or tryptophan), mutants where amino acid residues 49, 50, 51, 53, 55 and 56 are altered (for example, where residues 49–51 are altered to Thr-Ser-Ile or where residues 55–56 are altered to Tyr-Gln) and fusions between IGF-I or IGF-II and other amino acid sequences. IGF may be obtained from natural sources or prepared by recombinant means.

"Insulin-like growth factor binding protein" or "IGFBP", as used herein, is a family of insulin-like growth factor binding proteins which comprises, but is not limited to, IGFBP-1, IGFBP-2, IGFBP-3, IGFBP-4, IGFBP-5 and IGFBP-6. IGFBP may be obtained from natural or recombinant sources.

"Insulin-like growth factor binding protein 3" or "IGFBP-3" refers to one of the members of the IGFBP family. The mature protein is 264 amino acids and, in humans, comprises at least two naturally occurring allelic variant proteins, wherein the fifth amino acid residue of the mature protein is either glycine or alanine (referred to as Gly_5 IGFBP-3 and Ala_5 IGFBP-3, respectively). When produced by human and other mammalian cells, the protein is post-translationally modified by up to three N-linked glycosylations at three separate sites. When produced in bacteria, the protein is not glycosylated. IGFBP-3 also includes variants of the protein, for example those variants in which the amino acid sites of the normal N-linked glycosylation are altered to another amino acid (sequence variants will be notated throughout the specification as X#Y, where X is the single letter amino acid code for the amino acid residue in the native protein, # is the residue number in the mature protein sequence, and Y is the amino acid to which the residue is changed), particularly aspartate, such as N89D; N109D; N172D; N89D,N109D; N89D,N172D; N109D,N172D; and N89D,N109D,N172D variants or N89X; N109X; N172X; N89X,N109X; N89X,N172X; N109X,N172X; and N89X,N109X,N172X variants. Other variants include alterations at position 116 and 135 where the native sequence aspartate is altered to glutamate (*e.g.*, D116E, D135E and D116E,D135E) or to any other amino acid (*e.g.*, D116X, D135X and D116X,D135X) and variants in IGFBP-3's nuclear localizing sequence (NLS), such as K228E, R230G and K228E,R230G and/or alterations at residues 215, 216 and/or 231. Of course, variant IGFBP-3 may contain more than one variation (*e.g.*, a variant IGFBP-3 may include hydrolysis-resistance variations as well as NLS variations). IGFBP-3 may be produced by purification from natural sources or recombinantly in prokaryotic or eukaryotic host cells, although variants other than naturally occurring allelic variant proteins are preferably produce by recombinant means .

The term "bulking agent" refers to a compound which is pharmaceutically acceptable and which adds bulk to a lyo cake. Acceptable bulking agents include, but are not limited to, carbohydrates such as simple sugars such as dextrose, ribose, fructose and the like, alcohol sugars such as mannitol, inositol and sorbitol, disaccharides including

trehalose, sucrose and lactose, naturally occurring polymers such as starch, dextrans, chitosan, hyaluronate, proteins (*e.g.*, gelatin and serum albumin) and glycogen , and synthetic monomers and polymers. Bulking agents for use in the instant invention preferably also act as osmolytes (*i.e.*, aid in making the liquid form of the formulation isotonic with normal human serum).

As used herein, the term "osmolyte salt" means salts which are added for the purpose of helping a formulation to become isotonic with normal human serum. Osmolyte salts are normally compounds which are generally regarded as safe for administration to humans, and include sodium chloride, calcium chloride, potassium chloride and the like. Pharmaceutically acceptable osmolyte salts may generally found in the USP (UNITED STATES PHARMACOPEIA, United States Pharmacopeial Convention, Inc., Rockville, MD, 1995).

A "preservative" is a bacteriostatic, bacteriocidal, fungistatic or fungicidal compound which may be added to the formulations of the instant invention to retard or eliminate growth of bacteria or other contaminating microorganisms in the formulations. The preservative should be pharmaceutically acceptable and generally regarded as safe for administration to humans. Examples of preservatives useful in the formulations of the instant invention include benzyl alcohol, phenol, benzalkonium chloride, m-cresol, thimerosol, chlorobutanol, methylparaben, propylparaben and the like. Pharmaceutically acceptable preservatives may generally be found in the USP (*Id.*). Benzyl alcohol at 0.9-1% (v/v) is a preferred preservative for liquid formulations and reconstituted lyophilized formulations.

As used herein, the term "non-ionic surfactant" refers to a compound which reduces the surface tension of water. Surfactants are sometimes helpful in a number of ways, such as reduction of protein binding to storage and administration devices, for reduction of aggregate formation by proteins and as an aid for the resolubilization of proteins during reconstitution of lyophilized formulations. A surfactant useful in the instant invention will not promote protein denaturation. Examples of surfactants acceptable for use in the instant invention include, but are not limited to polyoxyethylenesorbitan monolaurate (Tween 20), polyoxyethylenesorbitan monooleate (Tween 80). dodecyl poly(oxyethyleneglycol ether)$_{23}$ (Brij 35) and octylphenol poly(ethyleneglycol ether)$_{10}$ (Triton® X-100). Generally, non-

ionic surfactants acceptable for use in the compositions of the invention may be found in the USP (*Id.*).

The term "stable", as used herein in relation to a particular formulation, means that the formulation meets minimum acceptable standards for purity after storage for a specified time under specified conditions. This means that the IGF/IGFBP in the formulation preferably has less than a 30, more preferably less than a 15, percentage point increase in aggregation over the course of one year under normal storage conditions (*i.e.*, approximately 20° C for a lyophilized formulation, or refrigerated, frozen or 20° C for liquid formulations), as measured by size exclusion chromatography (the material is analyzed by SEC and percent aggregation is measured by taking ratio of the peak area of material outside of the main IGF/IGFBP peak to the total peak area). A stable formulation also preferably has less than a 10, more preferably five, percentage point increase degradation over the course of one year under normal storage conditions, as measured by reverse phase HPLC (the material is analyzed by RP-HPLC and percent degradation is measured by taking ratio of the peak area of material outside of the main IGF and IGFBPs peak to the total peak area).

Preferred IGFs include wild-type IGF-I (most preferably recombinant human IGF-I, rhIGF-I) and the variant IGFs, which may be produced by any method known in the art. Preferably, the rhIGF-I is produced recombinantly, utilizing the technology disclosed in International Patent Applications Nos. WO 94/04076 and WO 96/40722. Preferred IGFBPs include recombinant wild-type human IGFBP-3, including naturally occurring allelic variants (particularly the Gly_5 and Ala_5 allelic variants of wild-type human IGFBP-3) and variants (*e.g.*, the variants at positions 89, 109, 116, 135, 172, 228 and 230) of human IGFBP-3. IGFBPs useful in the instant invention may be produced by any method known in the art, and are preferably produced recombinantly, utilizing the fusion protein technology disclosed in International Patent Applications Nos. WO 94/04076 and WO 96/40722.

Formation of IGF/IGFBP complex is preferably acomplished by simply mixing IGF and IGFBP. In the case of IGF-I and IGFBP-3, the complex forms quickly without any further manipulation. If so desired, the complex may be further purified following complex formation. Such purification may be accomplished by any technique known in the art.

Preferably, the IGF/IGFBP comples for use in the instant formulations has less than 5%, degradation products and less than 15% aggregates.

Normally, the complex is formed with the IGF and IGFBP in an aqueous solution including pH buffer salts and dissolved osmolyte salts (*e.g.*, NaCl). For formation of the formulations of the invention, the dissolved salts, and optionally the pH buffer salts must be removed from the solution. This may be accomplished by any buffer exchange technique known in the art, including, but not limited to, diafiltration, dialysis, reverse osmosis and other ultrafiltration techniques and de-salting by size exclusion chromatography. The protein solution may be directly exchanged into the formulations of the instant invention, or, preferably, it is exchanged into pure water. If the protein solution is exchanged into pure water, the other components of the formulation are added to the water/protein solution and thoroughly mixed. The components of the formulation (*e.g.*, bulking agent) may be added as dry chemicals (which is the form in which most bulking agents and some surfactants are supplied by the manufacturer) or as liquid concentrates.

The formulations of the instant invention contain no added osmolyte salts. Because it is nearly impossible to completely remove salts which are added to buffer solutions during production and purification of IGF and IGFBP, particularly when the formulations are produced in a commercial process, the formulations may not be completely free of osmolyte salts. However, the concentration of osmolyte salts in the formulations of the invention is low, preferably less than 12.5 mM, more preferably less than 2.5 mM, and most preferably less than 1 mM.

In one preferred embodiment, IGF/IGFBP complex is formulated in a pH buffer (*i.e.*, a solution containing buffer salts which can buffer against changes in pH). The pH buffer preferably has a pH of about 5.0 to 7.0, more preferably about 5.5 to 6.5. The IGF/IGFBP may be buffer exchanged into water, followed by the addition of a concentrated solution of pH buffer salts of the desired pH or the addition of dry pH buffer salts to the IGF/IGFBP solution. Alternately, the IGF/IGFBP may be directly buffer exchanged into a pH buffer. Preferably, the IGF/IGFBP is directly buffer exchanged into a pH buffer. The buffer salts may be any buffer salts that are pharmaceutically acceptable, such as sodium phosphate, potassium phosphate, sodium acetate, sodium citrate, and sodium succinate. Preferred buffer salts are sodium citrate and sodium succinate, more preferably sodium succinate. In stability testing experiments, Applicants have surpisingly

found that pharmaceutical formulations comprising IGF-I/IGFBP-3 with a pH buffer but lacking added osmolyte salts are more stable than formulations containing added osmolyte salts. In further surprising results, Applicants have found that formulations comprising a succinate buffer at pH 5.5 are more stable than formulations containing citrate and acetate buffers.

In another preferred embodiment of the invention, IGF/IGFBP complex is buffer exchanged into pure water. A bulking agent or agents may be added to the IGF/IGFBP solution to make it isotonic with normal human serum if necessary. Preferably, the bulking agent is mannitol, sorbitol, sucrose, inositol, lactose, dextrose or a mixture of bulking agents. In one preferred embodiment, the bulking agents are mannitol and sucrose, and the bulking agents are added to a total of 6% (w/v), with a preferred ratio of mannitol to sucrose of 3:2 (*i.e.*, 3.6% (w/v) mannitol and about 2.4% (w/v) sucrose). Also contemplated are formulations which are made hypotonic, lyophilized, then reconstituted with a reduced volume of water to create a isotonic formulation of increased protein concentration. For example, IGF-I/IGFBP-3 complex may be formulated in 1.5% mannitol, 1% sucrose at 50 mg/ml protein, lyophilized, then reconstituted to 0.5 times the original volume, to give a reconstituted formulation of 100 mg/ml that is isotonic with human serum. Neither osmolyte salts nor buffer salts are added to the formulations of this embodiment. Applicants have surprisingly found that pharmaceutical formulations comprising IGF-I/IGFBP-3 in mannitol and sucrose which lack any added pH buffer or osmolyte salts are more stable than formulations which contain pH buffers and osmolyte salts. Additionally, Applicants have found that formulations of this embodiment are particularly advantageous because formulations containing very high protein concentrations can be made (see Example 5).

The formulations of the instant invention may be kept as liquid formulations or they may be lyophilized. Liquid formulations are preferably frozen for long term storage. Frozen liquid formulations may be stored in ultra-low freezers (*i.e.*, less than about -70° C), non-defrosting freezers (*i.e.*, about -20° C) or defrosting freezers (*i.e.*, cycling between about 5° C and -15° C). Preferably, liquid formulations are stored in ultra-low freezers, but storage in non-defrosting freezers or defrosting freezers is acceptable.

Lyophilized formulations are first prepared as liquids, then frozen and lyophilized. The lyophilization process is well known to those of skill in the art, and involves the

sublimation of water from the frozen formulation under controlled conditions. Lyophilized formulations may be stored refrigerated or at normal room temperature (*e.g.*, approximately 20° C). Lyophilized formulations are reconstituted for use by addition of an aqueous solution to redissolve the formulation. Preferably the reconstitution solution is water (*e.g.*, USP WFI, or water for injection) or bacteriostatic water (*e.g.*, USP WFI with 0.9% benzyl alcohol), although solutions containing buffers or other excipients may also be used. Water and bacteriostatic water are preferred reconstitution solutions. Other preservatives may be added to the reconstitution solution, including phenol (preferably about 0.2 to 0.3%), m-cresol (preferably about 0.25-0.3%), thimerosal (preferably about 0.25-0.3%), methylparaben (preferably about 0.25-0.3%), propylparaben (preferably about 0.25-0.3%), chlorobutanol (preferably about 0.5%), and the like.

EXAMPLES

Example 1: Comparison of pH buffers

Frozen recombinant human (rh) IGF-I/IGFBP-3 (at 10 mg/ml in 50 mM acetate, pH 5.5, and 105 mM NaCl) was thawed and divided into 3 ml samples. One sample was dialyzed against three 500 ml changes of 20 mM sodium succinate 3% mannitol, 2% sucrose, pH 5.5. The second sample was dialyzed against three 500 ml changes of 20 mM sodium citrate, 3% mannitol, 2% sucrose, pH 5.5. After dialysis was complete, the samples were readjusted to 10 mg/ml. The samples were placed in a shelf lyophilizer and allowed to equilibrate at 18 °C for approximately 10 minutes, after which the temperature was reduced to 5 °C for approximately 18 minutes. After equilibration at 5 °C, the temperature was quickly reduced to -15 °C, where it was held for approximately 12 minutes, then reduced to -35 °C, at which point the pressure was reduced in the lyophilizer (200-300 millitorr) and the samples were lyophilized for four hours. The temperature was increased (under vacuum) to 20 °C over 6 hours, then held at 20 °C (under vacuum) for an additional 28 hours.

The two reconstituted samples, plus a control sample of 10 mg/ml IGF-I/IGFBP-3 in 50 mM sodium acetate, 105 mM NaCl, pH 5.5, were incubated at 37° C for 10 days. At the end of 10 days, the samples were visually inspected, then analyzed by reverse phase high performance liquid chromatography (RP-HPLC) and size exclusion chromatography (SEC). RP-HPLC was performed using a Vydac 4.6 x 250 mm C_{18} column (5 μm bead

size) loaded in 5% acetonitrile, 0.1% trifluoracetic acid (TFA) and eluted with a 26%-34% gradient over 40 minutes. SEC analysis was performed with a Pharmacia Superdex 75 HR 10/30 column run in 50 mM potassium phosphate, 0.5 M NaCl, pH 7.0 at a flow rate of 0.5 ml/min.. A sample of rhIGF-I/IGFBP-3 at 10 mg/ml in 50 mM acetate, pH 5.5, and 105 mM NaCl which was kept at -80 °C during the experiment was thawed and used as a control.

RP-HPLC analysis measures the degradation of IGF-I and IGFBP-3 by measuring the ratio of material outside of the main IGF-I and IGFBP-3 peaks to the total material (expressed as percent degradation). The citrate and succinate buffers were approximately equivalent in this test, and also approximately equivalent to the control. Acetate buffer (control) gave 3.6% degradation, while the citrate and succinate formulations were 3.5% and 4.1%, respectively.

SEC analysis showed a great difference between the three samples. SEC analysis is used to measure the formation of protein aggregates, which is expressed at percent aggregate by comparing the material outside of the main IGF-I/IGFBP-3 peak to the total material in the sample. The control had the highest level of aggregate, 6%, while citrate was 5%. Succinate was surprisingly better than the other formulations, with only 2.5% aggregation after 10 days at 37° C.

Example 2: pH optimization for formulations containing pH buffers

5 ml samples of 10 mg/ml rhIGF-I/IGFBP-3 were dialyzed against 20 mM sodium succinate buffer containing 3% mannitol, 2% sucrose (three changes of 500 ml over 24 hours) at pH 4.5, 5.0, 5.5, 6.0 or 6.5. Following dialysis, protein concentrations were checked by measuring OD_{276}, and concentrations were adjusted as necessary to make the samples 10 mg/ml. The pH of each sample was checked to ensure that the pH was within 0.1 pH point of the intended pH, then the samples were sterile filtered and lyophilized as described in Example 1. Sample pH was checked after reconstitution, then the samples were sterile filtered again and aliquots of each were placed at 5° C and 37° C for ten days. Stability of the formulation was assayed by RP-HPLC and SEC.

SEC analysis showed that increased aggregation was associated with increased pH. pH 4.5 buffer gave 3.5% aggregation, pH 5 gave 4%, pH 5.5 gave 4.2%, while pH 6 and 6.5 resulted in 5.3% and 7.2% aggregation, respectively.

RP-HPLC analysis showed an opposite trend, with increased degradation generally associated with decreased pH. pH 4.5 gave the highest degradation (6.2%), while the pH 5, 5.5, 6 and 6.5 resulted in 4%, 3.8%, 3.5% and 4.2%, respectively.

Based on these results, pH 5.5 was selected as the best pH for formulations containing a pH buffer.

Example 3: Optimization of pH buffer concentration for formulations containing pH buffers

5 ml samples of rhIGF-I/IGFBP-3 were dialyzed against solutions containing 3% mannitol (w/v), 2% sucrose (w/v) and various concentrations of sodium succinate, pH 5.5 (0, 5 mM, 10 mM, 20 mM and 40 mM). Samples were dialyzed for 48 hours in three 500 ml changes of buffer. Following dialysis, protein concentrations were checked by measuring OD_{276}, and concentrations were adjusted as necessary to make the samples 10 mg/ml. The pH of each sample was checked to ensure that the pH was within 0.1 pH point of the intended pH, then the samples were sterile filtered and lyophilized as described in Example 1. Sample pH was checked after reconstitution, then the samples were sterile filtered again and aliquots of each were placed at 5° C and 37° C for ten days. Stability of the formulation was assayed by RP-HPLC and SEC.

SEC analysis showed a direct correlation between aggregation and succinate buffer concentration. 40 mM succinate resulted in 5.5% aggregation, while the 20 mM, 10 mM, 5 mM and 0 samples resulted in 4.5%, 3.6%, 3.2% and 2.4%, respectively.

RP-HPLC analysis showed that all the samples were equivalent with regards to degradation (3.5-4% degradation), with the exception of the 5 mM sample, which had 7.5% degradation. This "spike" in degradation may be due to a salt optimum for whatever process or enzyme is involved in IGFBP-3 degradation.

These results show that lyophilized formulations without added pH buffer are more stable than formulations with a pH buffer.

Example 4: Formulations containing high concentrations of IGF-I/IGFBP-3

30 ml of a 10 mg/ml solution of rhIGF-I/IGFBP-3 was exhaustively dialyzed against 3.6% (w/v) mannitol, 2.4% (w/v) sucrose (formulation solution) then concentrated to10, 20, and 40 mg/ml by first concentrating the solution by ultrafiltration using an

Amicon Centricon® 10 centrifugal ultrafiltration device, testing the concentration by OD_{276}, then adjusting the concentration by addition of formulation solution. 10 mg/ml, 20 mg/ml and 40 mg/ml samples of rhIGF-I/IGFBP-3 in formulation solution were lyophilized as described in Example 1, then reconstituted with water or water plus 0.9% benzyl alcohol and sterile filtered. The samples were placed a 37° C for seven days, then assayed for stability by RP-HPLC and SEC. Assay results are shown in Table 1.

RP-HPLC analysis shows that increasing protein concentration has a minor effect on protein degradation, and that addition of benzyl alcohol does not appear to affect degradation.

SEC analysis showed that increasing protein concentration increased the level of aggregation in the sample. Interestingly, the addition of benzyl alcohol, which normally increases aggregation of protein, and particularly IGF-I/IGFBP-3, had no real effect on aggregation in the mannitol/sucrose formulations without added osmolyte salts or pH buffer.

Table 1

Sample	Degradation	Aggregation
10 mg/ml	1.4%	1.2%
10 mg/ml + benzyl alcohol	1.2%	1.2%
20 mg/ml	1.9%	2.1%
20 mg/ml + benzyl alcohol	1.7%	2.1%
40 mg/ml	1.9%	4.2%
40 mg/ml + benzyl alcohol	1.3%	6.1%

A further experiment was performed, using rhIGF-I/IGFBP-3 concentrated to 75 mg/ml. The protein was first dialyzed extensively against 3.6% mannitol/2.4% sucrose, then concentrated using a stirred cell ultrafiltration device with a 10 kDa cutoff filter. The solution was sterilized by sterile filtration, lyophilized as described above, then reconstituted. The reconstituted protein was assayed to be 75 mg/ml by OD_{276}. Samples with and without 0.9% benzyl alcohol were incubated at 37° C for seven days, then assayed by RP-HPLC and SEC (results are shown below in Table 2).

Extremely high protein concentrations result in increased protein aggregation. Interestingly, although benzyl alcohol had no effect on aggregation or degradation at low protein concentrations, addition of benzyl alcohol at this very high protein concentration did enhance aggregation but not degradation.

Table 2

Sample	Aggregation	Degradation
75 mg/ml	15%	3.4%
75 mg/ml + benzyl alcohol	27%	3.0%

Example 5: Formulations containing very high concentrations of IGF-I/IGFBP-3

rhIGF-I/IGFBP-3 was exhaustively dialyzed against one of four different formulations: (1) 3.6% mannitol, 2.4% sucrose; (2) 1.5% mannitol, 1% sucrose; (3) 0.525% mannitol, 0.35% sucrose; or (4) water. After dialysis, the solutions were concentrated using a stirred cell concentrator to 50 mg/ml protein concentration.

Samples (1 ml of formulation 1, 2 ml of formulation 2, 4 ml of formulation 3 and 10 ml of formulation 4) were transferred to vials and lyophilized as described in Example 1. The different formulations were designed to yield nominal rhIGF-I/IGFBP-3 concentrations of 50, 100, 200, and 500 mg/ml (calculated final concentrations were actually 49, 96, 187 and 495 mg/ml), respectively. Samples were reconstituted to a net weight of 1 g each and protein concentration was determined by measuring OD_{276}, except for formulation 4, which formed a thick syrup which could not be assayed. Purity was measured by SEC in the presence of Brij 35 (the standard, a sample of rhIGF-I/IGFBP-3 which had not been lyophilized, assayed at 98.57% pure in this assay). Results are shown in Table 3

Table 3

Formulation	Nominal Concentration	Expected Concentration	Measured Concentration	Purity by SEC
1	50 mg/ml	49 mg/ml	50 mg/ml	98.29%
2	100 mg/ml	96 mg/ml	96 mg/ml	98.31%
3	200 mg/ml	187 mg/ml	186 mg/ml	97.57%
4	500 mg/ml	495 mg/ml	not measurable	not measurable

pH values were also measured before lyophilization and after reconstitution. Results are shown in Table 4.

Table 4

Formulation	Nominal Concentration	pH Before Lyophilization	pH After Reconstitution
1	50 mg/ml	not determined	6.88
2	100 mg/ml	6.91	6.87
3	200 mg/ml	6.62	6.80
4	500 mg/ml	6.60	not determined

Osmolality was also measured before lyophilization and after reconstitution using an osmometer. Normal laboratory osmolality values for blood, plasma and serum range from 280-296 mOsm/kg (Merck Manual of Diagnosis and Therapy, R. Berkow ed., 16th edition, at 2581, 1992). Results are shown in Table 5.

Table 5

Formulation	Nominal Concentration	Predicted Osmolality	Measured Osmolality
1	50 mg/ml	304 mOsm/kg	309.5 mOsm/kg
2	100 mg/ml	293 mOsm/kg	297 mOsm/kg
3	200 mg/ml	294 mOsm/kg	290 mOsm/kg

In a second experiment to evaluate stability of lyophilized protein in these formulations, rhIGF-I/IGFBP-3 was exhaustively dialyzed against formulation 1, 2 or 3 and lyophilized as described in Example 1. After lyophilization, the samples were (a) reconstituted to 50, 100, or 200 mg/ml ("Time 0") or (b) held at 22° C or 37° C for one month ("22° C" and "37° C", respectively), then reconstituted to 50, 100 or 200 mg/ml

nominal concentration. Purity of the samples was assayed by SEC or RP-HPLC (as described in Example 1). rhIGF-I/IGFBP-3 stored at -80° C served as the control. The results (shown in Tables 6 and 7 for SEC and RP-HPLC, respectively) indicate that formulations 1, 2 and 3 are stable under these conditions, but formulations with low bulking agent concentration (*e.g.*, formulation 3) were slightly less stable due to des(Gly-Pro)IGF-I formation.

Table 6

Formulation	Nominal Concentration	SEC Purity (%) Time 0	SEC Purity (%) 1 mo. 22°C	SEC Purity (%) 1 mo. 37° C
Control	10 mg/ml	96.7	97.5*	97.5*
1	50 mg/ml	not determined	97.9	97.5
2	100 mg/ml	98.4	96.5	97.8
3	200 mg/ml	98.3	98.3	97.3

* Control samples were held at -80° C during the incubation period.

Table 7

Formulation	Nominal Concentration	HPLC Purity (%) Time 0	HPLC Purity (%) 1 mo. 22°C	HPLC Purity (%) 1 mo. 37° C
Control	10 mg/ml	99.3	99.6*	99.6*
1	50 mg/ml	not determined	99.5	99.6
2	100 mg/ml	99.4	99.4	99.6
3	200 mg/ml	99.4	99.3	99.4

* Control samples were held at -80° C during the incubation period.

The patents, patent applications, and publications cited throughout the disclosure are incorporated herein by reference in their entirety.

The present invention has been detailed both by direct description and by example. Equivalents and modifications of the present invention will be apparent to those skilled in the art, and are encompassed within the scope of the invention.

CLAIMS

1. A pharmaceutical formulation for insulin-like growth factor (IGF) and insulin-like growth factor binding protein (IGFBP) complex, comprising:

IGF/IGFBP complex;

a bulking agent; and

pH buffer salts,

wherein said formulation contains no added osmolyte salts.

2. The formulation of claim 1, wherein said pH buffer salts comprise sodium succinate.

3. The formulation of claim 2, wherein said pH buffer salts are at a concentration of less than about 40 millimolar (mM).

4. The formulation of claim 3, wherein said ph buffer salts are at a concentration of less than about 20 mM.

5. The formulation of claim 2, wherein said pH buffer salts are at a concentration of less than 10 mM.

6. The formulation of claim 1, wherein said formulation has a pH of about 5.5 to 6.5

7. The formulation of claim 1, wherein said bulking agent comprises mannitol.

8. The formulation of claim 1, wherein said bulking agent comprises sorbitol.

9. The formulation of claim 1 wherein said bulking agent comprises sucrose.

10. The formulation of claim 1 wherein said bulking agent comprises mannitol and sucrose.

11. The formulation of claim 1, wherein said bulking agent is present at about 6% (w/v).

12. The formulation of claim 11 wherein said mannitol is present at about 3.6% (w/v) and said sucrose is present at about 2.4%(w/v).

13. The formulation of claim 1 wherein said formulation further comprises a non-ionic surfactant.

14. The formulation of claim 1 wherein said IGFBP is IGFBP-3.

15. The formulation of claim 1 wherein said IGF is IGF-I.

16. The formulation of claim 15 wherein said IGFBP is IGFBP-3.

17. The formulation of claim 1, wherein said formulation further comprises a preservative.

18. The formulation of claim 17, wherein said preservative is benzyl alcohol.

19 The formulation of claim 10, wherein said IGF/IGFBP is 50 milligrams per milliliter (mg/ml), said mannitol is 1.5% (w/v), and said sucrose is 1% (w/v).

20. The formulation of claim 10, wherein said IGF/IGFBP is 100 mg/ml, said mannitol is 3% (w/v) and said sucrose is 2% (w/v).

21. A pharmaceutical formulation for insulin-like growth factor (IGF) and insulin-like growth factor binding protein (IGFBP) complex, comprising:

IGF/IGFBP complex; and

a bulking agent,

wherein said formulation contains no added osmolyte salts and no added pH buffer salts.

22. The formulation of claim 21, wherein said bulking agent is mannitol.

23. The formulation of claim 21, wherein said bulking agent is sorbitol.

24. The formulation of claim 21 wherein said bulking agent is sucrose.

25. The formulationof claim 21 wherein said bulking agent comprises mannitol and sucrose.

26. The formulation of claim 21, wherein said bulking agent is present at about 6% (w/v).

27. The formulation of claim 26 wherein said mannitol is present at about 3.6% (w/v) and said sucrose is present at about 2.4%(w/v).

28. The formulation of claim 21 wherein said formulation further comprises a non-ionic surfactant.

29. The formulation of claim 21 wherein said IGF is IGF-I.

30. The formulation of claim 21 wherein said IGFBP is IGFBP-3.

31. The formulation of claim 29 wherein said IGFBP is IGFBP-3.

32. The formulation of claim 21, wherein said formulation further comprises a preservative.

33. The formulation of claim 32, wherein said preservative is benzyl alcohol.

34. The formulation of claim 1, wherein said formulation is lyophilized.

35. The formulation of claim 21, wherein said formulation is lyophilized.

36. A lyophilized pharmaceutical formulation for insulin-like growth factor (IGF) and insulin-like growth factor binding protein (IGFBP) complex, produced by:

forming a mixture comprising IGF, IGFBP, a bulking agent, and pH buffer salts, wherein said mixture lacks any added osmolyte salts; and

lyophilizing said mixture to form a lyophilized formulation of IGF, IGFBP, a bulking agent, and pH buffer salts.

37. A lyophilized pharmaceutical formulation for insulin-like growth factor (IGF) and insulin-like growth factor binding protein (IGFBP) complex, produced by:

forming a mixture comprising IGF, IGFBP, and a bulking agent, wherein said mixture lacks any added osmolyte salts; and

lyophilizing said mixture to form a lyophilized formulation of IGF, IGFBP,and a bulking agent.

Figure 1

```
1                                                                  50
GASSAGLGPV VRCEPCDARA LAQCAPPPAV CAELVREPGC GCCLTCALSE

51                                                                 100
GQPCGIYTER CGSGLRCQPS PDEARPLQAL LDGRGLCVNA SAVSRLRAYL

101                                                                150
LPAPPAPGNA SESEEDRSAG SVESPSVSST HRVSDPKFHP LHSKIIIIKK

151                                                                200
GHAKDSQRYK VDYESQSTDT QNFSSESKRE TEYGPCRREM EDTLNHLKFL

201                                                                250
NVLSPRGVHI PNCDKKGFYK KKQCRPSKGR KRGFCWCVDK YGQPLPGYTT

251          264
KGKEDVHCYS MQSK
```

Electronic Acknowledgement Receipt

EFS ID:	38396282
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Kimberly Zuehlke
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	24-JAN-2020
Filing Date:	25-SEP-2019
Time Stamp:	16:59:33
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Transmittal Letter	REGN-024CON9_2020-01-24_IDS_trans.pdf	52546 e86de2fbcf64f992179b84027315748330cb2c33	no	2

Warnings:

Information:					
2	Information Disclosure Statement (IDS) Form (SB08)	REGN-024CON9_2020-01-24_IDS.pdf	32357 ec294287259cd39ce5bbcc3f63f8d62bba8fa287	no	2
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Foreign Reference	WO9962536_Celtrix.pdf	1110183 1ffb0f20bb86976bbb8abebcd82fa02196879c8f	no	23
Warnings:					
Information:					
		Total Files Size (in bytes):	1195086		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Electronically Filed 1/24/2020

INFORMATION DISCLOSURE STATEMENT	Attorney Docket No.	REGN-024CON9
	Confirmation No.	3381
	First Named Inventor	Eric Furfine
	Application Number	16/582,486
	Filing Date	September 25, 2019
	Group Art Unit	
	Examiner Name	
Address to: Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Title: "*VEGF Antagonist Formulations Suitable for Intravitreal Administration*"	

Sir:

Applicants submit herewith documents which may be material to the examination of this application and in respect of which there may be a duty to disclose in accordance with 37 C.F.R. § 1.56. This submission is not intended to constitute an admission that any document referred to therein is "prior art" for this invention unless specifically designated as such. A listing of the documents is shown on enclosed Form PTO/SB/08A and a copies of a foreign patent is also enclosed.

The Examiner is requested to make the documents listed on the enclosed PTO/SB/08A of record in this application. Applicants would appreciate the Examiner initialing and returning the initialed copy of form PTO/SB/08A, indicating the documents cited therein have been considered and made of record herein.

All of the references identified herein, with the exception of WO 99/62536 (attached hereto), were disclosed in parent application serial number 16/159,269, and as such, copies thereof are not included pursuant to the provisions of 37 CFR § 1.98(d).

Statements

☒ **No statement**

☐ **PTA Statement under 37 CFR § 1.704(d)(1):** Each item of information contained in the information disclosure statement filed herewith:

(i) Was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the information disclosure statement; or

(ii) Is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by

any individual designated in § 1.56(c) more than thirty days prior to the filing of the information disclosure statement.

☐ **IDS Statement under 37 CFR § 1.97(e)(1):** Each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or

☐ **IDS Statement under 37 CFR § 1.97(e)(2):** No item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

Fees

☒ No fee is believed to be due.

☐ The appropriate fee set forth in 37 C.F.R. §1.17(p) accompanies this information disclosure statement.

The Commissioner is hereby authorized to charge any underpayment of fees up to a strict limit of $3,000.00 beyond that authorized on the credit card, but not more than $3,000.00 in additional fees due with any communication for the above referenced patent application, including but not limited to any necessary fees for extensions of time, or credit any overpayment of any amount to Deposit Account No. 50-0815, order number REGN-024CON9.

Respectfully submitted,
BOZICEVIC, FIELD & FRANCIS LLP

Date: January 24, 2020

By: /Karl Bozicevic, Reg. No. 28,807/
Karl Bozicevic
Reg. No. 28,807

BOZICEVIC, FIELD & FRANCIS LLP
201 Redwood Shores Parkway, Suite 200
Redwood City, CA 94065
Telephone: (650) 327-3400
Facsimile: (650) 327-3231

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Reexam Control No.:	Not yet assigned
In re *Ex Parte* Reexamination of:	Furfine et al.
Filing Date:	Not Yet recorded
U.S. Patent No.:	10,464,992
Date of Issuance:	November 5, 2019
Appl. Ser. No.	16/159,269
Date of Appl. Filing:	October 12, 2018
Title:	VEGF Antagonist Formulations Suitable for Intravitreal Administration

---

VIA EFS
Mail Stop "Ex Parte Reexam"
Attn: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REQUEST FOR *EX PARTE* REEXAMINATION OF
U.S. PATENT NO. 10,464,992 (Furfine et al.)

Dear Sir:

Requester requests reexamination, pursuant to 35 U.S.C. §§ 301-307 and 37 C.F.R. § 1.510 et seq. of all claims (claims 1-18) of U.S. Patent No. 10,464,992 to Furfine *et al* ("the '992 Patent," Exhibit 1), which issued on November 5, 2019 from U.S. Patent Application No. 16/159,269 filed on October 12, 2018.

U.S. Patent and Trademark Office assignment records indicate that the '992 Patent is currently assigned to Regeneron Pharmaceuticals, Inc. ("Patent Owner"), located at 777 Old Saw Mill River Road, Tarrytown, New York 10591-6707. The term of the '992 Patent has not yet expired.

Requester certifies that it is not subject to the estoppel provisions of 35 U.S.C. §§ 315(e)(1) and 325(e)(1).

TABLE OF CONTENTS

I. INTRODUCTION 1

II. BACKGROUND 2

A. Subject Matter Claimed in the '992 Patent 2

B. State of the Art at the Time of the Application for the '992 Patent 5

C. Prosecution History of the '992 Patent 7

III. CLAIM CONSTRUCTION 8

IV. IDENTIFICATION OF CLAIMS FOR WHICH REEXAMINATION IS REQUESTED AND IDENTIFICATION OF PRIOR ART THAT PRESENTS SUBSTANTIAL NEW QUESTIONS OF PATENTABILITY (37 C.F.R. § 1.510 (b)(2)-(3)) 9

A. Claims for Which *Ex Parte* Reexamination is Requested and Identification of Prior Patents and Printed Publications 9

B. Each OTDP Reference Patent Expires Earlier than the '992 Patent 11

V. STATEMENT POINTING OUT EACH SUBSTANTIAL NEW QUESTION OF PATENTABILITY (37 C.F.R. § 1.510(b)(1)) 13

VI. SUBSTANTIAL NEW QUESTIONS OF PATENTABILITY AND DETAILED DISCUSSION OF HOW THE CITED ART IS APPLIED TO THE CHALLENGED CLAIMS (37 C.F.R. § 1.510(b)(2)) 17

A. Obviousness-Type Double Patenting is an Appropriate Basis for Reexamination of the '992 Patent 18

B. A One-Way Obviousness Type Double Patenting Test Applies 20

C. 35 U.S.C. § 121 Does Not Prevent Using Any of the OTDP Reference Patents as the Basis for Double Patenting Rejections 20

D. SNQ1: Claims 1–5 of the '594 Patent Create a Substantial New Question of Patentability Based on Obviousness-Type Double Patenting 22

1. Independent Claims 1 and 10 are Unpatentable For Double Patenting Over the '594 Patent 23

a. The '594 Patent Claims a Species Within the Scope of the '992 Patent Claims 24

b. The '594 Patent Claims Meet the Stability Recited in the '992 Patent's "Wherein" Clause, Expressly or Inherently 26

c. The Claims are Not Made Patentably Distinct by Reciting that the VEGF Antagonist is "Produced in" CHO Cells 29

d. The Claims are Not Made Patentably Distinct by Reciting a "Vial" 30

e. Claims 1 and 10 as a Whole are Unpatentable 31

2. Dependent Claims 2 and 11 are Unpatentable For Double Patenting Over the '594 Patent 32

3. Dependent Claims 3, 4, 12 and 13 are Unpatentable For Double Patenting Over the '594 Patent 33

4. Dependent Claims 5 and 14 are Unpatentable For Double Patenting Over the '594 Patent 34

5. Dependent Claims 6-9 and 15-18 are Unpatentable For Double Patenting Over the '594 Patent 35

E. SNQ2: Claims 1-5 of the '261 Patent Create a Substantial New Question of Patentability Based on Obviousness-Type Double Patenting 36

1. Independent Claims 1 and 10 are Unpatentable For Double Patenting Over the '261 Patent 36

a. The '261 Patent Claims a Species Within the Scope of the '992 Patent Claims 37

b. The Formulation Claimed in the '261 Patent Inherently Displays the Stability Recited in the '992 Patent's "Wherein" Clause 39

c. The Claims are Not Made Patentably Distinct by Reciting that the VEGF Antagonist is "Produced in" CHO Cells 41

d. The Claims are Not Made Patentably Distinct by Reciting a "Vial" 41

e. Claims 1 and 10 as a Whole are Unpatentable 42

2. Dependent Claims 2 and 11 are Unpatentable For Double Patenting Over the '261 Patent 42

3. Dependent Claims 3, 4, 12 and 13 are Unpatentable For Double Patenting Over the '261 Patent 43

4. Dependent Claims 5 and 14 are Unpatentable For Double Patenting Over the '261 Patent 44

5. Dependent Claims 6-9 and 15-18 are Unpatentable For Double Patenting Over the '261 Patent 45

F. SNQ3: The Claims of the '489 Patent Create a Substantial New Question of Patentability Based on Obviousness-Type Double Patenting 45

1. Independent Claims 1, 2, 10 and 11 are Unpatentable For Double Patenting Over the '489 Patent Claims 47

2. Dependent Claims 3, 4, 12 and 13 are Unpatentable For Double Patenting Over the '489 Patent 52

3. Dependent Claims 5-9 and 14-18 are Unpatentable For Double Patenting Over the '489 Patent 53

VII. NOTIFICATION OF PATENTEE 53

VIII. CONCLUSION 54

APPENDIX A – '594 Patent Claim Chart 55

APPENDIX B – '261 Patent Claim Chart 59

APPENDIX C – '489 Patent Claim Chart 63

APPENDIX D – Alignment of SEQ ID NO: 4 of '992 Patent and SEQ ID NO: 11 of Vitti (Exhibit 8) 68

APPENDIX E – Alignment of SEQ ID NO: 4 of '992 Patent and Sequence in FIG. 24A-24C of Papadopoulos (WO'319, Exhibit 7) 69

APPENDIX F – TERMINAL DISCLAIMER CHART 70

TABLE OF AUTHORITIES

Cases

Abbvie Inc. v. Mathilda and Terence Kennedy Inst. of Rheumatology Trust,
764 F.3d 1366 (Fed. Cir. 2014) ..... passim

Alcon Research, Ltd. v. Apotex Inc.,
687 F.3d 1362 (Fed. Cir. 2012) 14, 15

Atlas Powder Co. v. Ireco Inc.,
190 F.3d 1342 (Fed. Cir. 1999) 15

Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.,
246 F.3d 1368 (Fed. Cir. 2001) 9

Eli Lilly & Co. v. Barr Labs., Inc.,
251 F.3d 955 (Fed. Cir. 2001) 23, 26

Geneva Pharms., Inc. v. GlaxoSmithKline PLC,
349 F.3d 1373 (Fed. Cir. 2003) 19, 21

Gerber Garment Tech., Inc. v. Lectra Sys., Inc.,
916 F.2d 683 (Fed. Cir. 1990) 21

Gilead Sciences, Inc. v. Natco Pharma Ltd.,
753 F.3d 1208 (Fed. Cir. 2014) 13, 18

Hospira, Inc. v. Fresenius Kabi USA, LLC,
946 F.3d 1322 (Fed. Cir. 2020) 15

In re Berg,
140 F.3d 1428 (Fed. Cir. 1998) 32

In re Burke,
Appeal No. 2012-012640, 2015 WL 5782989 (PTAB Sept. 16, 2015) 29

In re Copaxone Consol. Cases,
906 F.3d 1013 (Fed. Cir. 2018) 9, 24, 37, 48

In re Crish,
393 F.3d 1253 (Fed. Cir. 2004) 28, 41, 51

In re Janssen Biotech, Inc.,
880 F.3d 1315 (Fed. Cir. 2018) 18

In re Kubin,
561 F.3d 1351 (Fed. Cir. 2009) 15

In re Lonardo,
119 F.3d 960 (Fed. Cir. 1997) 18

In re Metoprolol Succinate Patent Litig.,
494 F.3d 1011 (Fed. Cir. 2007) 52

In re Petering,
301 F.2d 676 (CCPA 1962) 40

In re Schneller,
397 F.2d 350 (CCPA 1968) 51, 52

In re Spada,
911 F.2d 705 (Fed. Cir. 1990) 28

In re Suitco Surface, Inc.,
603 F.3d 1255 (Fed. Cir. 2010) 8

In re Thorpe,
777 F.2d 695 (Fed. Cir. 1985) 29

In re Vogel,
422 F.2d 438 (C.C.P.A. 1970) 19, 40

In re Yamamoto,
740 F.2d 1569 (Fed. Cir. 1984) 8

In re Yamazaki,
702 F.3d 1327 (Fed. Cir. 2012) 19

Kennametal, Inc. v. Ingersoll Cutting Tool Co.,
780 F.3d 1376 (Fed. Cir. 2015) 40, 50

Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.,
868 F.3d 1013 (Fed. Cir. 2017) 8

Perricone v. Medicis Pharm. Corp.,
432 F.3d 1368 (Fed. Cir. 2005) 26, 48

Persion Pharm. LLC v. Alvogen Malta Operations Ltd.,
945 F.3d 1184 (Fed. Cir. 2019) 15

Procter & Gamble Co. v. Teva Pharms. USA, Inc.,
566 F.3d 989 (Fed. Cir. 2009) 19

Santarus, Inc. v. Par Pharm., Inc.,
694 F.3d 1344 (Fed. Cir. 2012) 32, 42, 51

Symbol Techs., Inc. v. Opticon, Inc.,
935 F.2d 1569 (Fed. Cir. 1991) 21, 22

Titanium Metals Corp. v. Banner,
778 F.2d 775 (Fed. Cir. 1985) 15

Toro Co. v. White Consol. Indus., Inc.,
199 F.3d 1295 (Fed. Cir. 1999) 40

Statutes
35 U.S.C. § 102 10

35 U.S.C. § 121 ..... 20, 21, 22

35 U.S.C. § 154 1

35 U.S.C. § 301 1

35 U.S.C. § 302 18

35 U.S.C. § 303 14

35 U.S.C. § 304 18

35 U.S.C. § 307 1

Rules
37 C.F.R. § 1.33 53

37 C.F.R. § 1.510 ..... passim

Manual of Patent Examining Procedure
MPEP § 1490 19

MPEP § 2113 29

MPEP § 2209 1

MPEP § 2216 ..... 14, 46

MPEP § 2258 8

MPEP § 804 ..... 14, 20, 40, 52

MPEP § 804.01 22

EXHIBIT LIST

Exhibit No.	*Document Description*
1	U.S. Patent No. 10,464,992 B2, issued on Nov. 5, 2019, to Furfine et al.
2	U.S. Patent No. 7.608,261 B2, issued on Oct. 27, 2009, to Furfine et al.
3	U.S. Patent No. 9,340,594 B2, issued on May 17, 2016, to Furfine et al.
4	U.S. Patent No. 9,914,763 B2, issued on Mar. 13, 2018, to Furfine et al.
5	U.S. Patent No. 10,400,025 B2, issued on Sept. 3, 2019, to Furfine et al.
6	U.S. Patent No. 9,580,489 B2, issued on Feb. 28, 2017, to Furfine et al.
7	Papadopoulos et al., International Patent Application Publication No. WO 00/75319 A1, published on Dec. 14, 2000
8	Vitti et al., U.S. Patent Application Publication No. 2016/0144025 A1, published on May 26, 2016
9	Baca et al., International Patent Application Publication No. WO 98/45331 A2, published on Oct. 15, 1998
10	Cunningham et al., International Patent Application Publication No. WO 00/63380 A1, published on Oct. 26, 2000
11	Prosecution history for U.S. Patent Application No. 16/159,269 (U.S. Patent No. 10,464,992)

I. INTRODUCTION

Requester hereby requests *ex parte* reexamination of claims 1-18 of U.S. Patent No. 10,464,992 ("the '992 Patent", Exhibit 1) to inventors Furfine et al., owned by Regeneron Pharmaceuticals, Inc. ("Patent Owner"), pursuant to 35 U.S.C. §§ 301-307 and 37 C.F.R. § 1.510 et seq. The basis of this request is that claims 1-18 of the '992 Patent are invalid for non-statutory obviousness-type double patenting over the claims of three earlier-expiring patents assigned to Patent Owner:

1. U.S. Pat. No. 7,608,261 ("the '261 Patent," Exhibit 2);

2. U.S. Pat. No. 9,340,594 ("the '594 Patent," Exhibit 3); and

3. U.S. Pat. No. 9,580,489 ("the '489 Patent," Exhibit 6).

This request is within the proper time period for filing because it is during the period of enforceability of the '992 Patent as defined in MPEP § 2209. The '992 Patent expires on June 14, 2027 because it lists June 14, 2007 as the earliest effective filing date on its face and has no Patent Term Adjustment. *See* 35 U.S.C. §§ 154(a)(2), (b) (pre-AIA). Patent Owner is the current assignee of each of the '261, '594, and '489 Patents (collectively referred to herein as the "OTDP Reference Patents").

The claims of the '992 Patent are directed to a formulation (or vial containing a formulation) for a small genus of vascular endothelial growth factor ("VEGF") antagonist fusion proteins, including the fusion protein now known as aflibercept. Aflibercept is marketed by Patent Owner as Eylea®. Each OTDP Reference Patent claims a *more specific* formulation that falls within the scope of the '992 Patent claims, or claims an obvious variant of the '992 Patent claims. The '992 Patent is in the same family as the OTDP Reference Patents ("the Furfine Family"), but has a term that is over *six years* longer than claims of those three commonly owned OTDP Reference Patents.

This is precisely the type of unjustified timewise extension of the right to exclude granted by a patent that obviousness-type double patenting was designed to protect against. Requester therefore requests *ex parte* reexamination of the '992 Patent based on the substantial new questions of patentability described herein, and requests that all claims (claims 1-18) be rejected on grounds of non-statutory obviousness-type double patenting.

II. BACKGROUND

A. Subject Matter Claimed in the '992 Patent

The '992 Patent contains two broad and substantively identical independent claims that recite:

> A vial [or formulation][1] comprising:
>
> a vascular endothelial growth factor (VEGF) antagonist,
>
> an organic co-solvent,
>
> a buffer, and
>
> a stabilizing agent,
>
> wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and
>
> wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC. for two months as measured by size exclusion chromatography.

'992 Patent at 19:31-43 and 19:65-20:40.

Claim 3 of the '992 Patent is dependent on claim 1 and narrows the genus of VEGF

[1] Independent claim 10 is identical to claim 1 except it recites the word "formulation" instead of the word "vial" in its preamble.

antagonist to a fusion protein "wherein the first VEGF receptor is human Flt1 and the second VEGF receptor is selected from the group consisting of human Flk1 and the human Flt4." *Id.* at 19:46-48. Claim 4 of the '992 Patent is dependent on claim 3 and further narrows the genus of VEGF antagonist to a fusion protein comprising "amino acids 27-457 of SEQ ID NO:4." *Id.* at 19:49-50. Thus, the claims of the '992 Patent demonstrate that the VEGF antagonist comprising amino acids 27-457 of SEQ ID NO:4 (aflibercept) as recited in claim 4 is a species within the scope of each of claims 1 and 3.

The '992 Patent does not define the phrase "organic co-solvent," but provides open-ended examples thereof, *e.g.*, "the organic co-solvent may be polysorbate, for example, polysorbate 20 or polysorbate 80, polyethylene glycol (PEG), for example, PEG 3350, or propylene glycol, or a combination thereof." *Id.* at 2:25-28.

The '992 Patent does not define the term "buffer," but provides open-ended examples thereof, *e.g.*, "the buffering agent may be, for example, phosphate buffer. In a specific embodiment, the phosphate buffer is a sodium phosphate buffer." *Id.* at 2:31-34.

The '992 Patent does not define the term "stabilizing agent," but provides open-ended examples thereof, *e.g.*, "the stabilizing agent may be sucrose, sorbitol, glycerol, trehalose, or mannitol." *Id.* at 2:30-31.

Both of the independent claims of the '992 Patent recite an intended result of the formulation, *i.e.*, "at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC. for two months as measured by size exclusion chromatography." *Id.* at claims 1 and 10. While the phrase "native conformation" is not used in the '992 specification, the similar phrase "Native Configuration" is used in the Tables in Examples 1-8 when reporting the size exclusion chromatography ("SEC") results. Those examples of the '992 Patent (and

each of the OTDP Reference Patents) provide experimental data which evidence that all formulations tested had at least 98% of the VEGF antagonist present in native configuration following storage at 5ºC for two months as measured by SEC. *Id.* at 8:8–12:18, Tables 1-8. For example, for the formulation tested in Example 3 of the '992 Patent (which is covered by the claims of, and identically reported in, each of the OTDP Reference Patents), 99.2% of the VEGF antagonist was present in native configuration after two months of storage at 5ºC:

Example 3. Stability of 40 mg/ml VEGF Trap Liquid Formulation Stored at 5° C. in 3 ml Glass Vials

[0060] A liquid formulation containing 40 mg/ml VEGF Trap (SEQ ID NO: 4), 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, and pH 6.3, was stored at 5° C. in 3 ml glass vials and samples tested at 0.5, 1, 2, 3, and 4 months. Stability results are shown in Table 3. Turbidity, percent recovered protein and purity was determined as described above.

TABLE 3

Stability of 40 mg/ml VEGF Trap Protein (VGFT-SS207)

Months	Visual Appearance	Turbidity	pH	% VEGF Trap Recovered	% VEGF Trap Native Configuration
0	Pass	0.00	6.3	100	99.5
0.5	Pass	0.00	6.3	99	99.4
1	Pass	0.00	6.2	98	99.5
2	Pass	0.00	6.2	95	99.2
3	Pass	0.01	6.4		
4	Pass	0.01	6.3		

The '992 Patent claims 2-9 are ultimately dependent from claim 1. Claim 2 specifies that "about 99% or more of the weight of the fusion protein is in native conformation." *Id.* at 19:44-45. Claims 3 and 4 further specify the VEGF antagonist fusion protein, as explained above. *Id.* at 19:46-50. Claim 5 specifies that "the VEGF antagonist is a dimer of the fusion protein." *Id.* at 19:51-52. Claim 6 specifies that "the organic co-solvent is selected for [sic] the group consisting

of polysorbate 20, polysorbate 90, polyethylene glycol (PEG), PEG3350, and propylene glycol." *Id.* at 19:53-56. Claim 7 specifies that "the stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol." *Id.* at 19:57-59. Claim 8 specifies that "the organic co-solvent is polysorbate 20 and the stabilizing agent is sucrose." *Id.* at 19:60-61. Claim 9 specifies that "the organic co-solvent is polysorbate 20, the buffer is phosphate, and the stabilizing agent is sucrose." *Id.* at 19:62-64. Claims 11-18 are ultimately dependent on claim 10, but are otherwise identical to dependent claims 2-9, respectively. *See id.* at 20:41-64.[2]

B. State of the Art at the Time of the Application for the '992 Patent

The '992 Patent claims priority through a series of applications to U.S. Provisional Application No. 60/814,484, filed on June 16, 2006. Prior to June 16, 2006, VEGF-specific fusion protein antagonists were well known. For example, Patent Owner's PCT Publication WO 00/75319 A1 ("Papadopoulos," Exhibit 7), published December 14, 2000, disclosed the exact same VEGF antagonist fusion proteins disclosed and claimed in the '992 Patent.

Papadopoulos teaches amino acid sequences encoding VEGF antagonist fusion proteins that fall within the scope of the independent claims of the '992 Patent, including a protein called "Flt1D2.Flk1D3.FcΔC1(a)," which corresponds to SEQ ID NO: 2 of the '992 Patent, and a protein called "VEGFR1R2-FcΔC1(a)," which corresponds to SEQ ID NO: 4 of the '992 Patent and is now known as "aflibercept." Ex. 7, 26:12-25; Ex. 8 ¶ [0086]. The nucleotide and amino acid sequences of VEGFR1R2-FcΔC1(a) are provided in Papadopoulos Figs. 24A-24C. Ex. 7, 22:1-2. As shown in Appendix E, the amino acid sequence of the VEGFR1R2-FcΔC1(a) protein

[2] Claim 11 of the '992 patent issued with a typographical error in which the recitation of "90%" after "99%" was not deleted. Patent Owner filed a Request for a Certificate of Correction on February 7, 2020, requesting deletion of the recitation of "90%" from claim 11. Requester has used the corrected version of claim 11 in this Request for Reexamination.

in Papadopoulos is 100% identical to SEQ ID NO: 4 of the '992 Patent (and each of the OTDP Reference Patents).

Patent Owner's post-filing U.S. Pub. No. 2016/0144025 (the "Vitti Publication," Exhibit 8) confirms that "VEGFR1R2-FcΔC1(a)" is "also known as aflibercept." Ex. 8 ¶ [0086]. Vitti teaches that aflibercept is "encoded by the amino acid sequence of SEQ ID NO: 11." *Id.* As shown in Appendix D, SEQ ID NO: 11 of the Vitti Publication is 100% identical to SEQ ID NO:4 of the '992 Patent (and each of the OTDP Reference Patents). Vitti also explains that aflibercept "consists of a dimer of two polypeptides consisting of amino acids 27-457 of [SEQ ID NO:4 of the '992 patent]." Ex. 8 ¶ [0197]. As was known in the prior art, the complete SEQ ID NO:4 includes, *inter alia*, a signal peptide that is removed during protein production, and an Fc sequence of human IgG that causes the protein to dimerize. *See* Ex. 7, Fig. 24A (identifying the signal sequence at amino acids 1-26 of SEQ ID NO: 4), Figs. 24B-C (identifying the human Fc region "hFCΔC1A" at amino acids 232-458). Accordingly, the VEGF fusion protein of SEQ ID NO:4 and the dimerized VEGF fusion protein consisting amino acids 27-457 of SEQ ID NO:4 both refer to aflibercept, as known in the prior art.

Papadopoulos also teaches that these VEGF antagonist fusion proteins were produced in recombinant Chinese hamster ovary (CHO) cells. *See id.* at 67:25-68:5 ("The process for production of Flt1D2.Flk1D3.FcΔC1(a) [*i.e.,* the protein of SEQ ID NO: 2 of the '992 Patent] protein… involves suspension culture of recombinant Chinese hamster ovary (CHO K1/E1A) cells which constitutively express the protein product. The cells are grown in bioreactors and the protein product is isolated and purified by affinity and size exclusion chromatography."). Papadopoulos also discloses that "CHO transiently expressed VEGFR1R2-FcΔC1(a) [*i.e.,* the protein of SEQ ID NO: 4 of the '992 Patent]." *Id.* at 82:12-13.

It was also well known in the art at the time of the alleged invention to place VEGF antagonist formulations in vials. *See, e.g.,* WO 1998/045331 A2, 47:13-18 (Exhibit 9); WO 2000/063380 A1, 23:6-10, 25:20-26 (Exhibit 10), (collectively referred to herein as "Exemplary Vial Pubs.").

C. Prosecution History of the '992 Patent

The '992 Patent was filed as U.S. Patent Application No. 16/159,269 on October 12, 2018 and issued on November 5, 2019.[3] In an Office Action dated April 2, 2019, all claims of the '992 Patent were rejected on grounds of non-statutory obviousness-type double patenting over five commonly owned patent references: U.S. Pat. No. 8,092,803; the '261 Patent; the '594 Patent; U.S. Pat. No. 9,914,763 ("the '763 Patent," Exhibit 4); and Application Serial No. 15/879,294 ("the '294 Application"), now issued as U.S. Pat. No. 10,400,025 ("the '025 Patent," Exhibit 5). Office Action dated April 2, 2019, at ¶¶ 9-13. In response to those rejections, Patent Owner:

1) Filed a terminal disclaimer over U.S. Pat. No. 8,092,803;
2) amended the independent claims to add the phrase "wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography"; and
3) argued that the new "element relating to stability" or "elements relating to the percentage of the VEGF antagonist which maintains its conformation following storage over a period of time" are "not contained" within any of the claims of the prior patents.

See Response to Non-Final Office Action and Amendment dated July 22, 2019, at 5-6.

[3] The prosecution history of the '992 Patent is attached as Exhibit 11.

Patent Owner also argued that the process of production in CHO cells is "not contained" in the claims of the '594 Patent and the '294 Application. *See id.* at 5-6.

The Examiner issued a Notice of Allowance stating only that the rejections were "withdrawn in view of the amended claims and the terminal disclaimer." Notice of Allowance dated August 21, 2019, at 2.

A substantial new question of patentability exists based on obviousness-type double patenting over at least the earlier-expiring '261 and '594 Patents, because the Examiner incorrectly concluded that the stability result language rendered the claims of the '992 Patent patentably distinct from the claims of Patent Owner's earlier-expiring patents. It does not, as explained in detail below. *See, e.g.*, Section V.E.1.b. *infra*.

The Examiner did not cite the '489 Patent at all during the brief prosecution, and a substantial new question of patentability exists based on obviousness-type double patenting over that patent for the reasons discussed below.

III. CLAIM CONSTRUCTION

In reexamination, claims are given their broadest reasonable interpretation ("BRI") consistent with the specification. *In re Yamamoto*, 740 F.2d 1569, 1571 (Fed. Cir. 1984); *In re Suitco Surface, Inc.*, 603 F.3d 1255, 1259 (Fed. Cir. 2010); MPEP § 2258(I)(G). Only terms in controversy need be construed, and only to the extent necessary to resolve the controversy. *See Nidec Motor Corp. v. Zhongshan Broad Ocean Motor Co.*, 868 F.3d 1013, 1017 (Fed. Cir. 2017). Application of the ordinary and customary meanings of broad terms such as "vascular endothelial growth factor (VEGF) antagonist," "organic co-solvent," "buffer," and "stabilizing agent" is sufficient for claim construction purposes. Moreover, the claim language of the '992 Patent is also used in the claims and specifications of each of the OTDP Reference Patents. Thus, because the same terms used in the '992 Patent claims are also used in the claims of the

OTDP Reference Patents, which share the same specification as the '992 Patent, the meanings of the claim terms are not in controversy and it is not necessary to construe them.

With regard to the recited phrase "wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography," the Federal Circuit has repeatedly held that claim terms that "only state an intended result" are non-limiting. *See, e.g.*, *In re Copaxone Consol. Cases*, 906 F.3d 1013, 1023 (Fed. Cir. 2018); *Bristol-Myers Squibb Co. v. Ben Venue Labs., Inc.*, 246 F.3d 1368, 1374-75 (Fed. Cir. 2001). When given its broadest reasonable interpretation, this phrase relates merely to the intended result, after storing the claimed formulation or vial at 5ºC for two months, that the remaining VEGF- antagonist protein content in native configuration (*e.g.*, not aggregated), constitutes "at least 98% of the VEGF antagonist" in the formulation or vial, measured using SEC. Even if given some limiting effect, the added phrase does not render the '992 Patent claims patentably distinct from the formulations and vials claimed in the OTDP Reference Patents for the reasons discussed below.

IV. IDENTIFICATION OF CLAIMS FOR WHICH REEXAMINATION IS REQUESTED AND IDENTIFICATION OF PRIOR ART THAT PRESENTS SUBSTANTIAL NEW QUESTIONS OF PATENTABILITY (37 C.F.R. § 1.510 (B)(2)-(3))

A. Claims for Which *Ex Parte* Reexamination is Requested and Identification of Prior Patents and Printed Publications

Reexamination of claims 1-18 (all claims) of the '992 Patent is requested in view of the commonly-owned OTDP Reference Patents, *i.e.*, the '261 Patent, the '594 Patent, and the '489 Patent. In accordance with 37 C.F.R. § 1.510(b)(3), a copy of every patent and printed publication relied upon or referred to in this Request is provided herewith and listed on the enclosed Form PTO/SB/08a.

1. **U.S. Patent No. 7,608,261 to Furfine et al. ("the '261 Patent," Exhibit 2)** was filed on June 14, 2007 and issued on October 27, 2009. Due to terminal disclaimers, the '261 Patent will expire no later than March 7, 2021.

2. **U.S. Patent No. 9,340,594 to Furfine et al. ("the '594 Patent," Exhibit 3)** was filed on July 14, 2014 and issued on May 17, 2016. Due to terminal disclaimers, the '594 Patent will expire no later than March 7, 2021.

3. **U.S. Patent No. 9,914,763 to Furfine et al. ("the '763 Patent," Exhibit 4)** was filed on April 11, 2016 and issued on March 13, 2018. Due to terminal disclaimers, the '763 Patent will expire no later than March 7, 2021.

4. **U.S. Patent No. 10,400,025 to Furfine et al. ("the '025 Patent," Exhibit 5)** was filed on January 24, 2018 and issued on September 3, 2019. Due to terminal disclaimers, the '025 Patent will expire no later than March 7, 2021.

5. **U.S. Patent No. 9,580,489 to Furfine et al. ("the '489 Patent," Exhibit 6)** was filed on May 11, 2016 and issued on February 28, 2017. Due to terminal disclaimers, the '489 Patent will expire no later than March 7, 2021.

6. **PCT Publication No. WO 00/75319 A1 to Papadopoulos et al. ("Papadopoulos," Exhibit 7)** published December 14, 2000 from PCT App. No. PCT/US00/14142. Papadopoulos and is prior art to the '992 Patent under 35 U.S.C. § 102(b).

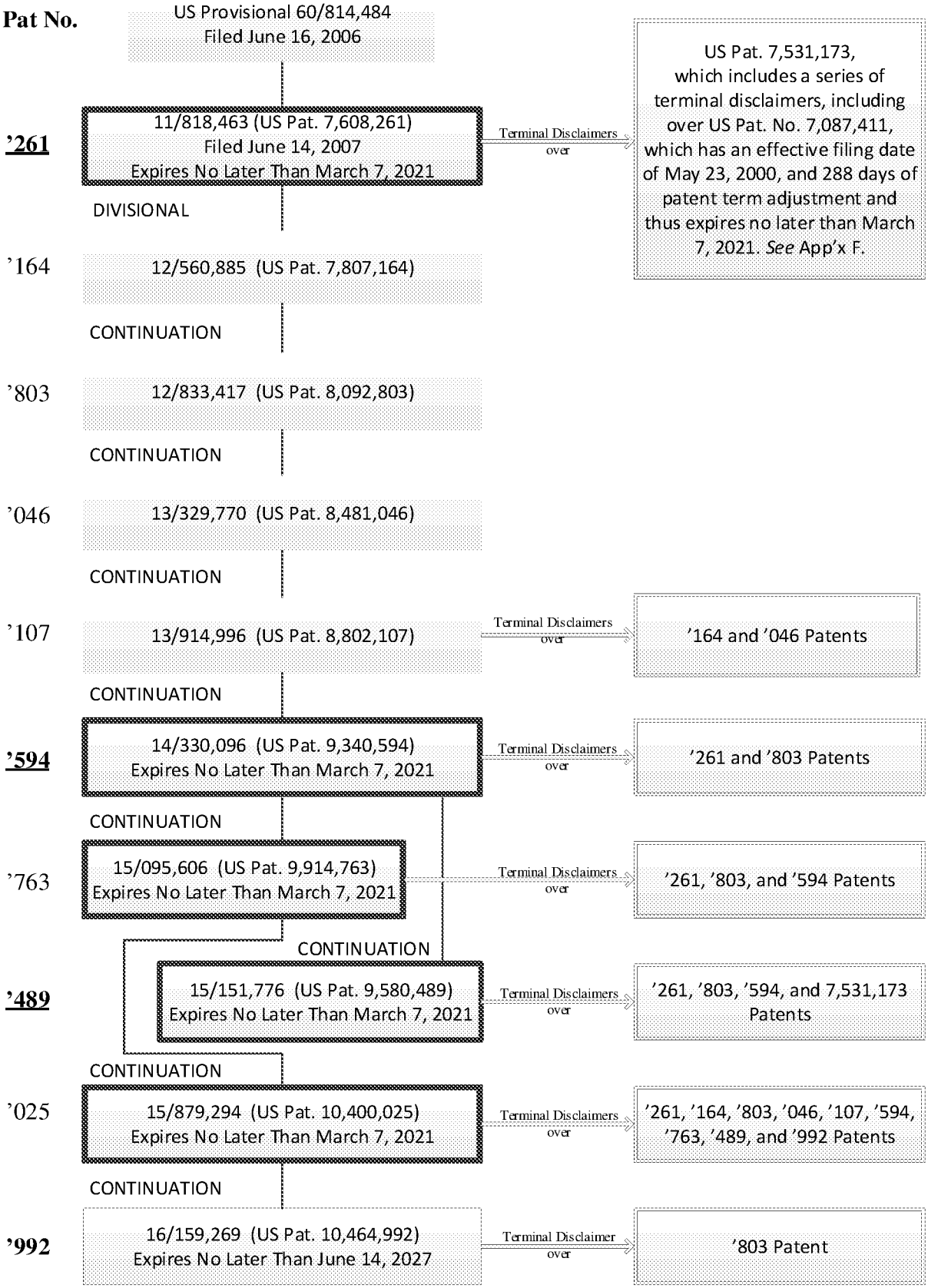
7. **U.S. Pub. No. 2016/0144025 A1 (the "Vitti Publication," Exhibit 8)** published May 26, 2016 from U.S. App. No. 14/943,490. The Vitti Publication is not prior art to the '992 Patent, but rather is included as evidence of Patent Owner's admissions that the VEGF receptor-based fusion protein referred to in the prior art Papadopoulos reference as "VEGFR1R2-FcΔC1(a)" is aflibercept (Eylea®) and it is encoded by the amino acid sequence identically disclosed in the prior art Papadopoulos publication (Exhibit 7) and in SEQ ID NO: 4 of the '992 Patent.

8. **PCT Publication No. WO 98/45331 A2 to Baca et al. (Exhibit 9)** published October 15, 1998 from PCT App. No. PCT/US98/06604. Baca et al. is prior art to the '992 Patent under 35 U.S.C. § 102(b).

9. **PCT Publication No. WO 00/63380 A1 to Cunningham et al. (Exhibit 10)** published October 26, 2000 from PCT App. No. PCT/US00/09483. Cunningham et al. is prior art to the '992 Patent under 35 U.S.C. § 102(b).

B. Each OTDP Reference Patent Expires Earlier than the '992 Patent

The '992 Patent claims priority through a series of applications (including all three OTDP Reference Patents) to U.S. Patent Application No. 11/818,463, filed June 14, 2007, which issued as the '261 Patent, and U.S. Provisional Application No. 60/814,484, filed June 16, 2006. During the '992 Patent's prosecution, Patent Owner filed a terminal disclaimer over U.S. Pat. No. 8,092,803, but not over any of the other patents in the Furfine Family, as depicted below:


Pat No.
US Provisional 60/814,484
Filed June 16, 2006
'261
11/818,463 (US Pat. 7,608,261)
Filed June 14, 2007
Expires No Later Than March 7, 2021
Terminal Disclaimers over
US Pat. 7,531,173, which includes a series of terminal disclaimers, including over US Pat. No. 7,087,411, which has an effective filing date of May 23, 2000, and 288 days of patent term adjustment and thus expires no later than March 7, 2021. See App'x F.
DIVISIONAL
'164
12/560,885 (US Pat. 7,807,164)
CONTINUATION
'803
12/833,417 (US Pat. 8,092,803)
CONTINUATION
'046
13/329,770 (US Pat. 8,481,046)
CONTINUATION
'107
13/914,996 (US Pat. 8,802,107)
Terminal Disclaimers over
'164 and '046 Patents
CONTINUATION
'594
14/330,096 (US Pat. 9,340,594)
Expires No Later Than March 7, 2021
Terminal Disclaimers over
'261 and '803 Patents
CONTINUATION
'763
15/095,606 (US Pat. 9,914,763)
Expires No Later Than March 7, 2021
Terminal Disclaimers over
'261, '803, and '594 Patents
CONTINUATION
'489
15/151,776 (US Pat. 9,580,489)
Expires No Later Than March 7, 2021
Terminal Disclaimers over
'261, '803, '594, and 7,531,173 Patents
CONTINUATION
'025
15/879,294 (US Pat. 10,400,025)
Expires No Later Than March 7, 2021
Terminal Disclaimers over
'261, '164, '803, '046, '107, '594, '763, '489, and '992 Patents
CONTINUATION
'992
16/159,269 (US Pat. 10,464,992)
Expires No Later Than June 14, 2027
Terminal Disclaimer over
'803 Patent

The challenged '992 Patent and all of the other patents in the Furfine Family claim priority to the '261 Patent and the same provisional application filed on June 16, 2006. Due to a series of terminal disclaimers, the '261 Patent expires no later than March 7, 2021. *See* Appendix F. The other OTDP Reference Patents are both terminally disclaimed over at least the '261 Patent, and therefore also expire no later than March 7, 2021. The OTDP Reference Patents are appropriate as obviousness-type double patenting references because they expire at least six years earlier than the '992 Patent. *AbbVie Inc. v. Mathilda & Terence Kennedy Inst. of Rheumatology Trust*, 764 F.3d 1366, 1374 (Fed. Cir. 2014) ("[T]he doctrine of obviousness-type double patenting continues to apply where two patents that claim the same invention have different expiration dates."); *Gilead Scis., Inc. v. Natco Pharma Ltd.*, 753 F.3d 1208, 1215 (Fed. Cir. 2014).

V. STATEMENT POINTING OUT EACH SUBSTANTIAL NEW QUESTION OF PATENTABILITY (37 C.F.R. § 1.510(B)(1))

Requester submits that substantial new questions ("SNQ") of patentability exist with respect to all claims of the '992 Patent (claims 1-18) and requests *ex parte* reexamination of those claims based at least on the substantial new questions summarized below:

SNQ1. Claims 1-18 of the '992 Patent are unpatentable on grounds of obviousness-type double patenting over claims 1-5 of the '594 Patent, optionally in view of Papadopoulos and the Exemplary Vial Pubs.;

SNQ2. Claims 1-18 of the '992 Patent are unpatentable on grounds of obviousness-type double patenting over claims 1-5 of the '261 Patent, optionally in view of Papadopoulos and the Exemplary Vial Pubs.;

SNQ3. Claims 1-18 of the '992 Patent are unpatentable on grounds of obviousness-type double patenting over claims 1-29 of the '489 Patent, optionally in view of Papadopoulos.

To establish a substantial new question of patentability, the request must demonstrate that

the patent or prior art relied upon in a proposed rejection "presents a new, non-cumulative technological teaching that was not previously considered and discussed on the record during the prosecution of the application that resulted in the patent for which reexamination is requested." MPEP § 2216. However, "[t]he substantial new question of patentability may be based on art previously considered by the Office if the reference is presented in a new light or a different way that escaped review during earlier examination." *Id.*; 35 U.S.C. § 303(a) ("The existence of a substantial new question of patentability is not precluded by the fact that a patent or printed publication was previously cited by or to the Office or considered by the Office."). "A double patenting issue may raise a substantial new question of patentability of a claim of a patent, and thus can be addressed in a reexamination proceeding." MPEP § 804(I)(D).

A substantial new question of patentability exists based on obviousness-type double patenting over the earlier-expiring '261 and '594 Patents, because the Examiner incorrectly concluded that the stability result language rendered the claims of the '992 Patent patentably distinct from the claims of these earlier-expiring patents. It does not. Assuming *arguendo* that the stability result language is considered to be a limitation, this Request demonstrates—based on Patent Owner's own data reported in the specification common to the '992 Patent and each of the OTDP Reference Patents (the "Common Specification")—that the formulations claimed in '261 and '594 Patents inherently achieve the stability result claimed in the '992 Patent. The work of the inventor or the patent itself can be used as the evidence of inherency. *See, e.g.*, *Alcon Research, Ltd. v. Apotex Inc.*, 687 F.3d 1362, 1369 (Fed. Cir. 2012) (analyzing inherency based on the disclosure of the "patent itself").

It is well-settled that claiming an inherent property of a composition does not render a claim to the composition nonobvious. *Hospira, Inc. v. Fresenius Kabi USA, LLC*, 946 F.3d

1322, 1332-33 (Fed. Cir. 2020) (holding patent invalid as obvious because it "simply recites a composition, with a 'wherein' clause that describes the stability of that recited composition, a result that was inherent in the prior art."). *See also Atlas Powder Co. v. Ireco Inc.*, 190 F.3d 1342, 1347 (Fed. Cir. 1999) ("[T]he discovery of a previously unappreciated property of a prior art composition, or of a scientific explanation for the prior art's functioning, does not render the old composition patentably new to the discoverer." (citing *Titanium Metals Corp. v. Banner*, 778 F.2d 775, 782 (Fed. Cir. 1985))).

A patent can be invalid based on inherency when the patent itself makes clear that a limitation is "not an additional requirement imposed by the claims ..., but rather a property necessarily present." *In re Kubin*, 561 F.3d 1351, 1357 (Fed. Cir. 2009); *see also Persion Pharm. LLC v. Alvogen Malta Operations Ltd.*, 945 F.3d 1184, 1191 (Fed. Cir. 2019) ("[T]he district court did not err by finding that the pharmacokinetic limitations of the asserted claims were inherent and added no patentable weight to the pharmacokinetic claims."); *Alcon Research*, 687 F.3d at 1369 ("[T]his claim language does not impose any additional requirement because the '805 patent itself defines mast cell stabilization as a property that is necessarily present at those concentrations.").

This Request thus presents the '261 and '594 Patents in a "new light" and in a different way that escaped review during earlier examination. By explaining the import of the experimental results reported in the Common Specification, this request also presents new, non-cumulative technological teachings that were not previously considered and discussed on the record during the prosecution of the application that resulted in the '992 Patent.

The '261 and '594 Patents claim very specific formulations that 1) fall within the genus of formulations claimed in the '992 Patent, and 2) are reported in the Common Specification as

achieving the claimed stability result. Specifically, as explained in detail below, claim 5 of the '261 Patent, and claim 5 of the '594 Patent, each recite the same VEGF specific fusion protein of SEQ ID NO: 4, in a formulation with specific combinations of the organic co-solvent, buffer, stabilizing agent(s), and pH that is disclosed in Examples 3 and 4 of the Common Specification as resulting in greater than 99% of the VEGF antagonist in native conformation following storage at 5°C for two months as measured by SEC. Thus, claims 1-18 of the '992 patent are anticipated by, or at the very least are obvious variants of, the claims of each of the '261 Patent and the '594 Patent. Insertion of a stability result did not render the formulation claimed in the '992 Patent patentably distinct from more specific formulations claimed in the earlier-expiring '261 and '594 Patents. Therefore, the Examiner erred in withdrawing the obviousness-type double patenting rejections over each of the '261 Patent and the '594 Patent, and this Request demonstrates a substantial new question of patentability by presenting these references in a new light.

A substantial new question of patentability also exists based on obviousness-type double patenting over the '489 Patent. The '489 Patent was not cited or discussed during prosecution of the application that became the '992 Patent. The '489 Patent presents a new, non-cumulative technological teaching because it claims a formulation and vial containing the same VEGF antagonist fusion proteins produced in CHO cells, buffer, organic co-solvent, and stabilizing agent as the '992 Patent, and also recites that "at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate." As explained in detail below, the claims of the '489 Patent as a whole render obvious the same formulation of Examples 3 and 4 of the Common Specification, which achieves the result of greater than 99% of the same VEGF antagonist in native conformation after two months of storage. *See* Section VI.F. *infra*.

The '489 Patent therefore presents a substantial new question of patentability because the Examiner 1) did not cite the '489 Patent and all, and 2) did not recognize that the experimental results presented in the Common Specification demonstrate that the '489 Patent claims cover the same formulations and stability result claimed in the '992 Patent.

The Examiner did not cite or discuss Papadopoulos during prosecution of the '992 Patent. Papadopoulos teaches that the VEGF antagonist fusion protein of SEQ ID NO: 4 and its production in CHO cells were known in the prior art. The claims of any of the OTDP Reference Patents in view of Papadopoulos present a substantial new question of patentability because it supports the obviousness of the subject matter claimed in the '992 Patent over the claims of each of the OTDP Reference Patents. In particular, Papadopoulos presents a new technological teaching demonstrating that claiming production of the fusion proteins "in a Chinese Hamster Ovary (CHO) cell" does not patentably distinguish the claims of the '992 Patent over the earlier-expiring OTDP Reference Patents.

A substantial new question of patentability therefore exists based on obviousness-type double patenting over each of the '261, '594, and '489 Patents, optionally in combination with Papadopoulos.

VI. SUBSTANTIAL NEW QUESTIONS OF PATENTABILITY AND DETAILED DISCUSSION OF HOW THE CITED ART IS APPLIED TO THE CHALLENGED CLAIMS (37 C.F.R. § 1.510(b)(2))

In accordance with 37 C.F.R. §§ 1.510 (b)(1) and (2), the following sections provide a detailed explanation about how the OTDP Reference Patents are being applied to the challenged claims 1-18. Further detailed explanations of how each reference patent renders the claims of the '992 Patent unpatentable for obviousness-type double patenting are presented in the claim charts attached hereto as Appendices A-C.

A. Obviousness-Type Double Patenting is an Appropriate Basis for Reexamination of the '992 Patent

The '992 Patent, with an expiration date over six years after the OTDP reference patents, provides an unjustified timewise extension of Patent Owner's monopoly. Nonstatutory obviousness-type double patenting may raise substantial new questions of patentability, and is an appropriate basis for instituting *ex parte* reexamination. MPEP § 2258(I)(D) ("[T]he issue of double patenting, over prior art patents or non-prior art patents, is appropriate for consideration in reexamination under 35 U.S.C. § 302, both as a basis for ordering reexamination under 35 U.S.C. § 304 and during subsequent examination on the merits."); *see, e.g.*, *In re Janssen Biotech, Inc.*, 880 F.3d 1315, 1317-18 (Fed. Cir. 2018) (affirming decision in an *ex parte* reexamination that held claims unpatentable for obviousness-type double patenting); *In re Lonardo*, 119 F.3d 960, 966 (Fed. Cir. 1997).

"The ban on double patenting ensures that the public gets the benefit of the invention after the original period of monopoly expires.... It is designed to prevent an inventor from securing a second, later expiring patent for the same invention." *AbbVie Inc.*, 764 F.3d at 1373. An inventor also cannot avoid the double patenting doctrine by procuring a later-expiring patent containing only small differences from the earlier-expiring patent. Rather, "it is a bedrock principle of our patent system that when a patent expires, the public is free to use not only the same invention claimed in the expired patent but also obvious or patentably indistinct modifications of that invention." *Gilead Scis., Inc.,* 753 F.3d at 1214. "[T]hat principle is violated when a patent expires and the public is nevertheless barred from practicing obvious modifications of the invention claimed in that patent because the inventor holds another later-expiring patent with claims for obvious modifications of the invention." *Id.* "Thus, if the later expiring patent is 'merely an obvious variation of an invention disclosed and claimed in the

[reference] patent,' the later expiring patent is invalid for obviousness-type double patenting." *AbbVie Inc.*, 764 F.3d at 1379 (quoting *In re Vogel*, 422 F.2d 438, 441 (CCPA 1970)).

Secondary considerations of nonobviousness, such as unexpectedly superior results, are not considered in the context of obviousness-type double patenting. *See Procter & Gamble Co. v. Teva Pharms. USA, Inc.*, 566 F.3d 989, 999 (Fed. Cir. 2009); *Geneva Pharms., Inc. v. GlaxoSmithKline PLC*, 349 F.3d 1373, 1377 n.1 (Fed. Cir. 2003) ("Obviousness requires inquiry into objective criteria suggesting non-obviousness; nonstatutory double patenting does not.").

The Federal Circuit has made clear that, even for post-URAA patents, "obviousness-type double patenting continues to apply where two patents that claim the same invention have different expiration dates." *AbbVie Inc.*, 764 F.3d at 1374. Nonstatutory double patenting rejections are appropriate where, as here, "the applicant chooses to file separate applications for overlapping subject matter," thereby obtaining different expiration dates. *Id.* at 1373.

Here, Patent Owner obtained issuance of the OTDP Reference Patents by filing terminal disclaimers such that those patents expire no later than March 7, 2021. *See* Section IV.B. *supra*. That expiration date is part of the bargain with the public by which Patent Owner obtained the OTDP Reference Patents, and cannot be withdrawn. *See In re Yamazaki*, 702 F.3d 1327, 1332-34 (Fed. Cir. 2012) ; MPEP § 1490(VIII)(B) ("The mechanisms to correct a patent … are not available to withdraw or otherwise nullify the effect of a recorded terminal disclaimer. As a general principle, public policy does not favor the restoration to the Patent Owner of something that has been freely dedicated to the public.").

The '992 Patent provides an unjustified timewise extension of Patent Owner's monopoly by broadly claiming formulations that are anticipated or obvious over the claims of the earlier-expiring OTDP Reference Patents. The '992 Patent claims should therefore be rejected for

double patenting. *See AbbVie Inc.*, 764 F.3d at 1373 ("[T]he doctrine of obviousness-type double patenting ensures that a particular invention (and obvious variations thereof) does not receive an undue patent term extension.").

B. A One-Way Obviousness Type Double Patenting Test Applies

MPEP § 804 explains that nonstatutory double patenting includes rejections based on anticipation, one-way or two-way determinations of obviousness, and rejections based on the equitable principle against permitting an unjustified timewise extension of patent rights. "If the application under examination is the later-filed application, or both applications are filed on the same day, only a one-way determination of distinctness is needed in resolving the issue of double patenting, *i.e.*, whether the invention claimed in the application would have been anticipated by, or an obvious variation of, the invention claimed in the patent." MPEP § 804(II)(B)(2)(b). "If a claimed invention in the application would have been obvious over a claimed invention in the patent, there would be an unjustified timewise extension of the patent and a nonstatutory double patenting rejection is proper." *Id.*

Here, the '992 Patent and each of the OTDP Reference Patents claim priority to a common parent application, filed June 16, 2006. The specifications of these patents are substantially identical and, with respect to the disclosures relevant to the claims at issue, are identical. Therefore, because the applications that issued as these patents were filed on the same day (by virtue of their common parent application), or because the claims of the '992 Patent could have been filed in each of the earlier-issued patents (by virtue of their nearly identical disclosures), a one-way test is appropriate.

C. 35 U.S.C. § 121 Does Not Prevent Using Any of the OTDP Reference Patents as the Basis for Double Patenting Rejections

The Safe Harbor provision of 35 U.S.C. § 121 only protects applicants from obviousness-

type double patenting invalidity when they are forced to pursue inventions in separate patent applications as a result of a restriction requirement set by the USPTO. *See Geneva Pharms., Inc.*, 349 F.3d at 1378-79. "Given the potential windfall [a] patent term extension could provide to a patentee," the courts apply a "strict test for application of §121." *Id.* at 1382. The Federal Circuit has established three requirements for invoking the protection of the Safe Harbor provision: (1) a restriction requirement, (2) a divisional application filed as a result of the restriction requirement, and (3) consonance with the restriction requirement. *Symbol Techs., Inc. v. Opticon, Inc.*, 935 F.2d 1569, 1579 (Fed. Cir. 1991).

The consonance requirement prevents an applicant from reclaiming, through a divisional application, the invention that was elected and examined in the parent.

> Consonance requires that the line of demarcation between the 'independent and distinct inventions' that prompted the restriction requirement be maintained. Though the claims may be amended, *they must not be so amended as to bring them back over the line imposed in the restriction requirement.* Where that line is crossed the prohibition of the third sentence of Section 121 does not apply.

Id. (quoting *Gerber Garment Tech., Inc. v. Lectra Sys., Inc.*, 916 F.2d 683, 688 (Fed. Cir. 1990) (emphasis added)). In other words, the Safe Harbor provision does not apply when an application claims the same invention that was elected for prosecution in the parent application.

The OTDP Reference Patents are all members of the same Furfine patent family as the '992 Patent. *See* chart in Section IV.B. *supra*. A restriction requirement was issued during pendency of the '261 Patent application, requiring the applicant to elect between (a) formulation claims and (b) method claims directed to methods of making a lyophilized formulation. The applicant elected to prosecute the formulation claims, which issued as the '261 Patent. Applicant then pursued a divisional with the method claims, which issued as the '164 Patent.

The '992 Patent is part of a chain of continuation applications filed from the '164 divisional application, and is a continuation of each of the other OTDP Reference Patents. To benefit from the Safe Harbor provision of 35 U.S.C. §121, the '992 Patent must maintain consonance with the original restriction requirement (*i.e.*, by pursuing only the method claims that were restricted from the '261 Patent). *See Symbol Techs., Inc.*, 935 F.2d at 1579.

Here, the '992 Patent claims clearly crossed the "line of demarcation" set by the restriction requirement because both the '992 Patent and the '261 Patent recite claims directed to the same formulations. The '992 Patent therefore is not entitled to the Safe Harbor provision of 35 U.S.C. § 121 for obviousness-type double patenting rejections over the '261 Patent. *See* MPEP § 804.01.

The '992 patent is a continuation of each of the '594 and '489 Patents, and therefore is not eligible for the Safe Harbor of § 121. Moreover, each of the '594 and '489 Patents, like the '261 and '992 patents, claims formulations rather than the restricted methods.

D. SNQ1: Claims 1–5 of the '594 Patent Create a Substantial New Question of Patentability Based on Obviousness-Type Double Patenting

Claims 1-18 of the '992 Patent are unpatentable over claims 1-5 of the '594 Patent for obviousness-type double patenting. Claim 5 of the '594 Patent (including the claims from which it depends) recites a specific formulation that falls within the scope of every claim of the '992 Patent, and the Common Specification demonstrates that this claimed formulation achieves the exact result that the Patent Owner used to overcome the examiner's double patenting rejection. In addition to the discussion below, a detailed explanation of how the '594 patent renders the claims of the '992 patent unpatentable for obviousness-type double patenting is presented in the claim chart attached hereto as Appendix A.

1. Independent Claims 1 and 10 are Unpatentable For Double Patenting Over the '594 Patent

The first step in the obviousness-type double patenting analysis is to compare the later-expiring claims to the earlier-expiring claims. *See AbbVie Inc.*, 764 F.3d at 1374. The second step is to determine whether those differences render the claims patentably distinct. "'A later claim that is not patentably distinct from,' *i.e.* 'is obvious over[ ] or anticipated by,' an earlier claim is invalid for obviousness-type double patenting." *Id.* (quoting *Eli Lilly*, 251 F.3d at 968).

Claim 1 of the '992 Patent recites:

> A vial comprising:
>
> a vascular endothelial growth factor (VEGF) antagonist,
>
> an organic co-solvent,
>
> a buffer, and
>
> a stabilizing agent,
>
> wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and
>
> wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography.

Claim 10 is identical to claim 1 except the word "vial" in the preamble is substituted with the word "formulation." Thus, claims 1 and 10 are discussed together below.

As explained in Section II.C., during prosecution, Patent Owner did not dispute that the '594 Patent claims contained each of the components of the claimed vial and formulation, *i.e.*, the claimed VEGF antagonist, an organic co-solvent, a buffer, and a stabilizing agent. Rather, in

response to the Examiner's obviousness-type double patenting rejection, Patent Owner amended the claims to recite the stability test results from the specification's examples and argued that those test results were not in the '594 Patent's claims. The phrase "wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography," only states an intended result and is therefore non-limiting. *See, e.g.*, *In re Copaxone Consol. Cases*, 906 F.3d at 1023. Nonetheless, even if this phrase is given patentable weight, it does not render the claims of the '992 Patent patentably distinct from the claims of the '594 Patent because the Common Specification itself demonstrates that the formulations claimed in the '594 Patent inherently achieve this level of stability.

a. The '594 Patent Claims a Species Within the Scope of the '992 Patent Claims

The table below shows that the independent claims of the '992 Patent (claims 1 and 10) are not patentably distinct from claim 5 of the '594 Patent:

'992 Patent Independent Claims (Claims 1 and 10)	**'594 Patent, Claim 5, which depends from claims 4, 3, 2, and 1**
A vial [or formulation] comprising: a vascular endothelial growth factor (VEGF) antagonist,	'594 Patent, claim 1: "A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a **stable** ophthalmic **formulation of a vascular endothelial growth factor (VEGF) trap**…" It was known to store protein formulations in a vial. *See, e.g.*, Exemplary Vial Pubs. (Ex. 9, 47:14-18; Ex. 10, 25:20-27).
an organic co-solvent	'594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap,

	10 mM phosphate, 40 mM NaCl, **0.03% polysorbate 20**, 5% sucrose, at pH 6.2-6.4."
a buffer	'594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, **10 mM phosphate**, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4."
a stabilizing agent	'594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, **5% sucrose**, at pH 6.2-6.4."
wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and	'594 Patent, claim 1: "A…a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component" '594 Patent, claim 4: "wherein the VEGF trap consists of amino acids 27-457 of **SEQ ID NO:4.**" Papadopoulos at 26:14-17 discloses that Regeneron's VEGF trap molecules, including VEGFR1R2-FcΔC1(a) (aflibercept, **SEQ ID NO:4**), were produced in **CHO cells**.
wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography.	'594 Patent, claim 3: "The pre-filled syringe according to claim 2, wherein **the VEGF trap is stable for at least 4 months**." Examples 3 and 4 of the Common Specification evidence the inherent stability results for the formulation of claim 5.

As shown in the chart above, claim 5 of the '594 patent recites a specific formulation that falls within the broader genus claims of the '992 patent, and therefore anticipates the '992 Patent claims. As noted in Section II.A., the '992 Patent specification states that polysorbate 20 is an "organic co-solvent," 10 mM phosphate is a "buffer," and sucrose is a "stabilizing agent." '992 Patent, col. 2:25-38. A claim in a reference patent that recites a "species renders the later genus claims invalid under non-statutory double patenting." *Perricone v. Medicis Pharm. Corp.*, 432 F.3d 1368, 1374 (Fed. Cir. 2005); *Eli Lilly & Co. v. Barr Labs., Inc.*, 251 F.3d 955, 971 (Fed. Cir. 2001) ("[Federal Circuit] case law firmly establishes that a later genus claim limitation is anticipated by, and therefore not patentably distinct from, an earlier species claim."). That is the case here. The formulation claimed in claim 5 the '594 Patent is a species of the broad formulation claimed in the '992 Patent, rendering claims 1 and 10 of the '992 invalid for double patenting.

Moreover, as demonstrated below, the formulation recited in claim 5 of the '594 Patent achieves the same stability result claimed in the '992 Patent.

b. The '594 Patent Claims Meet the Stability Recited in the '992 Patent's "Wherein" Clause, Expressly or Inherently

Claim 3 of the '594 Patent (from which claim 5 depends) expressly recites that the VEGF trap (*i.e.*, VEGF antagonist fusion protein) "is stable for at least 4 months." '594 Patent, claim 3, 1:36-48 (stating that the VEGF-specific fusion protein antagonist is also referred to as a VEGF "trap"). It is appropriate to look to the specification of the reference patent to determine the scope and meaning of the claims of an obviousness-type double patenting reference, and "when addressing the issue of whether a claim in the application defines an obvious variation of an invention claimed in the reference patent or application." MPEP § 804(II)(B)(2)(a).

The '594 Patent does not define the term "stable," but states that "stability is determined

in a number of ways at specified time points, including … size exclusion HPLC." *Id.* at 6:42-48, 8:2-3 ("Stability was determined by SE-HPLC," *i.e.*, size exclusion chromatography (SEC)). A POSA reading the '594 Patent would understand that a "stable" formulation retains a very high percentage of the protein in "native configuration" following storage, as measured by SEC, based on the data reported for all of the example formulations. *See id.*at Tables 1-8. Claim 3 recites that the protein "is stable' for *at least four months*, and therefore anticipates or renders obvious the '992 Patent claims' requirement that "at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for *two months* as measured by size exclusion chromatography."

Moreover, the Common Specification evidences that the specific formulation recited in claim 5 of the '594 Patent inherently achieves the result recited in the '992 Patent's "wherein" clause. Claim 5 of the '594 Patent specifically covers the formulation tested in Examples 3 and 4 of the Common Specification:

Examples 3 & 4 of the Common Specification	**'594 Patent, Claim 5, which depends from claims 4, 3, 2, and 1**
40 mg/ml VEGF Trap	"40 mg/mL of the VEGF Trap," (claim 5) "wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO: 4" (claim 4)
10 mM phosphate	10 mM phosphate
40 mM NaCl	40 mM NaCl
0.03% polysorbate 20	0.03% polysorbate 20
5% sucrose	5% sucrose
pH 6.3	pH 6.2-6.4

Example 3 of the Common Specification evidences the inherent stability results for the composition of claim 5 of the '594 Patent when stored in glass vials. Example 3 discloses that "[a] liquid formulation containing 40 mg/ml VEGF trap (SEQ ID NO:4), 10 mM phosphate, 40

mM NaCl, 0.03% polysorbate 20, 5% sucrose, and pH 6.3, was stored at 5°C in 3 ml glass vials and samples tested at 0.5, 1, 2, 3, and 4 months" and showed by SEC that the formulation has **99.2%** of the VEGF trap in native conformation at two months. *See* Table 3 of the '992 Patent.

Example 4 of the Common Specification evidences the inherent stability results for the composition of claim 5 when stored in glass syringes. Example 4 discloses that "[a] liquid formulation containing 40 mg/ml VEGF trap (SEQ ID NO: 4), 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, and pH 6.3, was stored at 5°C. in 1 ml prefilled luer glass syringe … and samples tested at 0.5. 1, 2, 3, and 4 months" and showed by SEC that the formulation has **99.1%** of the VEGF trap in native conformation at two months. *See* Table 4 of the '992 Patent.

The "VEGF trap (SEQ ID NO:4)" of Examples 3 and 4 is the same fusion protein that "consists of amino acids 27-457 of SEQ ID NO:4," recited in claim 4 of the '594 Patent, *i.e.*, aflibercept. *See* Section II.B. *supra*; Ex. 8 ¶¶ [0086], [0197].

Thus, the formulation claimed in the '594 Patent inherently achieves stability such that "at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography," regardless of whether it is stored in a vial or a syringe. In now claiming, in the '992 Patent, the stability results achieved when storing the previously patented formulation, Patent Owner has merely claimed an inherent result or property of the formulation of claim 5 of the '594 Patent. This does not distinguish the new claims over Patent Owner's existing, earlier-expiring claims. *See, e.g., In re Crish*, 393 F.3d 1253, 1258 (Fed. Cir. 2004) ("A long line of cases confirms that one cannot establish novelty by claiming a known material by its properties."); *In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990) ("The discovery of a new property or use of a previously known composition, even

when that property and use are unobvious from prior art, can not impart patentability to claims to the known composition."). *See also In re Burke*, Appeal No. 2012-012640, 2015 WL 5782989, at *6 (PTAB Sept. 16, 2015) (affirming double patenting rejection where the reference patent claimed the same elements except the inherent result claimed in the application).

c. The Claims are Not Made Patentably Distinct by Reciting that the VEGF Antagonist is "Produced in" CHO Cells

The phrase "wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell" in the '992 Patent claims is a product-by-process limitation. "[P]atentability of a product does not depend on its method of production. If the product in the product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process." *In re Thorpe,* 777 F.2d 695, 697 (Fed. Cir. 1985) (citation omitted); MPEP § 2113. There is no indication here that the claimed fusion protein "produced in a [CHO] cell" is any different from the fusion protein claimed in the '594 Patent. To the contrary, the '992 Patent and the '594 Patent have the same specification and support for this process element. The '594 Patent specification thus discloses that its claimed VEGF antagonist fusion protein can be "expressed in a mammalian cell line such as a CHO cell." '594 Patent, 6:2-4. For at least this reason, the recitation of production in CHO cells does not render the '992 Patent claims patentably distinct over the '594 Patent claims.

Moreover, it was entirely obvious to produce the VEGF fusion protein recited in the claims of the '594 Patent in CHO cells. Papadopoulos taught detailed processes for production of Patent Owner's VEGF antagonists in CHO cells. *See, e.g.* Ex. 7, 12:19-26, 67:25 – 68:5. Papadopoulos specifically reports that the protein of SEQ ID NO: 4 claimed in the '594 Patent (*i.e.*, "VEGFR1R2-FcΔC1(a)") was expressed in CHO cells. *Id.* at 82:12-13. Thus, the claims of the '594 Patent, at least in view of Papadopoulos, render claims 1 and 10 of the '992 Patent

invalid for obviousness-type double patenting.

Additionally, other members of the Furfine Family also claim the same VEGF antagonists produced in CHO cells. *See* '489 Patent, claim 24 ("The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell."); '763 Patent, claims 1 and 12 ("wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell"). No restriction requirement was issued during prosecution of either the '489 or '763 Patent, which indicates that recitation of production in CHO cells does not render these claims patentably distinct from claims omitting production in CHO cells.

The VEGF antagonist protein in the product-by-process claim of the '992 Patent is the same as or obvious over the VEGF antagonist protein claimed in the OTDP Reference Patents both because (1) the '594 Patent teaches that the VEGF antagonist protein was produced in CHO cells, and (2) it was known from Papadopoulos that the same VEGF antagonist protein was produced in CHO cells.

d. The Claims are Not Made Patentably Distinct by Reciting a "Vial"

It would have been obvious for a POSA to place the formulation claimed in the '594 Patent in a vial, because a vial is a well-known standard container for a pharmaceutical formulation. The recitation of a vial in independent claim 1 of the '992 Patent does not create a patentable distinction over the '594 patent claims. This is evidenced by the fact that Patent Owner has previously patented both "a formulation" and "a vial" containing VEGF antagonist formulations together in the '489 Patent (as well as the '992 Patent itself), without any requirement for restriction between claims to a vial and claims to a formulation. *See* Section VI.F. *infra*, '489 Patent, claim 26 ("A vial containing a formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist"). Thus, there is no basis to conclude that

claims directed to a vial comprising a formulation are patentably distinct from claims to a formulation in general.

Moreover, it was well known in the prior art to contain VEGF antagonist formulations in vials, as evidenced by the Exemplary Vial Pubs. *See, e.g.*, Ex. 9 (WO 98/45331), 47:14-18; Ex. 10 (WO 00/63380), 25:20-27. Thus, at a minimum, the claims of the '594 Patent in view of the Exemplary Vial Pubs render claim 1 invalid for obviousness-type double patenting.

e. Claims 1 and 10 as a Whole are Unpatentable

In sum, claims 1-5 of the '594 Patent recite a specific formulation that falls within the genus of formulations claimed in claims 1 and 10 of the '992 Patent, and therefore anticipate or render obvious the '992 Patent claims. Neither the recitation of production in CHO cells, nor that the formulation is in a vial, lends patentability to the claims. Critically, the Common Specification itself demonstrates that the formulation claimed in claims 1-5 of the '594 Patent inherently achieves the stability limitation recited in the '992 Patent's "wherein" clause. The technological teachings discussed above were not previously considered and discussed on the record during the prosecution of the application that resulted in the '992 Patent. This request presents the reference '594 Patent in a "new light" and in a different way that escaped review during earlier examination, and therefore presents a substantial new question of patentability. The Examiner erred by not maintaining the obviousness-type double patenting rejection over the '594 Patent.

The claims of the '992 Patent were not rendered patentably distinct from the claims of the '594 Patent by Patent Owner's insertion of an intended result. The '992 Patent's formulation "cannot become nonobvious simply by … claiming the [result]…. To hold otherwise would allow any formulation—no matter how obvious—to become patentable merely by testing and claiming an inherent property." *Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d 1344,

1354 (Fed. Cir. 2012). In the '992 patent, Patent Owner has attempted to extend the term of exclusivity it has under the '594 patent by obtaining new claims to essentially the same subject matter. "Effectively extending the patent term, however, is precisely the result that the doctrine of obviousness-type double patenting was created to prevent." *In re Berg*, 140 F.3d 1428, 1435 (Fed. Cir. 1998). Therefore, because independent claims 1 and 10 are anticipated by or obvious variants of claims 1-5 of the '594 Patent, claims 1 and 10 are unpatentable for obviousness-type double patenting.

2. Dependent Claims 2 and 11 are Unpatentable For Double Patenting Over the '594 Patent

Dependent claim 2 of the '992 Patent recites:

> The vial of claim 1, wherein about 99% or more of the weight of the fusion protein is in native conformation.

Claim 11 is identical to claim 2 except the word "vial" in the preamble is substituted with the word "formulation" and it depends from claim 10. Thus, claims 2 and 11 are discussed together below. Requester incorporates the explanations provided above for claims 1 and 10 in Section VI.D.1. above.

The same examples discussed above evidence that formulations claimed in claims 1–5 of the '594 Patent had "99% or more of the weight of the fusion protein … in native conformation," as recited in claims 2 and 11 of the '992 Patent. To the extent that this intended result is given patentable weight, it is an inherent result of the formulation claimed in the '594 Patent. Examples 3-4 of the Common Specification show that the formulation of claims 1-5 of the '594 Patent had 99.1% and 99.2% of the weight of the fusion protein in native conformation following storage for two months at 5°C, when stored in syringes and vials, respectively. Therefore, the Examiner erred by not maintaining the obviousness-type double patenting rejection. The claims

of the '992 Patent were not rendered patentably distinct from the claims of the '594 Patent by Patent Owner's insertion of this result into the claims. Thus, because claims 2 and 11 are anticipated by or obvious variants of claims 1-5 of the '594 Patent, claims 2 and 11 are unpatentable for obviousness-type double patenting.

3. Dependent Claims 3, 4, 12 and 13 are Unpatentable For Double Patenting Over the '594 Patent

Dependent claim 3 of the '992 Patent recites:

> The vial of claim 1, wherein the first VEGF receptor is human Fltl and the second VEGF receptor is selected from the group consisting of human Flkl and the human Flt4.

Dependent claim 4 of the '992 Patent recites:

> The vial of claim 3, wherein the fusion protein comprises amino acids 27-457 of SEQ ID NO:4.

Claims 12 and 13 are identical to claims 3 and 4, respectively, except the word "vial" in the preamble is substituted with the word "formulation" and the latter claims depend from independent claim 10. Requester incorporates the explanations provided above for claims 1 and 10 in Section VI.D.1. above.

Claim 4 of the '594 Patent recites that "the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4." SEQ ID NO: 4 of the '594 Patent is identical to SEQ ID NO: 4 of the '992 Patent, as the two patents share the Common Specification. Therefore, claim 4 of the '594 Patent (from which claim 5 depends) recites a species of fusion protein that anticipates the genus "VEGF receptor is human Fltl and the second VEGF receptor is selected from the group consisting of human Flkl and the human Flt4" of claims 3 and 12 of the '992 Patent, as well as the fusion protein comprising amino acids 27-457 of SEQ ID NO:4 recited in claims 4 and 13 of the '992 Patent. The claims are not patentably distinct.

The Examiner therefore erred by not maintaining the obviousness-type double patenting rejection. Because claims 3, 4, 12 and 13 are anticipated by or obvious variants of claims 1-5 of the '594 Patent, these claims are unpatentable for obviousness-type double patenting.

4. Dependent Claims 5 and 14 are Unpatentable For Double Patenting Over the '594 Patent

Dependent claim 5 of the '992 Patent recites:

> The vial of claim 4, wherein the VEGF antagonist is a dimer of the fusion protein.

Claim 14 is identical to claim 5 except the word "vial" in the preamble is substituted with the word "formulation" and it depends on independent claim 10. Requester incorporates the explanations provided above for claims 1 and 10 in Section VI.D.1. above.

The recitation that the VEGF antagonists is a dimer is not a patentable distinction, as this is merely a property of the VEGF antagonist claimed in the '594 Patent and known in the prior art. The VEGF antagonist of SEQ ID NO: 4 (aflibercept) comprises the Fc region of human IgG as a "multimerizing component," and is known to exist as a dimer. '594 Patent (SEQ ID NO:4); Ex. 8 ¶¶ [0086], [0197] (confirming that aflibercept "consists of a dimer of two polypeptides consisting of amino acids 27-457"). The '594 Patent discloses that "the VEGF antagonist is a dimer composed of two fusion proteins of SEQ ID NO:4." '594 Patent, 6:7-8. The prior art Papadopolous reference also discloses that the VEGF trap molecules form dimers. Ex. 7 at 70:23-24 (confirming the closely related VEGF trap "Flt1D2.Flk1D3.FcC1(a)" of SEQ ID NO:2 is a "dimer"); *see also* 12:10, 25:23-35 (noting intermolecular disulfide bonds in the Fc region); Fig 24B-C (identifying the Fc region in the aflibercept sequence).

Therefore, the Examiner erred by not maintaining the obviousness-type double patenting rejection. The claims of the '992 Patent were not rendered patentably distinct from the claims of

the '594 Patent by Patent Owner's insertion of an intended result. Thus, because claims 5 and 14 are anticipated by or obvious variants of claims 1-5 of the '594 Patent, claims 5 and 14 are unpatentable for obviousness-type double patenting.

5. Dependent Claims 6-9 and 15-18 are Unpatentable For Double Patenting Over the '594 Patent

Dependent claims 6-9 and 15-18 encompass a formulation comprising polysorbate 20, sucrose, and/or phosphate buffer, in various combinations. Claim 6 of the '992 Patent recites:

> The vial of claim 5, wherein the organic co-solvent is selected for the group consisting of **polysorbate 20**, polysorbate 90, polyethylene glycol (PEG), PEG3350, and propylene glycol.

Claim 7 of the '992 Patent recites:

> The vial of claim 6, wherein the stabilizing agent is selected from the group consisting of **sucrose**, sorbitol, glycerol, trehalose, and mannitol.

Claim 8 of the '992 Patent recites:

> The vial of claim 1, wherein the organic co-solvent is **polysorbate 20** and the stabilizing agent is **sucrose**.

Claim 9 of the '992 Patent recites:

> The vial of claim 1, wherein the organic co-solvent is **polysorbate 20**, the buffer is **phosphate**, and the stabilizing agent is **sucrose**.

Claims 15–18 are identical to claims 6–9, respectively, except the word "vial" in the preamble is substituted with the word "formulation" and claims 15–18 ultimately depend from claim 10. Requester incorporates the explanations provided above for claims 1 and 10 in Section VI.D.1. above.

Claim 5 of the '594 Patent recites, in a single formulation, the same elements as claims 6-9 and 15-18 of the '992 Patent, *i.e.*," **10 mM phosphate**, 40 mM NaCl, 0.03% **polysorbate 20**,

5% **sucrose**." Claim 5 therefore anticipates, or at a minimum renders obvious, the subject matter of claims 6–9 and 15–18 of the '992 Patent. This is the same formulation that inherently achieves the results recited in the "wherein" clauses of claims 1, 2, 10 and 11 of the '992 Patent. *See* Sections VI.D.1.b. and VI.D.2. *supra*. Claims 6–9 and 15–18 of the '992 Patent are not patentably distinct over the '594 Patent claims.

Therefore, the Examiner erred by not maintaining the obviousness-type double patenting rejection. The claims of the '992 Patent were not rendered patentably distinct from the claims of the '594 Patent by Patent Owner's insertion of an intended result. Thus, because claims 6–9 and 15–18 are anticipated by or obvious variants of claims 1-5 of the '594 Patent, these claims are unpatentable for obviousness-type double patenting.

E. SNQ2: Claims 1-5 of the '261 Patent Create a Substantial New Question of Patentability Based on Obviousness-Type Double Patenting

Claims 1-18 of the '992 Patent are unpatentable over claims 1-5 of the '261 Patent for obviousness-type double patenting. Claim 5 of the '261 Patent (including the claims from which it depends) recites a specific formulation that falls within the scope of every claim of the '992 Patent, and the Common Specification demonstrates that this formulation achieves the exact result that the Patent Owner used to overcome the examiner's double patenting rejection. In addition to the discussion below, a detailed explanation of how the '261 patent renders the claims of the '992 patent unpatentable for obviousness-type double patenting is presented in the claim chart attached hereto as Appendix B.

1. Independent Claims 1 and 10 are Unpatentable For Double Patenting Over the '261 Patent

As explained in Section II.C., during prosecution, Patent Owner did not dispute that the claims of the '261 Patent contained each of the components of the claimed vial and formulation, *i.e.*, the claimed VEGF antagonist, an organic co-solvent, a buffer, and a stabilizing agent.

Rather, in response to the Examiner's obviousness-type double patenting rejection, Patent Owner amended the claims to recite the stability test results from the specification's examples and argued that those test results were not in the '261 Patent's claims. The phrase "wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography," only states an intended result and is therefore non-limiting. *See, e.g.*, *In re: Copaxone Consol. Cases*, 906 F.3d at 1023. Even if this phrase is given patentable weight, this phrase does not render the claims of the '992 Patent patentably distinct from the claims of the '261 Patent for the reasons discussed below.

a. The '261 Patent Claims a Species Within the Scope of the '992 Patent Claims

As shown in the following table, the independent claims of the '992 Patent are not patentably distinct from claims 1-5 of the '261 Patent:

'992 Patent Independent Claims (claims 1 and 10)	**'261 Patent Claim 5, which depends from claims 4, 3, 2, and 1**
A formulation [or vial] comprising: a vascular endothelial growth factor (VEGF) antagonist,	"An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising…" It was known to store protein formulations in a vial. *See, e.g.*, Exemplary Vial Pubs (Ex. 9, 47:14-18; Ex. 10, 25:20-27).
an organic co-solvent,	'261 Patent, claim 3: "0.03% polysorbate"
a buffer,	'261 Patent, claim 3: "10 mM sodium phosphate buffer"
a stabilizing agent,	'261 Patent, claim 3: "5% sucrose"

wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and	'261 Patent, claim 1: "a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of **SEQ ID NO:4**;" Papadopoulos (Ex. 7) at 26:14-17 discloses that Regeneron's VEGF antagonists, including VEGFR1R2-FcΔC1(a) (aflibercept, **SEQ ID NO:4), were produced in CHO cells**.
wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography.	'261 Patent, claim 5: "…VEGF antagonist at a concentration selected from the group consisting of 10 mg/ml, 20 mg/ml, **40 mg/ml**, and 80 mg/ml." Examples 3 and 4 of the '992 Patent evidence that the composition of claim 5, comprising 40 mg/mL of the VEGF antagonist, inherently has at least 98% of the VEGF antagonist present in native conformation following storage at 5ºC for two months as measured by SEC.

As shown in the chart above, claim 5 of the '261 patent recites a specific formulation that falls within the broader genus claim of the '992 patent. As noted in Section II.A., the '992 Patent specification states that polysorbate is an "organic co-solvent," sodium phosphate buffer is an exemplary "buffer," and sucrose is a "stabilizing agent." '992 Patent, 2:25-38. Likewise, the '992 Patent specification states that the VEGF antagonist of SEQ ID NO: 4 (as claimed in the '261 patent) is a preferred species of the genus of VEGF antagonist "fusion protein[s] comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component" (as claimed in the '992 Patent). '992 Patent, col. 2, lines 14-18; claim 4.

The formulation claimed in claim 5 the '261 Patent is a species of the broad formulation claimed in the '992 Patent, and thus anticipates, or at a minimum renders obvious, claims 1 and 10 of the '992 Patent. *See Perricone*, 432 F.3d at 1374; Section VI.D.1.a. *supra*. Moreover, as demonstrated below, the formulation recited in claim 5 of the '261 Patent achieves the same stability result claimed in the '992 Patent.

b. The Formulation Claimed in the '261 Patent Inherently Displays the Stability Recited in the '992 Patent's "Wherein" Clause

The fact that the '992 Patent recites a result obtained by the formulation—"wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography"—does not render its claims patentably distinct from those of the earlier-expiring '261 Patent. This result is an inherent characteristic of the formulation claimed in claim 5 of the '261 Patent, as demonstrated by the Common Specification.

As shown in the following table, claim 5 of the '261 Patent specifically recites the formulation tested in Examples 3 and 4 of the Common Specification:

Examples 3 & 4 of the Common Specification	**'261 Patent, claim 5**
40 mg/ml VEGF Trap (SEQ ID NO: 4)	10 mg/mL, 20 mg/mL, **40 mg/mL**, or 80 mg/mL VEGF Trap comprising amino acids 27-457 of SEQ ID NO: 4
10 mM phosphate	10 mM sodium phosphate
40 mM NaCl	40 mM NaCl
0.03% polysorbate 20	0.03% polysorbate
5% sucrose	5% sucrose
pH 6.3	pH 6.2-**6.3**

Although the claims of the '261 Patent do not expressly require that the polysorbate is polysorbate 20, the '261 Patent defines "polysorbate" as including two options: polysorbate 20 and polysorbate 80.[4] '261 Patent at 2:10-12. Further, a POSA would understand that polysorbate 20 is the preferred polysorbate of the '261 Patent claims. Polysorbate 20 is used in every working example that includes a polysorbate. *See* '261 Patent at 7:67, 8:63, 9:23, 9:52, 10:26, 10:59, 11:20. A POSA would at once envisage polysorbate 20 when reading the '261 Patent's claim to "0.03% polysorbate," so the claim anticipates this species. *See Kennametal, Inc. v. Ingersoll Cutting Tool Co.*, 780 F.3d 1376, 1381 (Fed. Cir. 2015) (quoting *In re Petering*, 301 F.2d 676, 681 (CCPA 1962)) (holding a reference disclosure can anticipate a claim "if a person of skill in the art, reading the reference, would 'at once envisage' the claimed arrangement or combination."); *AbbVie Inc.*, 764 F.3d at 1379 (same, in obviousness-type double patenting context).

As explained in Section VI.D.1.b. above, Examples 3 and 4 demonstrate that the above formulation has 99.2% and 99.1% of the VEGF trap in native conformation at two months, when the formulation is stored in vials or a prefilled syringe, respectively. *See* '992 Patent at Tables 3 and 4. Therefore, the formulations recited in the claims of the '261 Patent inherently have "at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography."

[4] It is appropriate to refer to portions of the reference patent's specification relating to the claimed invention and to use its teachings to define terms recited in the claims. MPEP § 804(II)(B); *In re Vogel,* 422 F.2d at 441-42; *Toro Co. v. White Consol. Indus., Inc.,* 199 F.3d 1295, 1299 (Fed. Cir. 1999).

As explained in Section VI.D.1.b. above, the '992 Patent claims are not rendered patentably distinct from the claims of the '261 Patent by reciting the inherent result or property of the formulations claimed in the '261 Patent. *See, e.g., In re Crish*, 393 F.3d at 1258.

c. The Claims are Not Made Patentably Distinct by Reciting that the VEGF Antagonist is "Produced in" CHO Cells

As discussed in Section VI.D.1.c., the phrase "wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell" is a product-by-process limitation that does not distinguish the '992 Patent claims from those of the OTDP Reference Patents. Like the '594 Patent discussed above, the '261 Patent claims the same fusion protein of SEQ ID NO: 4 and teaches that it can be expressed in CHO cells. '261 Patent, claim 1, 6:2-5.

Moreover, it was entirely obvious to produce the VEGF fusion protein recited in the claims of the '261 Patent in CHO cells in view of Papadopoulos. *See, e.g.* Ex. 7, 12:19-26, 67:25–68:5.

Requester incorporates the explanations provided above in Section VI.D.1.c., which apply equally to the '261 Patent claims because both claim sets recite the same VEGF antagonist fusion protein of SEQ ID NO:4. The product in the product-by-process limitation of the '992 Patent is the same as or obvious over the VEGF antagonist protein claimed in the '261 Patent both because (1) the '261 Patent teaches that the claimed VEGF antagonist protein was produced in CHO cells, and (2) it was known from Papadopoulos that the same VEGF antagonist protein was produced in CHO cells.

d. The Claims are Not Made Patentably Distinct by Reciting a "Vial"

It would have been obvious for a POSA to place the formulation claimed in the '261 Patent in a vial for the same reasons discussed in Section VI.D.1.d. above with respect to the '594 Patent. Requester incorporates the explanations provided above in Section VI.D.1.d.

e. Claims 1 and 10 as a Whole are Unpatentable

In sum, claims 1-5 of the '261 Patent recite specific formulations that fall within the genus of formulations claimed in claims 1 and 10 of the '992 Patent, and therefore anticipate the '992 Patent claims. Neither the recitation of production of the protein in CHO cells, nor that the formulation is in a vial, lends patentability to the claims. Critically, the '992 Patent itself demonstrates that the formulation claimed in claims 1-5 of the '261 Patent inherently achieves the stability limitation recited in the '992 Patent's "wherein" clause. The technological teachings discussed above were not previously considered and discussed on the record during the prosecution of the application that resulted in the '992 Patent. This request presents the reference '261 Patent in a "new light" and in a different way that escaped review during earlier examination, and therefore presents a substantial new question of patentability.

Because the inserted test result element was also inherently part of the formulations claimed in the '261 Patent as evidenced by Examples 3-4 of the Common Specification, the Examiner erred by not maintaining the obviousness-type double patenting rejection. The claims of the '992 Patent were not rendered patentably distinct from the claims of the '261 Patent by Patent Owner's insertion of an intended result. The '992 Patent's formulation "cannot become nonobvious simply by … claiming the [result]…. To hold otherwise would allow any formulation—no matter how obvious—to become patentable merely by testing and claiming an inherent property." *Santarus, Inc.*, 694 F.3d at 1354. Thus, because independent claims 1 and 10 are anticipated by or obvious variants of claims 1-5 of the '261 Patent, claims 1 and 10 are unpatentable for obviousness-type double patenting.

2. Dependent Claims 2 and 11 are Unpatentable For Double Patenting Over the '261 Patent

Dependent claim 2 of the '992 Patent recites:

> The vial of claim 1, wherein about 99% or more of the weight of the fusion protein is in native conformation.

Claim 11 is identical to claim 2 except the word "vial" in the preamble is substituted with the word "formulation" and it depends on independent claim 10. Requester incorporates the explanations provided above for claims 1 and 10 in Section VI.E.1. above.

The same examples from Common Specification discussed above also evidence that the claimed formulations had test results showing that "99% or more of the weight of the fusion protein is in native conformation following storage at 5°C. for two months" as recited in claims 2 and 11. To the extent that this intended result is given patentable weight, it is inherently achieved by the formulations claimed in the '261 Patent as evidenced by Examples 3-4 of the Common Specification. Therefore, the Examiner erred by not maintaining the obviousness-type double patenting rejection. The claims of the '992 Patent were not rendered patentably distinct from the claims of the '261 Patent by Patent Owner's insertion of an intended result. Thus, because claims 2 and 11 are anticipated by or obvious variants of claims 1-5 of the '261 Patent, claims 2 and 11 are unpatentable for obviousness-type double patenting.

3. Dependent Claims 3, 4, 12 and 13 are Unpatentable For Double Patenting Over the '261 Patent

As explained in Section VI.D.3. above, claims 3, 4, 12, and 13 of the '992 Patent all encompass a protein that "comprises amino acids 27-457 of SEQ ID NO: 4." Requester also incorporates the explanations provided for claims 1 and 10 in Section VI.E.1. above.

Claim 1 of the '261 Patent recites "a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4," which is a species of the "protein compris[ing] amino acids 27-457 of SEQ ID NO:4" recited in claims 4 and 13 of the '992 Patent, and also necessarily falls within the broader genus of claims 3 and 12 of the '992 Patent (from which claims 4 and 13 depend).

Therefore, the Examiner erred by not maintaining the obviousness-type double patenting rejection. Thus, because claims 3, 4, 12 and 13 are anticipated by or obvious variants of claims 1-5 of the '261 Patent, these claims are unpatentable for obviousness-type double patenting.

4. Dependent Claims 5 and 14 are Unpatentable For Double Patenting Over the '261 Patent

Dependent claim 5 of the '992 Patent recites:

> The vial of claim 4, wherein the VEGF antagonist is a dimer of the fusion protein.

Claim 14 is identical to claim 5 except the word "vial" in the preamble is substituted with the word "formulation" and it depends on independent claim 10. Requester incorporates the explanations provided above for claims 1 and 10 in Section VI.E.1. above.

As explained in Section VI.D.4. above, the recitation that the VEGF antagonists is a dimer is not a patentable distinction, as this is merely a property of the VEGF antagonist of SEQ ID NO:4 claimed in the '261 Patent and known in the prior art. *See* Ex. 8 ¶¶ [0086], [0197] (confirming aflibercept, SEQ ID NO: 4, is a dimer); Ex. 7, 70:23-24 (confirming the closely related VEGF trap "Flt1D2.Flk1D3.FcC1(a)" of SEQ ID NO:2 is a "dimer"), 12:10, 25:23-35 (noting intermolecular disulfide bonds in the Fc region); Fig 24B-C (identifying the Fc region in the aflibercept sequence).

Therefore, the Examiner erred by not maintaining the obviousness-type double patenting rejection. The claims of the '992 Patent were not rendered patentably distinct from the claims of the '261 Patent by Patent Owner's insertion of an intended result. Thus, because claims 5 and 14 are anticipated by or obvious variants of claims 1-5 of the '261 Patent, these claims are unpatentable for obviousness-type double patenting.

5. Dependent Claims 6-9 and 15-18 are Unpatentable For Double Patenting Over the '261 Patent

As detailed in Section VI.D.5. above, dependent claims 6-9 and 15-18 encompass a formulation comprising polysorbate 20, sucrose, and/or phosphate buffer, in various combinations. Requester also incorporates the explanations provided above for claims 1 and 10 in Section VI.E.1. above.

Claims 3-5 of the '261 Patent recite, in a single formulation, the same elements as claims 6-9 and 15-18 of the '992 Patent, *i.e.*,"10 mM sodium **phosphate buffer**, 40 mM NaCl, 0.03% **polysorbate**, and 5% **sucrose**." As explained in Section VI.E.1.b. above, a POSA would at once envisage polysorbate 20 when reading the '261 Patent's claim to "0.03% polysorbate," so this species is not patentably distinct from the earlier-claimed "polysorbate." *See* '261 Patent at 2:10-12, 7:67, 8:63, 9:23, 9:52, 10:26, 10:59, 11:20; *AbbVie, Inc.*, 764 F.3d at 1379. This is the same formulation that inherently achieves the results recited in the "wherein" clauses of claims 1, 2, 10 and 11 of the '992 Patent. *See* Sections VI.E.1.b. and VI.E.2. *supra*. Claims 6-9 and 15-18 of the '992 Patent thus are not patentably distinct over the '261 Patent claims.

Therefore, the Examiner erred by not maintaining the obviousness-type double patenting rejection. The claims of the '992 Patent were not rendered patentably distinct from the claims of the '261 Patent by Patent Owner's insertion of an intended result. Thus, because claims 6-9 and 15-18 are anticipated by or obvious variants of claims 1-5 of the '261 Patent, claims 6-9 and 15-18 are unpatentable for obviousness-type double patenting.

F. SNQ3: The Claims of the '489 Patent Create a Substantial New Question of Patentability Based on Obviousness-Type Double Patenting

Claims 1-18 of the '992 Patent are unpatentable over claims 1-29 of the '489 Patent for obviousness-type double patenting. The independent claims of the '489 Patent are very similar to the independent claims the '992 Patent. Independent claims 1 and 26 of the '489 Patent claim

a formulation and a vial, respectively, comprising a VEGF antagonist protein (defined by the same genus as the independent claims of the '992 Patent); an organic co-solvent; a buffer; and a stabilizer or tonicity agent. Dependent claim 24 recites that the protein is expressed in a CHO cell. The '489 Patent's independent claims are more specific than those of the '992 Patent in that they recite a concentration range for the formulation components.

Dependent claims 5, 7, 9, 15, 18, 21, and 25 of the '489 Patent (and the claims from which they depend) direct the POSA to each of the specific formulation components described in Examples 3 and 4 of the Common Specification (*e.g.*, 0.03% polysorbate 20 as the organic co-solvent, phosphate buffer, 5% sucrose as the stabilizing agent, the VEGF antagonist protein of SEQ ID NO:4, and pH 6.2-6.3). The Common Specification demonstrates that the formulation taught by these claims as a whole achieves the exact result that the Patent Owner used to overcome the examiner's double patenting rejection.

In addition to the discussion below, a detailed explanation of how the '489 patent renders the claims of the '992 patent unpatentable for obviousness-type double patenting is presented in the claim chart attached hereto as Appendix C.

The '489 Patent was not cited by the examiner during prosecution of the '992 Patent. The proposed rejection "presents a new, non-cumulative technological teaching that was not previously considered and discussed on the record during the prosecution of the application that resulted in the patent for which reexamination is requested," at least because the Examiner did not recognize that the Examples in the Common Specification demonstrate that the earlier-claimed formulations achieve the stability result recited in the '992 Patent's "wherein" clause. MPEP § 2216. Additionally, like the '992 Patent, the '489 Patent recites a set of claims to a "formulation" and a set of claims to a "vial" containing the formulation, which evidences that

there is no basis to conclude that placing a formulation in a vial is patentably distinct from a formulation in general or a formulation in a syringe, as discussed above for the other OTDP Reference Patents. As demonstrated below, the claims of the '489 Patent create a substantial new question of patentability.

1. Independent Claims 1, 2, 10 and 11 are Unpatentable For Double Patenting Over the '489 Patent Claims

The Examiner erroneously did not reject the claims of the '992 Patent for double patenting over the claims of the '489 Patent. As shown in the following table, the independent claims of the '992 Patent are not patentably distinct from claims 1-29 of the '489 Patent:

'992 Patent Independent Claims (Claims 1 and 10)	**'489 Patent, Claims 1, 5, 7, 9, 15, 18, 21, 24, 25 and 26**
A vial [or formulation] comprising: a vascular endothelial growth factor (VEGF) antagonist,	'489 Patent, claim 1: "A **formulation** comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist;" '489 Patent, claim 26: "A **vial** containing a formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist."
an organic co-solvent,	'489 Patent, claim 1: "(c) 0.01-5% of an organic co-solvent"
a buffer, and	'489 Patent, claim 1: "(b) 5-40 mM of a buffer"
a stabilizing agent,	'489 Patent, claim 1: "(d) a stabilizer or 30-150 mM of a tonicity agent"

wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and	'489 Patent, claim 1: " … wherein … the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component." '489 Patent, claim 24: "The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell."
wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography.	'489 Patent, claims 1 and 26: "…wherein at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate…" Example 3 of the '992 Patent evidences the inherent stability results for a formulation taught by the combination of claims 1, 5, 7, 9, 15, 18, 21, and 25. *See* Table *infra*.

As is apparent from the above claim chart, claims 1 and 26 of the '489 Patent are directed to a formulation and vial, respectively, having the same components recited in the '992 Patent's independent claims. The '489 Patent claims also specify the concentrations of the formulation components. The earlier-expiring '489 Patent claims are a species that falls within the genus of claims 1 and 10 of the '992 Patent, and thus claims 1 and 10 of the '992 Patent are invalid for obviousness-type double patenting. *See Perricone*, 432 F.3d at 1374.

The '992 Patent's recitation of an intended result in the "wherein" clause is not limiting and therefore does not render the claims patentably distinct. *In re Copaxone Consol. Cases*, 906 F.3d at 1023. Even if this phrase is given patentable weight, it does not render the claims of the '992 Patent patentably distinct from the claims of the '489 Patent. As an initial matter, the independent claims of the '489 Patent recite the result that "at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate," which is achieved by

the same working examples in the specification that achieve the result now claimed in the '992 Patent. '489 Patent, 7:45-12:18 (Examples 1-8); *see AbbVie Inc.*, 764 F.3d at 1380-81 (holding that in an obviousness-type double patenting inquiry, the specification may be consulted to determine "whether the claims merely define an obvious variation of what is earlier disclosed and claimed").

Moreover, and as an independent basis for finding the claims not patentably distinct, the Common Specification demonstrates that formulations taught by the claims of the '489 Patent as a whole inherently achieve the level of stability recited in claims 1, 2, 10, and 11 of the '992 Patent. The dependent claims of the '489 Patent recite all of the specific formulation ingredients of Examples 3 and 4 of the Common Specification, and teach, or at least render obvious, their use in combination, as shown in the following table:

Examples 3 & 4 of the Common Specification	**'489 Patent, Claims 5, 7, 9, 15, 18, 21, 25**
40 mg/ml VEGF Trap (SEQ ID NO:4)	"the VEGF-specific fusion protein antagonist is present at a concentration of about 10, about 20, about 30, **about 40**, about 50, about 60, about 70, or about 80 **mg/ml**" (claim 5); "the VEGF-specific fusion protein antagonist comprises glycosylated Asn residues corresponding to Asn residues at positions 62, 94, 129, 222, and 308 of **SEQ ID NO: 4**" (claim 25)
10 mM phosphate	"the buffer comprises **sodium phosphate** present at a concentration of **10 mM**" (claim 7)
40 mM NaCl	" **sodium chloride** is present at a concentration of 20 mM, **40 mM**, 50 mM, 100 mM, or 135 mM" (claim 18)
0.03% polysorbate 20	"the organic co-solvent is polysorbate 80 or **polysorbate 20** present at a concentration of 0.015%, **0.03%** or 0.1%" (claim 15)
5% sucrose	" **sucrose** is present at a concentration of **5%**" (claim 21)

pH 6.3	"the pH is about **pH 6.2-6.3**" (claim 9)

Although the dependency structure of the claims of the '489 patent is such that the claims do not recite each of the specific components of Examples 3 and 4 together in a single formulation, a POSA reading the claims as a whole would have at once envisaged—or at least found it obvious to prepare—a formulation comprising each of the most specific claimed elements. The independent claims of the '489 patent (claims 1 and 26) each require a formulation comprising (a) a VEGF-specific fusion protein antagonist; (b) a buffer; (c) an organic co-solvent; and (d) a stabilizer or tonicity agent. The dependent claims listed in the table above are the most specific recitations of each of these components found in the '489 Patent claims. Indeed, the dependent claims of the '489 Patent direct the POSA to a small genus of formulations (*i.e.*, 8 possible concentrations of VEGF antagonist; 5 possible concentrations of sodium chloride; 8 possible concentrations/types of organic co-solvent (across claims 13 and 15); and a very narrow pH range). The dependent claims as a whole direct the POSA to the exact formulations exemplified in Examples 3 and 4 of the Common Specification, rendering those formulations anticipated by or at least obvious over the '489 Patent claims as a whole. *See Kennametal*, 780 F.3d at 1381-83 (holding claims anticipated by a reference that taught to combine types of components, and provided multiple options for each type of component resulting in about 10,000 possible combinations).

As explained in Section VI.D.1.b. above, Examples 3 and 4 demonstrate that the formulation in the above chart has 99.2% and 99.1% of the VEGF trap in native conformation at two months, when the formulation is stored in vials or a prefilled syringe, respectively. *See* '992 Patent at Tables 3 and 4. Therefore, the claims of the '489 Patent direct the POSA to formulations having the property that "at least 98% of the VEGF antagonist is present in native

conformation following storage at 5ºC for two months as measured by size exclusion chromatography" as recited in claims 1 and 10 of the '992 Patent. For the same reason, these formulations also meet the limitation of claims 2 and 11 of the '992 patent, which recite "wherein about 99% or more of the weight of the fusion protein is in native conformation."

The '992 Patent claims are not rendered patentably distinct from the claims of the '489 Patent by reciting a property of formulations that are anticipated or rendered obvious by the claims of the earlier expiring '489 Patent. *See, e.g.*, *Crish*, 393 F.3d at 1258. Even if the '489 Patent claims only render the formulation of Examples 3 and 4 obvious, "an obvious formulation cannot become nonobvious simply by … claiming the result[]." *Santarus, Inc. v. Par Pharm., Inc.*, 694 F.3d at 1354; *see also Alcon Research*, 687 F.3d at 1369 (holding that a property "necessarily present" in an obvious formulation does not patentably distinguish the claims). Thus, because claims 1, 2, 10, and 11 of the '992 Patent are anticipated by, or obvious variants of, the claims of the '489 Patent, these claims are unpatentable for obviousness-type double patenting.

A very strong case for obviousness-type double patenting based on anticipation and obviousness over the '489 Patent claims exists as set out above. In addition, as a separate and independent reason for finding obviousness-type double patenting, the situation here is very similar to *In re Schneller,* 397 F.2d 350 (CCPA 1968). In *Schneller*, the patent owner disclosed an invention comprising elements ABCXY and obtained earlier-expiring claims to "BCX and ABCX, but so claiming these combinations as to cover them no matter what other feature is incorporated in them, thus covering effectively ABCXY." 397 F.2d at 355-56. The court held that the patent owner was not entitled "many years later" to obtain "claims directed to ABCY and ABCXY," because the "protection he already had would be extended, albeit is [sic]

somewhat different form, for several years beyond the expiration of his [first] patent." *Id.* at 356; *see also In re Metoprolol Succinate Patent Litig.*, 494 F.3d 1011, 1018 (Fed. Cir. 2007) (noting *Schneller* controls over earlier CCPA cases discussing double patenting).

Here, the '489 Patent claims formulations comprising VEGF-specific fusion protein antagonists, with separate dependent claims 5, 9, 15, 18, 21, and 25 reciting a formulation "comprising" more specific components (*e.g.*, claims to AB, AC, AD, AE, and AF), all of which *cover* the formulation in Examples 3 and 4 (*e.g.*, the specific formulation ABCDEF), which is disclosed in the Common Specification to achieve the results now claimed in the "wherein" clauses of the '992 Patent. Allowing the claims of the '992 Patent to expire six years later than the claims of the '489 Patent would unjustly extend the effective term of the '489 Patent. A nonstatutory double patenting rejection is thus also applicable here based on equitable principles. *See* MPEP § 804(II)(B)(3) (noting that "the fundamental reason for nonstatutory double patenting – to prevent unjustified timewise extension of patent rights – is itself enforceable no matter how the extension is brought about"). Thus, because claims 1, 2, 10, and 11 of the '992 Patent constitute an unjustified or improper timewise extension of the right to exclude granted by the '489 Patent, claims 1, 2, 10 and 11 of the '992 Patent are unpatentable for obviousness-type double patenting.

2. Dependent Claims 3, 4, 12 and 13 are Unpatentable For Double Patenting Over the '489 Patent

As explained in Section II.A. above, claims 3, 4, 12, and 13 of the '992 Patent all encompass a protein that "comprises amino acids 27-457 of SEQ ID NO: 4." Requester incorporates the explanations provided above for claims 1 and 10 in Section VI.F.1. above.

Claim 25 of the '489 Patent recites: "The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist comprises glycosylated Asn residues corresponding to Asn

residues at positions 62, 94, 149, 222, and 308 of SEQ ID NO:4." Claim 25 encompasses and teaches, or at least strongly suggests, the use of the fusion protein of SEQ ID NO: 4 (*e.g.*, the fusion protein comprising amino acids 27-457 of SEQ ID NO: 4), which is the subject matter claimed in claims 4 and 13 of the '992 Patent, and encompassed by claims 3 and 12 of the '992 Patent.

Therefore, because claims 3, 4, 12 and 13 are anticipated by, or obvious variants of, the claims of the '489 Patent, and based on the equitable reason of preventing unjustified or improper timewise extension of the "right to exclude," claims 3, 4, 12, and 13 are unpatentable for obviousness-type double patenting.

3. Dependent Claims 5-9 and 14-18 are Unpatentable For Double Patenting Over the '489 Patent

As shown in Appendix C, the elements of each of the remaining dependent claims of the '992 Patent (claims 5-9 and 14-18) are also rendered obvious by the claims of the '489 Patent. Claims 5 and 14 recite that the VEGF antagonist is a dimer, which is recited in claim 23 of the '489 patent. Claims 6-9 and 15-18 of the '992 Patent recite the use of certain components of the formulations described in Examples 3 and 4 of the Common Specification, which are anticipated or rendered obvious by the claims of the '489 Patent as discussed in Section VI.F.1. above. For these reasons, and based on the equitable reason of preventing unjustified or improper timewise extension of the "right to exclude," dependent claims 5-9 and 14-18 are unpatentable for obviousness-type double patenting.

VII. NOTIFICATION OF PATENTEE

The signature below indicates that a true and correct copy of this request and all accompanying papers have been served in accordance with 37 C.F.R. § 1.510 on the Patent Owner at the correspondence address in the patent file, as provided for in 37 C.F.R. § 1.33(c):

REGENERON - BOZICEVIC, FIELD & FRANCIS LLP

201 Redwood Shores Parkway, Suite 200

Redwood City, CA 94065

VIII. CONCLUSION

As discussed above, Requestor has explained how each of the OTDP Reference Patents, either alone or in combination with Papadopoulos and/or the Exemplary Vial Pubs., presents a new, non-cumulative technological teaching that a reasonable examiner would consider to be important in determining whether or not claims 1-18 of the '992 Patent are patentable, and thus raises a substantial new question of patentability. As set forth above and in the claim charts in Appendices A through C, the OTDP Reference Patents cited herein render claims 1-18 unpatentable for nonstatutory obviousness-type double patenting. Accordingly, it is respectfully requested that the Office grant this Request for *ex parte* Reexamination of the '992 Patent, and, after further examination in view of the OTDP Reference Patents and the preceding discussion, reject and cancel claims 1-18 of the '992 Patent.

As noted above, Requester certifies that a true and correct copy of this Request for *ex parte* Reexamination, together with the references relied upon, was served on the patent owner.

Dated: February 11, 2020

Respectfully submitted,

By /Christopher J. Maier/
Christopher J. Maier
Attorney for Requester
Registration No. 53,255
MAIER & MAIER, PLLC

APPENDIX A – '594 PATENT CLAIM CHART

'992 Patent	'594 Patent, Claim 5, which depends from claims 4, 3, 2, and 1.
Claim 1	
A vial [or formulation] comprising: a vascular endothelial growth factor (VEGF) antagonist,	'594 Patent, claim 1: "A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic **formulation of a vascular endothelial growth factor (VEGF) trap**…" It was known to store VEGF antagonist protein formulations in a vial. *See, e.g.*, Exemplary Vial Pubs. (Ex. 9, 47:14-18; Ex. 10, 25:20-27).
an organic co-solvent	'594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, **0.03% polysorbate 20**, 5% sucrose, at pH 6.2-6.4."
a buffer	'594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, **10 mM phosphate**, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4."
a stabilizing agent	'594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, **5% sucrose**, at pH 6.2-6.4."
wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary	'594 Patent, claim 1: "… a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an

(CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and	immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component" '594 Patent, claim 4: "wherein the VEGF trap consists of amino acids 27-457 of **SEQ ID NO:4**." Papadopoulos (Ex. 7, 26:14-17) discloses that Regeneron's VEGF trap molecules, including VEGFR1R2-FcΔC1(a) (aflibercept), **SEQ ID NO:4**, were produced in **CHO cells**.
wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography.	'594 Patent, claim 3: "The pre-filled syringe according to claim 2, wherein **the VEGF trap is stable for at least 4 months**." To the extent that this intended result is given patentable weight, Examples 3 and 4 of the Common Specification evidence the inherent stability results for the formulation of claim 5 of the '594 Patent. *See, e.g.*,'992 Patent, 8:62-67, Table 3 (Example 3: "A liquid formulation containing 40 mg/ml VEGF trap (**SEQ ID NO:4**), 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, and pH 6.3, was stored at 5°C… in 3 ml glass vials and samples tested at 0.5, 1, 2, 3, and 4 months" and showed that the formulation has 99.2% of the VEGF trap in native conformation at two months), '992 Patent, 9:1-9:54, Table 4 (Example 4: "A liquid formulation containing 40 mg/ml VEGF trap (**SEQ ID NO:4**), 10 mM phosphate, 40 mM. NaCl, 0.03% polysorbate 20, 5% sucrose, and pH 6.3, was stored at 5°C. in 1 ml prefilled luerglass syringe with 4023/50 FLUROTEC™ coated (elastomer coated) plunger and samples tested at 0.5. 1, 2, 3, and 4 months" and showed that the formulation has 99.1% of the VEGF trap in native conformation at two months).

Claims 2 and 11	
The vial [or formulation] of claim 1, wherein about 99% or more of the weight of the fusion protein is in native conformation.	See claim 1
Claims 3 and 12	
The vial [or formulation] of claim 1, wherein the first VEGF receptor is human Fltl and the second VEGF receptor is selected from the group consisting of human Flkl and the human Flt4.	See claim 1 '594 Patent, claim 2: "The pre-filled syringe of claim 1, wherein the first VEGF receptor is Flt1, and the second VEGF receptor is Flk1 or Flt4."
Claims 4 and 13	
The vial [or formulation] of claim 3, wherein the fusion protein comprises amino acids 27-457 of SEQ ID NO:4.	See claim 1 '594 Patent, claim 4: "The pre-filled syringe according to claim 3, wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4."
Claims 5 and 14	
The vial [or formulation] of claim 4, wherein the VEGF antagonist is a dimer of the fusion protein.	See Claims 4 and 13 above. The '594 Patent admits that the protein of SEQ ID NO: 4 forms dimers.'594 Patent, 6:7-8 ("Preferably, the VEGF antagonist is a dimer composed of two fusion proteins of SEQ ID NO:4.") Papadopolous discloses that the VEGF trap molecules form dimers. (Ex. 7, 12:10, 70:23-24) A POSA also would understand that the VEGF trap consisting of amino acids 27-457 of SEQ ID NO:4 contains the Fc region of a human IgG molecule, and therefore forms dimers.

Claims 6 and 15	
The vial [or formulation] of claim 5, wherein the organic co-solvent is selected for the group consisting of polysorbate 20, polysorbate 90, polyethylene glycol (PEG), PEG3350, and propylene glycol.	'594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% **polysorbate 20**, 5% sucrose, at pH 6.2-6.4."
Claims 7 and 16	
The vial [or formulation] of claim 6, wherein the stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	'594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% **sucrose**, at pH 6.2-6.4."
Claims 8 and 17	
The vial [or formulation] of claim 1, wherein the organic co-solvent is polysorbate 20 and the stabilizing agent is sucrose.	See claim 1 '594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% **polysorbate 20**, 5% **sucrose**, at pH 6.2-6.4."
Claims 9 and 18	
The vial [or formulation] of claim 1, wherein the organic co-solvent is polysorbate 20, the buffer is phosphate, and the stabilizing agent is sucrose.	See claim 1 '594 Patent, claim 5: "The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM **phosphate**, 40 mM NaCl, 0.03% **polysorbate 20**, 5% **sucrose**, at pH 6.2-6.4."

APPENDIX B – '261 PATENT CLAIM CHART

'992 Patent	'261 Patent, Claim 5, which depends from claims 4, 3, 2, and 1.
Claim 1	
A vial [or formulation] comprising: a vascular endothelial growth factor (VEGF) antagonist,	'261 Patent, claim 1: "An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising…" It was known to store VEGF antagonist protein formulations in a vial. *See, e.g.*, Exemplary Vial Pubs. (Ex. 9, 47:14-18; Ex. 10, 25:20-27.)
an organic co-solvent	'261 Patent, claim 3: "The ophthalmic formulation of claim 2, comprising about 1-100 mg/ml of the VEGF antagonist, 10mM sodium phosphate buffer, 40mM NaCL, **0.03% polysorbate**, and 5% sucrose, pH about 6.2-6.3."
a buffer	'261 Patent, claim 3: "The ophthalmic formulation of claim 2, comprising about 1-100 mg/ml of the VEGF antagonist, **10mM sodium phosphate buffer**, 40mM NaCL, 0.03% polysorbate, and 5% sucrose, pH about 6.2-6.3."
a stabilizing agent	'261 Patent, claim 3: "The ophthalmic formulation of claim 2, comprising about 1-100 mg/ml of the VEGF antagonist, 10mM sodium phosphate buffer, 40mM NaCL, 0.03% polysorbate, and **5% sucrose**, pH about 6.2-6.3."
wherein the VEGF antagonist is a fusion protein produced in a	'261 Patent, claim 1:

Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and	a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of **SEQ ID NO:4**;" Papadopoulos (Ex. 7, 26:14-17) discloses that VEGF antagonists, including VEGFR1R2-FcΔC1(a) (aflibercept), **SEQ ID NO: 4,** were **produced in CHO cells**.
wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography.	To the extent that this intended result is given patentable weight, Examples 3 and 4 of the Common Specification evidence the inherent stability results for the formulation of claim 5 of the '261 Patent, comprising 40 mg/ml of the VEGF antagonist. *See, e.g.* '992 Patent, 8:62-9:54, Tables 3-4. '261 Patent, claim 5: "The ophthalmic formulation of claim 4 [dependent from claim 3], comprising VEGF antagonist at a concentration selected from the group consisting of 10 mg/ml, 20 mg/ml, **40 mg/ml**, and 80 mg/ml." Example 3: "A liquid formulation containing 40 mg/ml VEGF trap (**SEQ ID NO:4**), 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, and pH 6.3, was stored at 5°C. in 3 ml glass vials and samples tested at 0.5, 1, 2, 3, and 4 months" and showed that the formulation has 99.2% of the VEGF trap in native conformation at two months. '261 Patent, 8:60-67, Table 3; *see also* '261 Patent, 9:21-30 (Example 4), Table 4.
Claims 2 and 11	
The vial [or formulation] of claim 1, wherein about 99% or more of the weight of the fusion protein is in native conformation.	See claim 1 above.

Claims 3 and 12	
The vial [or formulation] of claim 1 wherein the first VEGF receptor is human Fltl and the second VEGF receptor is selected from the group consisting of human Flkl and the human Flt4.	'261 Patent, claim 1: "a VEGF antagonist comprising … the amino acid sequence of **SEQ ID NO:4**," which is a species of the "protein compris[ing] amino acids 27-457 of **SEQ ID NO:4**"
Claims 4 and 13	
The vial [or formulation] of claim 3, wherein the fusion protein comprises amino acids 27-457 of SEQ ID NO:4.	'261 Patent, claim 1: "a VEGF antagonist comprising … the amino acid sequence of **SEQ ID NO:4**," which is a species of the "protein compris[ing] amino acids 27-457 of **SEQ ID NO:4**"
Claims 5 and 14	
The vial [or formulation] of claim 4, wherein the VEGF antagonist is a dimer of the fusion protein.	See claims 4 and 13 above. The '261 Patent admits that the protein of **SEQ ID NO: 4** forms dimers. '261 Patent, 6:7-8 ("Preferably, the VEGF antagonist is a dimer composed of two fusion proteins of SEQ ID NO:4."). Papadopolous discloses that the VEGF trap molecules form dimers. (Ex. 7, 12:10, 70:23-24). A POSA also would understand that the VEGF trap "consisting of amino acids 27-457 of **SEQ ID NO:4**" contains the Fc region of a human IgG molecule, and therefore forms dimers.
Claims 6 and 15	
The vial [or formulation] of claim 5, wherein the organic co-solvent is selected for the group consisting of polysorbate 20, polysorbate 90,	'261 Patent, claim 1: "b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol;"

polyethylene glycol (PEG), PEG3350, and propylene glycol.	'261 Patent, claim 3: "The ophthalmic formulation of claim 2, comprising about 1-100 mg/ml of the VEGF antagonist, 10mM sodium phosphate buffer, 40mM NaCL, **0.03% polysorbate**, and 5% sucrose, pH about 6.2-6.3." The '261 specification defines polysorbate as including "for example, **polysorbate 20** or polysorbate 80." ''261 pat. 2:10-12.
Claims 7 and 16	
The vial [or formulation] of claim 6, wherein the stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	'261 Patent, claim 3: "… 10 mM sodium phosphate buffer, 40 mM NaCl, 0.03% polysorbate, and 5% **sucrose**, pH about 6.2-6.3."
Claims 8 and 17	
The vial [or formulation] of claim 1, wherein the organic co-solvent is polysorbate 20 and the stabilizing agent is sucrose.	See claims 6 and 15 above. '261 Patent, claim 3: "… 10 mM sodium phosphate buffer, 40 mM NaCl, **0.03% polysorbate, and 5% sucrose**, pH about 6.2-6.3."
Claims 9 and 18	
The vial [or formulation] of claim 1, wherein the organic co-solvent is polysorbate 20, the buffer is phosphate, and the stabilizing agent is sucrose.	See claims 6 and 15 above. '261 Patent, claim 3: "… **10 mM sodium phosphate buffer**, 40 mM NaCl, **0.03% polysorbate, and 5% sucrose**, pH about 6.2-6.3."

APPENDIX C – '489 PATENT CLAIM CHART

'992 Patent	'489 Patent, Claims 1, 4, 5, 7, 15, 18, and 24
Claim 1	
A vial [or formulation] comprising: a vascular endothelial growth factor (VEGF) antagonist,	'489 Patent, claim 1: "A **formulation** comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist." '489 Patent, claim 26: "a **vial** containing a formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist."
an organic co-solvent	'489 Patent, claim 1: "(c) 0.01-5% of an organic co-solvent"
a buffer, and	'489 Patent, claim 1: "(b) 5-40 mM of a buffer;"
a stabilizing agent	'489 Patent, claim 1: "(d) a stabilizer or 30-150 mM of a tonicity agent"
wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component,	'489 Patent, claim 1: "wherein … the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component." '489 Patent, claim 24: "The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell."
wherein at least 98% of the VEGF antagonist is present	To the extent that this intended result is given patentable weight, Examples 3-4 of the Common Specification evidence the inherent

in native conformation following storage at 5ºC for two months as measured by size exclusion chromatography.	stability results for the formulation taught by the combination of claims 1, 5, 7, 9, 15, 18, and 21 (**99.2% and 99.1% of the VEGF antagonist in native conformation at two months as measured by SEC**). '489 Patent, claim 5: "The formulation of claim 4, where the VEGF-specific fusion protein antagonist is present at a concentration of about 10, about 20, about 30, **about 40**, about 50, about 60, about 70, or about 80 **mg/ml**." '489 Patent, claim 7: "The formulation of claim 6, wherein the buffer comprises **sodium phosphate** present at a concentration of **10 mM**." '489 Patent, claim 9: "The formulation of claim 1, wherein the pH is about **pH 6.2-6.3**." '489 Patent, claim 15: "The formulation of claim 14, wherein the organic co-solvent is polysorbate 80 or **polysorbate 20** present at a concentration of 0.015%, **0.03%** or 0.1%." '489 Patent, claim 18: "The formulation of claim 17, wherein the **sodium chloride** is present at a concentration of 20 mM, **40 mM**, 50 mM, 100 mM, or 135 mM." '489 Patent, claim 21: "The formulation of claim 20, wherein the **sucrose is present at a concentration of 5%**." '489 Patent, claim 25: "The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist comprises glycosylated Asn residues corresponding to Asn residues at positions 62, 94, 149, 222, and 308 of **SEQ ID NO:4**."

Claims 2 and 11	
The vial [or formulation] of claim 1, wherein about 99% or more of the weight of the fusion protein is in native conformation.	See claim 1
Claims 3 and 12	
The vial [or formulation] of claim 1, wherein the first VEGF receptor is human Fltl and the second VEGF receptor is selected from the group consisting of human Flkl and the human Flt4.	See claim 1 '489 Patent, claim 25: "The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist comprises glycosylated Asn residues corresponding to Asn residues at positions 62, 94, 149, 222, and 308 of **SEQ ID NO:4**."
Claims 4 and 13	
The vial [or formulation] of claim 3, wherein the fusion protein comprises amino acids 27-457 of SEQ ID NO:4.	See claims 1, 3 and 12. '489 Patent, claim 25: "The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist comprises glycosylated Asn residues corresponding to Asn residues at positions 62, 94, 149, 222, and 308 of **SEQ ID NO:4**."
Claims 5 and 14	
The vial [or formulation] of claim 4, wherein the VEGF antagonist is a dimer of the fusion protein.	'489 Patent, claim 23: "The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist **is a dimer**."
Claims 6 and 15	
The vial [or formulation] of claim 5, wherein the organic co-solvent is	'489 Patent, claim 15:

selected for the group consisting of **polysorbate 20**, polysorbate 90, polyethylene glycol (PEG), PEG3350, and propylene glycol.	"The formulation of claim 14, wherein the organic co-solvent is polysorbate 80 or **polysorbate 20** present at a concentration of 0.015%, 0.03% or 0.1%."
Claims 7 and 16	
The vial [or formulation] of claim 6, wherein the stabilizing agent is selected from the group consisting of **sucrose**, sorbitol, glycerol, trehalose, and mannitol.	See claim 1 '489 Patent, claim 20: "The formulation of claim 19, wherein the stabilizer comprises **sucrose**."
Claims 8 and 17	
The vial [or formulation] of claim 1, wherein the organic co-solvent is polysorbate 20 and the stabilizing agent is sucrose.	See claim 1 '489 Patent, claim 15: "The formulation of claim 14, wherein the organic co-solvent is polysorbate 80 or **polysorbate 20** present at a concentration of 0.015%, 0.03% or 0.1%." '489 Patent, claim 20: ". . . the stabilizer comprises **sucrose**"

Claims 9 and 18	
The vial [or formulation] of claim 1, wherein the organic co-solvent is polysorbate 20, the buffer is phosphate, and the stabilizing agent is sucrose.	See claim 1 '489 Patent, claim 15: "The formulation of claim 14, wherein the organic co-solvent is polysorbate 80 or **polysorbate 20** present at a concentration of 0.015%, 0.03% or 0.1%." '489 Patent, claim 6: ". . . the **buffer comprises a phosphate** buffer" '489 Patent, claim 7: ". . . the **buffer comprises sodium phosphate** present at a concentration of 10 mM" '489 Patent, claim 20: ". . . the stabilizer comprises **sucrose**"

APPENDIX D – ALIGNMENT OF SEQ ID NO: 4 OF '992 PATENT AND SEQ ID NO: 11 OF VITTI (EXHIBIT 8)

```
100.0% identity in 458 residues overlap; Score: 2437.0; Gap frequency: 0.0%

SEQ4of992       1 MVSYWDTGVLLCALLSCLLLTGSSSGSDTGRPFVEMYSEIPEIIHMTEGRELVIPCRVTS
SEQ11           1 MVSYWDTGVLLCALLSCLLLTGSSSGSDTGRPFVEMYSEIPEIIHMTEGRELVIPCRVTS
                  ************************************************************

SEQ4of992      61 PNITVTLKKFPLDTLIPDGKRIIWDSRKGFIISNATYKEIGLLTCEATVNGHLYKTNYLT
SEQ11          61 PNITVTLKKFPLDTLIPDGKRIIWDSRKGFIISNATYKEIGLLTCEATVNGHLYKTNYLT
                  ************************************************************

SEQ4of992     121 HRQTNTIIDVVLSPSHGIELSVGEKLVLNCTARTELNVGIDFNWEYPSSKHQHKKLVNRD
SEQ11         121 HRQTNTIIDVVLSPSHGIELSVGEKLVLNCTARTELNVGIDFNWEYPSSKHQHKKLVNRD
                  ************************************************************

SEQ4of992     181 LKTQSGSEMKKFLSTLTIDGVTRSDQGLYTCAASSGLMTKKNSTFVRVHEKDKTHTCPPC
SEQ11         181 LKTQSGSEMKKFLSTLTIDGVTRSDQGLYTCAASSGLMTKKNSTFVRVHEKDKTHTCPPC
                  ************************************************************

SEQ4of992     241 PAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKT
SEQ11         241 PAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKT
                  ************************************************************

SEQ4of992     301 KPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVY
SEQ11         301 KPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVY
                  ************************************************************

SEQ4of992     361 TLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSK
SEQ11         361 TLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSK
                  ************************************************************

SEQ4of992     421 LTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
SEQ11         421 LTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
                  ************************************
```

APPENDIX E – ALIGNMENT OF SEQ ID NO: 4 OF '992 PATENT AND SEQUENCE IN FIG. 24A-24C OF PAPADOPOULOS (WO'319, EXHIBIT 7)

100.0% identity in 458 residues overlap; Score: 2437.0; Gap frequency: 0.0%

```
WO319_FIG_24   1  MVSYWDTGVLLCALLSCLLLTGSSSGSDTGRPFVEMYSEIPEIIHMTEGRELVIPCRVTS
SeqID4-992     1  MVSYWDTGVLLCALLSCLLLTGSSSGSDTGRPFVEMYSEIPEIIHMTEGRELVIPCRVTS

WO319_FIG_24  61 PNITVTLKKFPLDTLIPDGKRIIWDSRKGFIISNATYKEIGLLTCEATVNGHLYKTNYLT
SeqID4-992    61 PNITVTLKKFPLDTLIPDGKRIIWDSRKGFIISNATYKEIGLLTCEATVNGHLYKTNYLT

WO319_FIG_24 121 HRQTNTIIDVVLSPSHGIELSVGEKLVLNCTARTELNVGIDFNWEYPSSKHQHKKLVNRD
SeqID4-992   121 HRQTNTIIDVVLSPSHGIELSVGEKLVLNCTARTELNVGIDFNWEYPSSKHQHKKLVNRD

WO319_FIG_24 181 LKTQSGSEMKKFLSTLTIDGVTRSDQGLYTCAASSGLMTKKNSTFVRVHEKDKTHTCPPC
SeqID4-992   181 LKTQSGSEMKKFLSTLTIDGVTRSDQGLYTCAASSGLMTKKNSTFVRVHEKDKTHTCPPC

WO319_FIG_24 241 PAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKT
SeqID4-992   241 PAPELLGGPSVFLFPPKPKDTLMISRTPEVTCVVVDVSHEDPEVKFNWYVDGVEVHNAKT

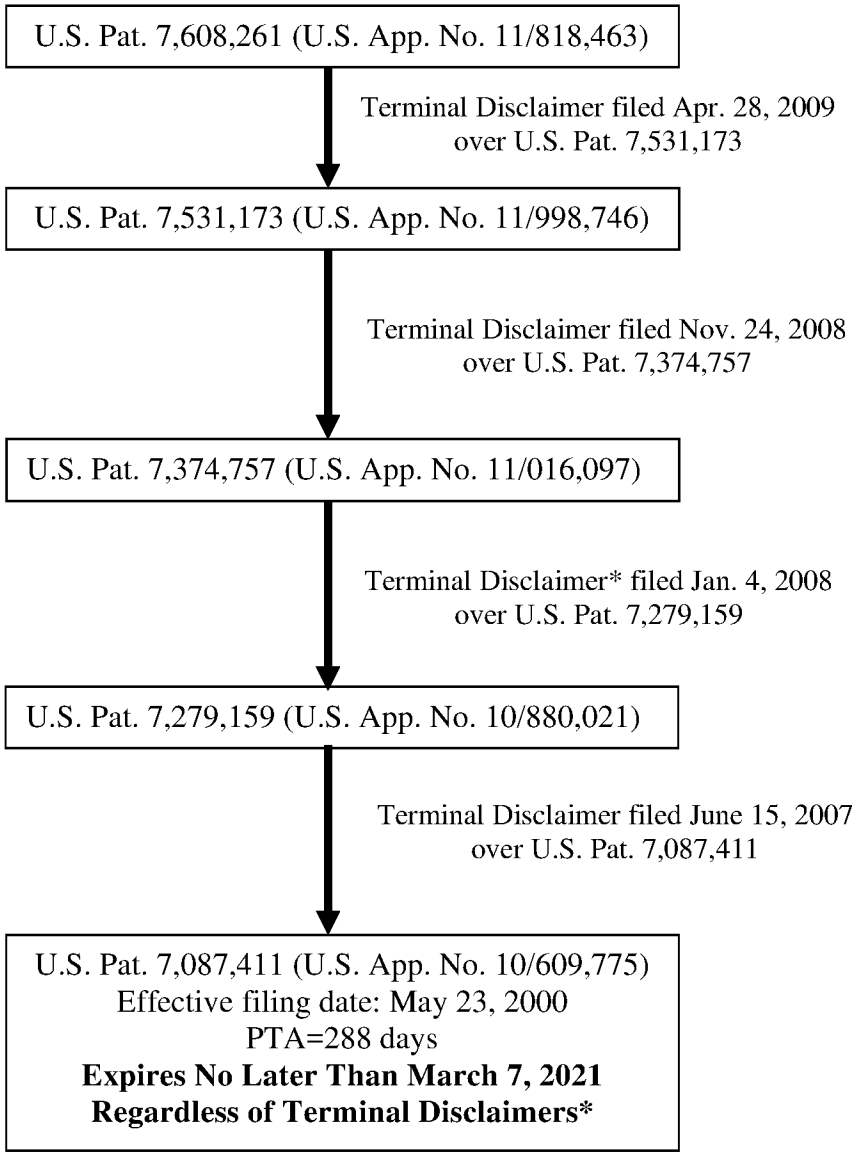
WO319_FIG_24 301 KPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVY
SeqID4-992   301 KPREEQYNSTYRVVSVLTVLHQDWLNGKEYKCKVSNKALPAPIEKTISKAKGQPREPQVY

WO319_FIG_24 361 TLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSK
SeqID4-992   361 TLPPSRDELTKNQVSLTCLVKGFYPSDIAVEWESNGQPENNYKTTPPVLDSDGSFFLYSK

WO319_FIG_24 421 LTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
SeqID4-992   421 LTVDKSRWQQGNVFSCSVMHEALHNHYTQKSLSLSPGK
```

APPENDIX F – TERMINAL DISCLAIMER CHART

As shown below, the '261 Patent expires no later than March 7, 2021 due to its terminal disclaimer over U.S. Pat. 7,531,173. Each of the '594 and '489 Patents carries a terminal disclaimer over at the '261 Patent.



* The '757 and '411 Patents carry additional terminal disclaimers not analyzed here.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
90/014,448	02/11/2020	10464992	13850001REEX	5306

96387 7590 04/01/2020

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

EXAMINER
TURNER, SHARON L

ART UNIT	PAPER NUMBER
3991	

MAIL DATE	DELIVERY MODE
04/01/2020	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Commissioner for Patents
United States Patent and Trademark Office
P.O. Box 1450
Alexandria, VA 22313-1450
www.uspto.gov

DO NOT USE IN PALM PRINTER

(THIRD PARTY REQUESTER'S CORRESPONDENCE ADDRESS)

MAIER & MAIER, PLLC
345 SOUTH PATRICK STREET
ALEXANDRIA, VA 22314

EX PARTE REEXAMINATION COMMUNICATION TRANSMITTAL FORM

REEXAMINATION CONTROL NO. *90/014,448* .

PATENT UNDER REEXAMINATION *10464992* .

ART UNIT *3991* .

Enclosed is a copy of the latest communication from the United States Patent and Trademark Office in the above identified *ex parte* reexamination proceeding (37 CFR 1.550(f)).

Where this copy is supplied after the reply by requester, 37 CFR 1.535, or the time for filing a reply has passed, no submission on behalf of the *ex parte* reexamination requester will be acknowledged or considered (37 CFR 1.550(g)).

Order Granting Request For Ex Parte Reexamination	Control No.	Patent Under Reexamination	
	90/014,448	10464992	
	Examiner	Art Unit	AIA (FITF) Status
	SHARON L TURNER	3991	No

--The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

The request for *ex parte* reexamination filed 02/11/2020 has been considered and a determination has been made. An identification of the claims, the references relied upon, and the rationale supporting the determination are attached.

Attachments: a)☐ PTO-892, b)☑ PTO/SB/08, c)☐ Other: ____

1. ☑ The request for *ex parte* reexamination is GRANTED.

RESPONSE TIMES ARE SET AS FOLLOWS:

For Patent Owner's Statement (Optional): TWO MONTHS from the mailing date of this communication (37 CFR 1.530 (b)). **EXTENSIONS OF TIME ARE GOVERNED BY 37 CFR 1.550(c).**

For Requester's Reply (optional): TWO MONTHS from the **date of service** of any timely filed Patent Owner's Statement (37 CFR 1.535). **NO EXTENSION OF THIS TIME PERIOD IS PERMITTED.** If Patent Owner does not file a timely statement under 37 CFR 1.530(b), then no reply by requester is permitted.

cc:Requester (if third party requester)

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Ex Parte Reexamination

2. A Request for *Ex Parte* Reexamination (90/014,448, the '448 proceeding), of claims 1-18 (all) of U.S. Patent No. 10,464,992 ('992) was filed 2/11/2020 by third party requester.

Scope of Reexamination

3. The reexamination proceeding provides a complete reexamination of the patent claims on the basis of prior art patents and printed publications (37 CFR 1.552, MPEP 2258).

Decision on Reexamination Request

4. A substantial new question of patentability (SNQ) affecting claims 1-18 of the '992 patent is raised by the request for reexamination.

Substantial New Question of Patentability

5. The presence or absence of "a substantial new question of patentability" (SNQ) determines whether or not reexamination is ordered.

For a "substantial new question of patentability" to be present, it is only necessary that:

A) the prior art patents and/or printed publications raise a substantial new question of patentability for at least one claim, such that a reasonable examiner would consider the teaching to be important in deciding whether or not the claim was patentable. A SNQ may be based on newly cited art or even solely on old art where the old art is being presented/viewed in a new light, or in a different way, as compared with its use in earlier concluded examination(s), in view of a material new argument or interpretation presented in the request. (MPEP 2242).

B) the same question of patentability as to the claim has not been decided by the Office in a previous examination or pending reexamination of the patent or in a final holding of invalidity by the Federal Courts, after appeals, or time for such have expired.

The '992 Patent and Claims

6. Instant 90/014,448, filed 02/11/2020 is a re-examination of 16/159,269, filed 10/12/2018, now U.S. Patent 10,464,992.

16/159,269 is a continuation of 15/879,294, filed 01/24/2018, now U.S. Patent 10,400,025.

15/879,294 is a continuation of 15/095,606, filed 04/11/2016, now U.S. Patent 9,914,763.

15/095,606 is a continuation of 14/330,096, filed 07/14/2014, now U.S. Patent 9,340,594.

14/330,096 is a continuation of 13/914,996, filed 06/11/2013, now U.S. Patent 8,802,107.

13/914,996 is a continuation of 13/329,770, filed 12/19/2011, now U.S. Patent 8,481,046.

13/329,770 is a continuation of 12/833,417, filed 07/09/2010, now U.S. Patent 8,092,803.

12/833,417 is a continuation of 12/560,885, filed 09/16/2009, now U.S. Patent 7,807,164.

12/560,885 is a division of 11/818,463, filed 06/14/2007, now U.S. Patent 7,608,261.

11/818,463 Claims Priority from Provisional Application 60/814,484, filed 06/16/2006.

The '992 patent consists of claims 1-18. Claims 1 and 10 are independent as appended below. Claims 2-9 and 11-18 depend directly or indirectly therefrom.

1. *A vial comprising*: a vascular endothelial growth factor (VEGF) antagonist, an organic co-solvent, a buffer, and a stabilizing agent, wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5.degree. C. for two months as measured by size exclusion chromatography.

10. *A formulation comprising*: a vascular endothelial growth factor (VEGF) antagonist, an organic co-solvent, a buffer, and a stabilizing agent, wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component; and wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5.degree. C. for two months as measured by size exclusion chromatography.

Claim Interpretation

7. In making the determination of whether to order reexamination, the Office will determine the proper meaning of the patent claims by giving the claims their broadest reasonable interpretation consistent with the specification (see In re Yamamoto, 740 F.2d 1569 (Fed. Cir. 1984)). See MPEP 2240, 2258.

Documents Cited as Raising an SNQ

U.S. Patent No. 7,608,261 B2, issued on Oct. 27, 2009, to Furfine et al.

U.S. Patent No. 9,340,594 B2, issued on May 17, 2016, to Furfine et al.

U.S. Patent No. 9,580,489 B2, issued on Feb. 28, 2017, to Furfine et al.

Papadopoulos et al., International Patent Application Publication No. WO 00/75319 Al, published on Dec. 14, 2000 (Papadopoulos).

Baca et al., International Patent Application Publication No. WO 98/45331 A2, published on Oct. 15, 1998 (Baca).

Cunningham et al., International Patent Application Publication No. WO 00/63380 Al, published on Oct. 26, 2000 (Cunningham).

It is noted that the Request at p. 7, lines 1-4 notes that the Baca and Cunningham references are referred to as the "Exemplary Vial Pubs." While this terminology is utilized within the request, the instant proceeding will refer to the cited teachings within the references individually.

Discussion of the Documents Cited as Raising an SNQ

8. The request proposes that a SNQ as to claims 1-18 is raised by claims 1-5 of the '594 patent in view of Papadopoulos, Baca and Cunningham (SNQ1 Request pp. 7, 13 and 22-36).

Claims 1-12 of the '594 patent were previously cited alone within the prosecution history within an obviousness-type double patenting rejection (see 16/159,269 Office Action 4/2/19). The rejection was overcome by amendments introducing elements relating to the percentage of VEGF antagonist which maintains conformation following storage over time (see 16/159,269

Response 7/22/19 and Notice of Allowance 8/21/19). Requester newly cites the teachings of claims 1-5 of the '594 patent with the teachings of Papadopoulos, Baca and Cunningham.

'594 claims 1-5 teach as follows:

1. A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent.
2. The pre-filled syringe of claim 1, wherein the first VEGF receptor is Flt1, and the second VEGF receptor is Flk1 or Flt4.
3. The pre-filled syringe according to claim 2, wherein the VEGF trap is stable for at least 4 months.
4. The pre-filled syringe according to claim 3, wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4.
5. The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCI, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4.

Papadopoulos is newly cited and teaches modified chimeric polypeptides with improved pharmacokinetic properties, Title, Abstract, 28:2-29:6. In particular, the polypeptides are VEGF antagonists, including modified Flt1 receptors termed VEGFR1R2-FcΔC1(a), dimers, expression vectors and host cells for expression including CHO cells (12:10, 12:19-26, 22:1-2). Peptide mapping and glycosylation analysis shows peptides arrangements including in which the first two cysteines in the Fc region (211 and 214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain (25:23-25). The reference also teaches the pharmacokinetics of Flt1(1-3)-Fc (A40), Flt1D2.Flk1D3.FcΔC1(a) and VEGFR1R2- FcΔC1(a) (26:12-25). CHO cell culture production, harvest and purification of Flt1D2.Flk1D3.FcΔC1(a) is taught in Example 21-22, particularly (67:25-68:5, 70:23-24). CHO transiently expressed Flt1 D2.Flk1D3.FcΔC1(a), CHO stably expressed Flt1D2.Flk1D3.FcΔC1 (a), and CHO transiently expressed VEGFR1R2-FcΔC1(a) is taught in Example 29, particularly (82:12-13), and corresponding sequences are taught in Fig. 24 A-C. These teachings are new non-cumulative technological features not previously discussed within the prosecution history and are relevant to VEGF antagonist compositions as recited within the '992 patent.

Baca is newly cited and teaches anti-VEGF antibodies and particularly containers and labels including syringes with compositions effective for treatment (Title, Abstract, 47:13-18). These teachings are new non-cumulative technological features not previously discussed within the prosecution history and are relevant to VEGF antagonist compositions as recited within the '992 patent.

Cunningham is newly cited and teaches VEGF variants and particularly containers and labels including syringes with compositions useful for diagnosing or treating conditions (Title, Abstract, 25:20-27). These teachings are new non-cumulative technological features not previously discussed within the prosecution history and are relevant to VEGF antagonist compositions as recited within the '992 patent.

The new non-cumulative technological features of Papadopolous, Baca and Cunningham present the teachings of claims 1-5 of the '594 patent in a new light and different way than previously discussed within the prosecution history. The new teachings are relevant to the vial compositions and formulations of claims 1-18 of the '992 patent and have not been previously addressed together within the prosecution history. There is a substantial likelihood that a reasonable examiner would consider these additional teachings together important in deciding whether the claims are patentable, and the same question of patentability has not been previously decided. Accordingly, the '594 patent with Papadopoulos, Baca and Cunningham raises a SNQ as to claims 1-18 of the '992 patent.

9. The request proposes that a SNQ as to claims 1-18 is raised by claims 1-5 of the '261 patent in view of Papadopoulos, Baca and Cunningham (SNQ2 Request pp. 7, 13 and 36-45).

Claims 1-15 and 17 of the '261 patent were previously cited alone within the prosecution history within an obviousness-type double patenting rejection (see 16/159,269 Office Action 4/2/19). The rejection was overcome by amendments introducing elements relating to the percentage of VEGF antagonist which maintains conformation following storage over time (see 16/159,269 Response 7/22/19 and Notice of Allowance 8/21/19). Requester newly cites the teachings of claims 1-5 of the '261 patent with the teachings of Papadopoulos, Baca and Cunningham.

'261 claims 1-5 teach as follows:

1. An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer.
2. The ophthalmic formulation of claim 1, further comprising 1-7.5% of a stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, or mannitol, pH between about 5.8-7.0.
3. The ophthalmic formulation of claim 2, comprising about 1-100 mg/ml of the VEGF antagonist, 10 mM sodium phosphate buffer, 40 mM NaCl, 0.03% polysorbate, and 5% sucrose, pH about 6.2-6.3.
4. The ophthalmic formulation of claim 3, comprising about 10-80 mg/ml of the VEGF antagonist.
5. The ophthalmic formulation of claim 4, comprising VEGF antagonist at a concentration selected from the group consisting of 10 mg/ml, 20 mg/ml, 40 mg/ml, and 80 mg/ml.

The new non-cumulative teachings of Papadopoulos, Baca and Cunningham are addressed above.

The new non-cumulative technological features of Papadopolous, Baca and Cunningham present the teachings of claims 1-5 of the '261 patent in a new light and different way than previously discussed within the prosecution history. The new teachings are relevant to the vial compositions and formulations of claims 1-18 of the '992 patent and have not been previously addressed together within the prosecution history. There is a substantial likelihood that a reasonable examiner would consider these additional teachings together important in deciding whether claims 1-18 were patentable, and the same question of patentability has not been

previously decided. Accordingly, the '261 patent with Papadopoulos, Baca and Cunningham raises a SNQ as to claims 1-18 of the '992 patent.

10. The request proposes that a SNQ as to claims 1-18 is raised by claims 1-29 of the '489 patent in view of Papadopoulos (SNQ3 Request pp. 13 and 45-53).

The '489 patent is newly cited and claims 1-29 teach as follows:

1. A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component.
2. The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist represents at least 95% of the total weight of protein in the composition.
3. The formulation of claim 2, wherein the VEGF-specific fusion protein antagonist represents at least 99% of the total weight of protein in the composition.
4. The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is present at a concentration of about 10 to about 80 mg/ml.
5. The formulation of claim 4, where the VEGF-specific fusion protein antagonist is present at a concentration of about 10, about 20, about 30, about 40, about 50, about 60, about 70, or about 80 mg/ml.
6. The formulation of claim 1, wherein the buffer comprises a phosphate buffer.
7. The formulation of claim 6, wherein the buffer comprises sodium phosphate present at a concentration of 10 mM.
8. The formulation of claim 1, wherein the pH of the composition is about pH 5.8-7.0.
9. The formulation of claim 1, wherein the pH is about pH 6.2-6.3.
10. The formulation of claim 1, wherein the pH is about pH 6.0.
11. The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol.
12. The formulation of claim 11, wherein the organic co-solvent is present at a concentration of 0.01-3%.
13. The formulation of claim 12, wherein the organic co-solvent is PEG 3350 or polypropylene glycol at a concentration of about 3%.
14. The formulation of claim 1, wherein the organic co-solvent is present at a concentration of 0.01-0.15%.
15. The formulation of claim 14, wherein the organic co-solvent is polysorbate 80 or polysorbate 20 present at a concentration of 0.015%, 0.03% or 0.1%.
16. The formulation of claim 1, wherein the tonicity agent comprises sodium chloride or potassium chloride.
17. The formulation of claim 16, wherein the tonicity agent comprises sodium chloride present at a concentration of 20-135 mM.
18. The formulation of claim 17, wherein the sodium chloride is present at a concentration of 20 mM, 40 mM, 50 mM, 100 mM, or 135 mM.
19. The formulation of claim 1, comprising a stabilizer comprising trehalose or sucrose.
20. The formulation of claim 19, wherein the stabilizer comprises sucrose.
21. The formulation of claim 20, wherein the sucrose is present at a concentration of 5%.
22. The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist does not comprise amino acids 1-26 of SEQ ID NO:4.
23. The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is a dimer.
24. The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell.

25. The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist comprises glycosylated Asn residues corresponding to Asn residues at positions 62, 94, 149, 222, and 308 of SEQ ID NO:4.
26. A vial containing a formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of a human VEGF receptor 2, and a multimerizing component.
27. The vial of claim 26, wherein the composition is stored under an inert gas, wherein the inert gas is nitrogen, helium or argon.
28. The vial of claim 27, wherein the vial is stored at 5.degree. C.
29. The vial of claim 28, wherein the VEGF-specific fusion protein antagonist does not comprise amino acids 1-26 of SEQ ID NO:4.

The new non-cumulative teachings of Papadopoulos are addressed above.

These new non-cumulative technological features of the '489 patent claims and Papadopolous are relevant to claims 1-18 of the '992 patent and have not previously been discussed together within the prosecution history. There is a substantial likelihood that a reasonable examiner would consider these new teachings important in deciding whether claims 1-18 were patentable, and the same question of patentability has not been previously decided. Accordingly, the '489 patent with Papadopoulos raises a SNQ as to claims 1-18 of the '992 patent.

Conclusion

11. A substantial new question of patentability (SNQ) affecting claims 1-18 of the '992 patent is raised by the request for reexamination. Accordingly, Ex Parte reexamination is granted.

Amendment in Reexamination Proceedings

12. Patent owner is notified that any proposed amendment to the specification and/or claims in this reexamination proceeding must comply with 37 CFR 1.530(d)-(j), must be formally presented pursuant to 37 CFR 1.52(a) and (b), and must contain any fees required by 37 CFR 1.20(c).

Waiver of Right to file Patent Owner Statement

13. In a reexamination proceeding, Patent Owner may waive the right under 37 C.F.R. 1.530 to file a Patent Owner Statement. The document needs to contain a statement that Patent Owner waives the right under 37 C.F.R. 1.530 to file a Patent Owner Statement and proof of service in the manner provided by 37 C.F.R. 1.248, if the request for reexamination was made by a third party requester, see 37 C.F.R 1.550(f).

Service of Papers

14. After the filing of a request for reexamination by a third party requester, any document filed by either the patent owner or the third party requester must be served on the other party (or parties where two or more third party requester proceedings are merged) in the reexamination proceeding in the manner provided by 37 CFR 1.248. See 37 CFR 1.550(f).

Extension of Time

15. Extensions of time under 37 CFR 1.136(a) will not be permitted in these proceedings because the provisions of 37 CFR 1.136 apply only to "an applicant" and not to parties in a reexamination proceeding. Additionally, 35 U.S.C. 305 requires that ex parte reexamination proceedings "will be conducted with special dispatch" (37 CFR 1.550(a)). Extensions of time in ex parte reexamination proceedings are provided for in 37 CFR 1.550(c).

Duty to Disclose

16. The patent owner and requester are reminded of the continuing responsibility under 37 CFR 1.565(a), to apprise the Office of any litigation activity, or other prior or concurrent proceeding, involving Patent No. 10,464,992 throughout the course of this reexamination proceeding. See MPEP §§ 2207, 2282 and 2286.

Future Correspondence

17. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Sharon Turner whose telephone number is 571-272-0894. The examiner can normally be reached on Monday through Thursday from 7:00 a.m. to 5:00 p.m. If the attempts to reach the examiner are unsuccessful, the examiner's supervisor, Tim Speer can be reached by dialing 313-446-4825. The official fax number for the organization where this application is assigned is 571-273-9900.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

All correspondence relating to this *ex parte* reexamination proceeding should be directed as follows:

By EFS web: https://efs.uspto.gov/efile/myportal/efs-registered

By U.S. Postal Service Mail to:

Mail Stop *Ex Parte* Reexam
ATTN: Central Reexamination Unit
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

By FAX to: (571) 273-9900
Central Reexamination Unit

By hand to: Customer Service Window
Randolph Building
401 Dulany St.
Alexandria, VA 22314

/Sharon Turner/
Patent Reexamination Specialist
Central Reexamination Unit 3991

Conferees:

/Bruce Campell/
Patent Reexamination Specialist
Central Reexamination Unit 3991

/TIMOTHY M SPEER/
Supervisory Patent Examiner, Art Unit 3991

Reexamination	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,448	10464992
	Certificate Date	Certificate Number

Requester Correspondence Address: ☐ Patent Owner ☑ Third Party
MAIER & MAIER, PLLC 345 SOUTH PATRICK STREET ALEXANDRIA, VA 22314

LITIGATION REVIEW ☑	ST (examiner initials)	03 March 2020 (date)
Case Name		Director Initials
None		

COPENDING OFFICE PROCEEDINGS	
TYPE OF PROCEEDING	NUMBER
None	

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	90/014,448	10464992
	Examiner	Art Unit
	SHARON L TURNER	3991

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
Litigation Search - None	03/08/2020	ST
Prosecution History 16/159,269	03/11/2020	ST

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

PTO/SB/08a (02-18)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(Not for submission under 37 CFR 1.99)

Application Number	16159269
Filing Date	2018-10-12
First Named Inventor	Eric FURFINE
Art Unit	
Examiner Name	
Attorney Docket Number	13850001REEX

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.L.T/

U.S.PATENTS Remove

Examiner Initial*	Cite No	Patent Number	Kind Code[1]	Issue Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear
	1	7,608,261	B2	2009-10-27	Furfine et al.	Throughout
	2	9,340,594	B2	2016-05-17	Regeneron Pharmaceuticals, Inc.	Throughout
	3	9,914,763	B2	2018-03-13	Regeneron Pharmaceuticals, Inc.	Throughout
	4	10,400,025	B2	2019-09-03	Regeneron Pharmaceuticals, Inc.	Throughout
	5	9,580,489	B2	2017-02-28	Regeneron Pharmaceuticals, Inc.	Throughout
	6	10,464,992	B2	2019-11-05	Regeneron Pharmaceuticals, Inc.	Throughout

If you wish to add additional U.S. Patent citation information please click the Add button. Add

U.S.PATENT APPLICATION PUBLICATIONS Remove

Examiner Initial*	Cite No	Publication Number	Kind Code[1]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16159269
	Filing Date	2018-10-12
	First Named Inventor	Eric FURFINE
	Art Unit	
	Examiner Name	
	Attorney Docket Number	13850001REEX

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /S.L.T/

	1	20160144025	A1	2016-05-26	Regeneron Pharmaceuticals, Inc.	paragraphs [0086], [0197]

If you wish to add additional U.S. Published Application citation information please click the Add button. Add

FOREIGN PATENT DOCUMENTS Remove

Examiner Initial*	Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[4]	Publication Date	Name of Patentee or Applicant of cited Document	Pages,Columns,Lines where Relevant Passages or Relevant Figures Appear	T[5]
	1	00/75319	WO	A1	2000-12-14	Regeneron Pharmaceuticals, Inc.	Throughout	
	2	98/45331	WO	A2	1998-10-15	GENENTECH, INC.	Throughout	
	3	00/63380	WO	A1	2000-10-26	GENENTECH, INC.	Throughout	

If you wish to add additional Foreign Patent Document citation information please click the Add button Add

NON-PATENT LITERATURE DOCUMENTS Remove

Examiner Initials*	Cite No	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc), date, pages(s), volume-issue number(s), publisher, city and/or country where published.	T[5]
	1	~~Prosecution history for U.S. Patent No. 10,464,992 (U.S. Patent Application No. 16/159,269)~~	

If you wish to add additional non-patent literature document citation information please click the Add button Add

EXAMINER SIGNATURE

Examiner Signature	/SHARON L TURNER/	Date Considered	03/08/2020

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through a citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16159269
	Filing Date	2018-10-12
	First Named Inventor	Eric FURFINE
	Art Unit	
	Examiner Name	
	Attorney Docket Number	13850001REEX

[1] See Kind Codes of USPTO Patent Documents at www.USPTO.GOV or MPEP 901.04. [2] Enter office that issued the document, by the two-letter code (WIPO Standard ST.3). [3] For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. [4] Kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 if possible. [5] Applicant is to place a check mark here if English language translation is attached.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT (Not for submission under 37 CFR 1.99)		
	Application Number	16159269
	Filing Date	2018-10-12
	First Named Inventor	Eric FURFINE
	Art Unit	
	Examiner Name	
	Attorney Docket Number	13850001REEX

CERTIFICATION STATEMENT

Please see 37 CFR 1.97 and 1.98 to make the appropriate selection(s):

That each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(1).

OR

☐ That no item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in 37 CFR 1.56(c) more than three months prior to the filing of the information disclosure statement. See 37 CFR 1.97(e)(2).

See attached certification statement.

The fee set forth in 37 CFR 1.17 (p) has been submitted herewith.

☒ A certification statement is not submitted herewith.

SIGNATURE

A signature of the applicant or representative is required in accordance with CFR 1.33, 10.18. Please see CFR 1.4(d) for the form of the signature.

Signature	/Christopher J. Maier/	Date (YYYY-MM-DD)	2020-02-11
Name/Print	Christopher J. Maier	Registration Number	53,255

This collection of information is required by 37 CFR 1.97 and 1.98. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 1 hour to complete, including gathering, preparing and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C. 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether the Freedom of Information Act requires disclosure of these record s.

2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.

3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.

4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).

5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.

6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).

7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.

8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspections or an issued patent.

9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Concise Description of Relevance of References Submitted by Third Party

The table on the following pages illustrate where and how the references submitted by the third party— US Patent No. 9,340,594 (hereinafter "P1"); US Patent No. 7,608,261 (hereinafter "P2"); US Patent No. 9,580,489 (hereinafter "P3"); International Patent Application Publication No. WO 00/75319 A1, published on Dec. 14, 2000 (herein after "P4"), and International Patent Application Publication No. WO 98/45331 A2, published on Oct. 15, 1998 (herein after "P5"); disclose the limitations of claims 12-35 of US Application No. 16/582,486, published as US2020/0017572 on Jan. 16, 2020, further evidenced by the request for re-examination (herein after "P6") of related US Patent No. 10,464,992 as received by USPTO on Feb. 11, 2020, and the communication from USPTO on Apr. 1, 2020 regarding institution of re-examination (herein after "P7"), where the re-examination is granted under control number US 90/014448.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 12 A vial comprising: a vascular endothelial growth factor (VEGF) antagonist; polysorbate; a buffer; and sucrose; wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5° C. for two months as measured by size exclusion chromatography.	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent. Claim 2: The pre-filled syringe of claim 1, wherein the first VEGF receptor is Flt1, and the second VEGF receptor is Flk1 or Flt4. Claim 3: The pre-filled syringe according to claim 2, wherein the VEGF trap is stable for at least 4 months. Claim 5: The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 2: The ophthalmic formulation of claim 1, further comprising 1-7.5% of a stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, or mannitol, pH between about 5.8-7.0. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0;	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 11: The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol. Claim 19: The formulation of claim 1, comprising a stabilizer comprising trehalose or sucrose. Claim 20: The formulation of claim 19, wherein the stabilizer comprises sucrose.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
	VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4. Claim 8: The pre-filled syringe according to claim 2 wherein the VEGF trap is stable for at least 5 months. WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of	c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol. Claim 9: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 10 mM sodium phosphate buffer, about 0.03% polysorbate, about 0.1% PEG and about 2.5% sucrose, pH about 6.2-6.3. Claim 10: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 5 mM sodium phosphate buffer, about 0.015% polysorbate, about 2.5% sucrose, and further comprising sodium chloride at about 20 mM, pH about 6.2-6.3. WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-	Claim 24: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell. WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
	materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	
Claim 13 The vial of claim 12 wherein the polysorbate is polysorbate 20.	Claim 5: The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4.	*Same Analysis as Claim 12*	Claim 11: The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 14 The vial of claim 13 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.	Claim 4: The pre-filled syringe according to claim 3, wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 22: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist does not comprise amino acids 1-26 of SEQ ID NO:4. Claim 23: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is a dimer.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 15 The vial of claim 14 wherein about 99% or more of the weight of the fusion protein is in native conformation.	*Same Analysis as Claim 12*	*Same Analysis as Claim 12*	*Same Analysis as Claim 12*

Claim 16 A vial comprising: a vascular endothelial growth factor (VEGF) antagonist; 0.01% polysorbate 20 or polysorbate 80; a buffer; and sucrose, trehalose, mannitol or glucose; wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5° C. for two months as measured by size exclusion chromatography.	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent. Claim 2: The pre-filled syringe of claim 1, wherein the first VEGF receptor is Flt1, and the second VEGF receptor is Flk1 or Flt4. Claim 3: The pre-filled syringe according to claim 2, wherein the VEGF trap is stable for at least 4 months. Claim 5: The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4. Claim 8: The pre-filled syringe according to claim 2 wherein the VEGF trap is stable for at least 5 months.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 2: The ophthalmic formulation of claim 1, further comprising 1-7.5% of a stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, or mannitol, pH between about 5.8-7.0. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 11: The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol. Claim 19: The formulation of claim 1, comprising a stabilizer comprising trehalose or sucrose. Claim 24: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell. WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The

	WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	Claim 9: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 10 mM sodium phosphate buffer, about 0.03% polysorbate, about 0.1% PEG and about 2.5% sucrose, pH about 6.2-6.3. Claim 10: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 5 mM sodium phosphate buffer, about 0.015% polysorbate, about 2.5% sucrose, and further comprising sodium chloride at about 20 mM, pH about 6.2-6.3. WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The	containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
		containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	

Claim 17 The vial of claim 16 wherein the concentration of vascular endothelial growth factor (VEGF) antagonist is about 40 mg/ml.	Claim 10: The pre-filled syringe according to claim 9, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 135 mM NaCI, and 0.03% polysorbate 20, at pH 6.2-6.4.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 5: The ophthalmic formulation of claim 4, comprising VEGF antagonist at a concentration selected from the group consisting of 10 mg/ml, 20 mg/ml, 40 mg/ml, and 80 mg/ml. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 5: The formulation of claim 4, where the VEGF-specific fusion protein antagonist is present at a concentration of about 10, about 20, about 30, about 40, about 50, about 60, about 70, or about 80 mg/ml.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 18 The vial of claim 17 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.	Claim 4: The pre-filled syringe according to claim 3, wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 22: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist does not comprise amino acids 1-26 of SEQ ID NO:4. Claim 23: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is a dimer.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 19 The vial of claim 18 wherein about 99% or more of the weight of the fusion protein is in native conformation.	*Same Analysis as Claim 16*	*Same Analysis as Claim 16*	*Same Analysis as Claim 16*

Claim 20 The vial of claim 12 comprising vascular endothelial growth factor (VEGF) antagonist; 30-150 mM NaCl; 0.03% polysorbate 20; 5% sucrose; and a buffer; wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5° C. for two months as measured by size exclusion chromatography	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent. Claim 2: The pre-filled syringe of claim 1, wherein the first VEGF receptor is Flt1, and the second VEGF receptor is Flk1 or Flt4. Claim 3: The pre-filled syringe according to claim 2, wherein the VEGF trap is stable for at least 4 months. Claim 5: The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4. Claim 8: The pre-filled syringe according to claim 2 wherein the VEGF trap is stable for at least 5 months.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 2: The ophthalmic formulation of claim 1, further comprising 1-7.5% of a stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, or mannitol, pH between about 5.8-7.0. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 11: The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol. Claim 16: The formulation of claim 1, wherein the tonicity agent comprises sodium chloride or potassium chloride. Claim 17: The formulation of claim 16, wherein the tonicity agent comprises sodium chloride present at a concentration of 20-135 mM. Claim 19: The formulation of claim 1, comprising a stabilizer comprising trehalose or sucrose.

	WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	Claim 9: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 10 mM sodium phosphate buffer, about 0.03% polysorbate, about 0.1% PEG and about 2.5% sucrose, pH about 6.2-6.3. Claim 10: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 5 mM sodium phosphate buffer, about 0.015% polysorbate, about 2.5% sucrose, and further comprising sodium chloride at about 20 mM, pH about 6.2-6.3. WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The	Claim 20: The formulation of claim 19, wherein the stabilizer comprises sucrose. Claim 21: The formulation of claim 20, wherein the sucrose is present at a concentration of 5%. Claim 24: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell. WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
		containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	

Claim 21 The vial of claim 20 comprising about 40 mg/ml of the vascular endothelial growth factor (VEGF) antagonist.	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 5: The ophthalmic formulation of claim 4, comprising VEGF antagonist at a concentration selected from the group consisting of 10 mg/ml, 20 mg/ml, 40 mg/ml, and 80 mg/ml. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 5: The formulation of claim 4, where the VEGF-specific fusion protein antagonist is present at a concentration of about 10, about 20, about 30, about 40, about 50, about 60, about 70, or about 80 mg/ml.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 22 The vial of claim 21 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.	Claim 4: The pre-filled syringe according to claim 3, wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 22: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist does not comprise amino acids 1-26 of SEQ ID NO:4. Claim 23: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is a dimer.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 23 The vial of claim 22 wherein about 99% or more of the weight of the fusion protein is in native conformation.	*Same Analysis as Claim 20*	*Same Analysis as Claim 20*	*Same Analysis as Claim 20*

Claim 24 A formulation comprising: a vascular endothelial growth factor (VEGF) antagonist; polysorbate; a buffer; and sucrose; wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5° C. for two months as measured by size exclusion chromatography.	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent. Claim 2: The pre-filled syringe of claim 1, wherein the first VEGF receptor is Flt1, and the second VEGF receptor is Flk1 or Flt4. Claim 3: The pre-filled syringe according to claim 2, wherein the VEGF trap is stable for at least 4 months. Claim 5: The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4. Claim 8: The pre-filled syringe according to claim 2 wherein the VEGF trap is stable for at least 5 months.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 2: The ophthalmic formulation of claim 1, further comprising 1-7.5% of a stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, or mannitol, pH between about 5.8-7.0. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 11: The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol. Claim 19: The formulation of claim 1, comprising a stabilizer comprising trehalose or sucrose. Claim 20: The formulation of claim 19, wherein the stabilizer comprises sucrose. Claim 24: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell. WO 98/45331 A2 (P5) Anti-vegf antibodies (Title)

	WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	Claim 9: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 10 mM sodium phosphate buffer, about 0.03% polysorbate, about 0.1% PEG and about 2.5% sucrose, pH about 6.2-6.3. Claim 10: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 5 mM sodium phosphate buffer, about 0.015% polysorbate, about 2.5% sucrose, and further comprising sodium chloride at about 20 mM, pH about 6.2-6.3. WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The	Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
		containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	
Claim 25 The formulation of claim 24 wherein the polysorbate is polysorbate 20.	Claim 5: The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4.	*Same Analysis as Claim 1*	Claim 11: The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 26 The formulation of claim 25 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.	Claim 4: The pre-filled syringe according to claim 3, wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 22: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist does not comprise amino acids 1-26 of SEQ ID NO:4. Claim 23: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is a dimer.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 27 The formulation of claim 26 wherein about 99% or more of the weight of the fusion protein is in native conformation.	*Same Analysis as Claim 24*	*Same Analysis as Claim 24*	*Same Analysis as Claim 24*

Claim 28 A formulation comprising: a vascular endothelial growth factor (VEGF) antagonist; 0.01% polysorbate 20 or polysorbate 80; a buffer; and sucrose, trehalose, mannitol or glucose; wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5° C. for two months as measured by size exclusion chromatography.	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent. Claim 2: The pre-filled syringe of claim 1, wherein the first VEGF receptor is Flt1, and the second VEGF receptor is Flk1 or Flt4. Claim 3: The pre-filled syringe according to claim 2, wherein the VEGF trap is stable for at least 4 months. Claim 5: The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4. Claim 8: The pre-filled syringe according to claim 2 wherein the VEGF trap is stable for at least 5 months.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 2: The ophthalmic formulation of claim 1, further comprising 1-7.5% of a stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, or mannitol, pH between about 5.8-7.0. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 11: The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol. Claim 19: The formulation of claim 1, comprising a stabilizer comprising trehalose or sucrose. Claim 24: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell. WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The

	WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	Claim 9: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 10 mM sodium phosphate buffer, about 0.03% polysorbate, about 0.1% PEG and about 2.5% sucrose, pH about 6.2-6.3. Claim 10: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 5 mM sodium phosphate buffer, about 0.015% polysorbate, about 2.5% sucrose, and further comprising sodium chloride at about 20 mM, pH about 6.2-6.3. WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The	containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
		containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	

Claim 29 The formulation of claim 28 wherein the concentration of vascular endothelial growth factor (VEGF) antagonist is about 40 mg/ml.	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 5: The ophthalmic formulation of claim 4, comprising VEGF antagonist at a concentration selected from the group consisting of 10 mg/ml, 20 mg/ml, 40 mg/ml, and 80 mg/ml. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 5: The formulation of claim 4, where the VEGF-specific fusion protein antagonist is present at a concentration of about 10, about 20, about 30, about 40, about 50, about 60, about 70, or about 80 mg/ml.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 30 The formulation of claim 29 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.	Claim 4: The pre-filled syringe according to claim 3, wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 22: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist does not comprise amino acids 1-26 of SEQ ID NO:4. Claim 23: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is a dimer.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 31 The formulation of claim 30 wherein about 99% or more of the weight of the fusion protein is in native conformation.	*Same Analysis as Claim 28*	*Same Analysis as Claim 28*	*Same Analysis as Claim 28*

Claim 32 The formulation of claim 24 comprising vascular endothelial growth factor (VEGF) antagonist; 30-150 mM NaCl; 0.03% polysorbate 20; 5% sucrose; and a buffer; wherein the VEGF antagonist is a fusion protein produced in a Chinese Hamster Ovary (CHO) cell, the fusion protein comprising an immunoglobin-like (Ig) domain 2 of Flt1 and Ig domain 3 of Flk1, and a multimerizing component; and wherein at least 98% of the VEGF antagonist is present in native conformation following storage at 5° C. for two months as measured by size exclusion chromatography	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent. Claim 2: The pre-filled syringe of claim 1, wherein the first VEGF receptor is Flt1, and the second VEGF receptor is Flk1 or Flt4. Claim 3: The pre-filled syringe according to claim 2, wherein the VEGF trap is stable for at least 4 months. Claim 5: The pre-filled syringe according to claim 4, wherein the stable ophthalmic formulation comprises 40 mg/mL of the VEGF trap, 10 mM phosphate, 40 mM NaCl, 0.03% polysorbate 20, 5% sucrose, at pH 6.2-6.4. Claim 8: The pre-filled syringe according to claim 2 wherein the VEGF trap is stable for at least 5 months.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 2: The ophthalmic formulation of claim 1, further comprising 1-7.5% of a stabilizing agent is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, or mannitol, pH between about 5.8-7.0. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 11: The formulation of claim 1, wherein the organic co-solvent comprises one or more of polysorbate 20, polysorbate 80, polyethylene glycol (PEG) 3350, and propylene glycol. Claim 16: The formulation of claim 1, wherein the tonicity agent comprises sodium chloride or potassium chloride. Claim 17: The formulation of claim 16, wherein the tonicity agent comprises sodium chloride present at a concentration of 20-135 mM. Claim 19: The formulation of claim 1, comprising a stabilizer comprising trehalose or sucrose.

	WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	Claim 9: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 10 mM sodium phosphate buffer, about 0.03% polysorbate, about 0.1% PEG and about 2.5% sucrose, pH about 6.2-6.3. Claim 10: The lyophilizable formulation of claim 8, comprising about 20 mg/ml of the VEGF antagonist, about 5 mM sodium phosphate buffer, about 0.015% polysorbate, about 2.5% sucrose, and further comprising sodium chloride at about 20 mM, pH about 6.2-6.3. WO 00/75319 A1 (P4) Modified chimeric polypeptides with improved pharmacokinetic properties (Title) Other included embodiments are a host-vector system for the production of a fusion polypeptide which comprises the expression vector, in a suitable host cell; ... the host-vector system wherein the suitable host cell is a CHO cell. (Page 12 Lines 19-26) The first two cysteines in the Fc region (Cys211 and Cys214) form an intermolecular disulfide bond with the same two cysteines in another Fc chain. (Page 25 Lines 23-25) WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The	Claim 20: The formulation of claim 19, wherein the stabilizer comprises sucrose. Claim 21: The formulation of claim 20, wherein the sucrose is present at a concentration of 5%. Claim 24: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is expressed in a Chinese hamster ovary (CHO) cell. WO 98/45331 A2 (P5) Anti-vegf antibodies (Title) Suitable containers include, for example, bottles, vials, syringes, and test tubes. The containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
		containers may be formed from a variety of materials such as glass or plastic. The container holds a composition which is effective for treating the condition and may have a sterile access port (for example the container may be an intravenous solution bag or a vial having a stopper pierceable by a hypodermic injection needle). The active agent in the composition is the anti-VEGF antibody. (Page 47 lines 13-18)	

Claim 33 The formulation of claim 32 comprising about 40 mg/ml of the vascular endothelial growth factor (VEGF) antagonist.	Claim 1: A pre-filled syringe suitable for intravitreal administration comprising a 1 mL luer glass syringe fitted with a plunger and a stable ophthalmic formulation of a vascular endothelial growth factor (VEGF) trap, which consists of (i) a receptor component consisting essentially of an immunoglobulin-like domain 2 of a first VEGF receptor and an immunoglobulin-like domain 3 of a second VEGF receptor, and (ii) a multimerizing component, wherein the stable ophthalmic formulation comprises: (a) 1-100 mg/ml a VEGF antagonist; (b) 0.01-5% of one or more organic co-solvent; (c) 5-40 mM of buffer; and (d) optionally comprising 1.0-7.5% of a stabilizing agent.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 5: The ophthalmic formulation of claim 4, comprising VEGF antagonist at a concentration selected from the group consisting of 10 mg/ml, 20 mg/ml, 40 mg/ml, and 80 mg/ml. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 1: A formulation comprising: (a) 1-100 mg/mL of a VEGF-specific fusion protein antagonist; (b) 5-40 mM of a buffer; (c) 0.01-5% of an organic co-solvent; and (d) a stabilizer or 30-150 mM of a tonicity agent, wherein the VEGF-specific fusion protein antagonist represents at least 90% of the total weight of protein in the composition, at least 90% of the total weight of the VEGF-specific fusion protein antagonist is not present as an aggregate, and the VEGF-specific fusion protein antagonist comprises an Ig domain 2 of human VEGF receptor 1, an Ig domain 3 of human VEGF receptor 2, and a multimerizing component. Claim 5: The formulation of claim 4, where the VEGF-specific fusion protein antagonist is present at a concentration of about 10, about 20, about 30, about 40, about 50, about 60, about 70, or about 80 mg/ml.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 34 The formulation of claim 33 wherein the vascular endothelial growth factor (VEGF) antagonist is a dimer of a fusion protein comprising amino acids 27-457 of the amino acid sequence set forth in SEQ ID NO:4.	Claim 4: The pre-filled syringe according to claim 3, wherein the VEGF trap consists of amino acids 27-457 of SEQ ID NO:4.	Claim 1: An ophthalmic formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 1-100 mg/ml of a VEGF antagonist comprising the amino acid sequence of SEQ ID NO:4; b) 0.01-5% of one or more organic co-solvent(s) which is one or more of polysorbate, polyethylene glycol (PEG), and propylene glycol; c) 30-150 mM of a tonicity agent selected from sodium chloride or potassium chloride; and, d) 5-40 mM of sodium phosphate buffer. Claim 8: A lyophilizable formulation of a vascular endothelial growth factor (VEGF) antagonist, comprising a) 5-50 mg/ml of the VEGF antagonist, comprising the amino acid sequence of SEQ ID NO:4; b) 5-25 mM of sodium phosphate buffer, pH about 5.8-7.0; c) 0.01-0.15% of an organic co-solvent, selected from the group consisting of polysorbate, polyethylene glycol (PEG), propylene glycol, and a combination thereof; and, d) 1-10% of a stabilizing agent selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.	Claim 22: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist does not comprise amino acids 1-26 of SEQ ID NO:4. Claim 23: The formulation of claim 1, wherein the VEGF-specific fusion protein antagonist is a dimer.

Claims in Application US16/582,486, as published on April 19, 2018 (Priority 2006-06-16)	US9,340,594 (P1) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US7,608,261 B2 (P2) (Priority: 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)	US9,580,489B2 (P3) (Priority 2006-06-16) VEGF antagonist formulations for intravitreal administration (Title)
Claim 35 The formulation of claim 34 wherein about 99% or more of the weight of the fusion protein is in native conformation.	*Same Analysis as Claim 24*	*Same Analysis as Claim 24*	*Same Analysis as Claim 24*

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290
CONCISE DESCRIPTION OF RELEVANCE

Application Number	16582486

U.S. PATENTS

Cite No	Patent Number	Concise Description of Relevance
1	9580489	Concise Description uploaded as a separate document
2	7608261	Concise Description uploaded as a separate document
3	9340594	Concise Description uploaded as a separate document

U.S. PATENT APPLICATION PUBLICATION		
Cite No	**Publication Number**	**Concise Description of Relevance**

FOREIGN PATENT DOCUMENTS		
CiteNo	**Foreign Document Number**	**Concise Description of Relevance**
1	WO2000075319	Concise Description uploaded as a separate document

2	WO1998045331	Concise Description uploaded as a separate document

NON-PATENT PUBLICATIONS		
Cite No	**Reference**	**Concise Description of Relevance**
1	Ex Parte Request for Reexamination of US10464992, pages 1-70, published 02/11/2020, USPTO, PUBLIC PAIR	Concise Description uploaded as a separate document

2	USPTO Communication on Ex Parte Reexamination of US10464992, pages 1-12, published 04/01/2020, USPTO, PUBLIC PAIR	Concise Description uploaded as a separate document

PTO/SB/429(08-12)
Approved for use through 07/31/2015. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

U.S. PATENTS				
Cite No	Patent Number	Kind Code[1]	Issue Date (YYYY-MM-DD)	First Named Inventor
1	9340594		2016-05-17	Eric FURFINE
2	7608261		2009-10-27	Eric Furfine
3	9580489		2017-02-28	Eric FURFINE

U.S. PATENT APPLICATION PUBLICATIONS				
Cite No	Publication Number	Kind Code[1]	Publication Date (YYYY-MM-DD)	First Named Inventor

FOREIGN PATENTS AND PUBLISHED FOREIGN PATENT APPLICATIONS						
Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[1]	Publication Date (YYYY-MM-DD)	Applicant, Patentee or First Named Inventor	T[5]
1	WO1998045331	WO		1998-10-15	Manuel Baca	☐

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

2	WO2000075319	WO		2000-12-14	Nicholas J. Papadopoulos	☐

NON-PATENT PUBLICATIONS (e.g., journal article, Office action)

Cite No	Author (if any), title of the publication, page(s) being submitted, publication date, publisher (where available), place of publication (where available).	T[5]	E[6]
1	USPTO Communication on Ex Parte Reexamination of US10464992, pages 1-12, published 04/01/2020, USPTO, PUBLIC PAIR	☐	☒
2	Ex Parte Request for Reexamination of US10464992, pages 1-70, published 02/11/2020, USPTO, PUBLIC PAIR	☐	☒

STATEMENTS

The party making the submission is not an individual who has a duty to disclose information with respect to the above-identified application under 37 CFR 1.56.

This submission complies with the requirements of 35 U.S.C. 122(e) and 37 CFR 1.290.

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

☒ The fee set forth in 37 CFR 1.290(f) has been submitted herewith.

☐ The fee set forth in 37 CFR 1.290(f) is not required because this submission lists three or fewer total items and, to the knowledge of the person signing the statement after making reasonable inquiry, this submission is the first and the only submission under 35 U.S.C 122(e) filed in the above-identified application by the party making the submission or by a party in privity with the party.

☐ This resubmission is being made responsive to a notification of non-compliance issued for an earlier filed third-party submission. The corrections in this resubmission are limited to addressing the non-compliance. As such, the party making this resubmission: (1) requests that the Office apply the previously-paid fee set forth in 37 CFR 1.290(f), or (2) states that no fee is required to accompany this resubmission as the undersigned is again making the fee exemption statement set forth in 37 CFR 1.290(g).

Signature	/Ngam Fung David Chan/		
Name/Print	Ngam Fung David Chan	Registration Number (if applicable)	76820

Examiner Signature		Date Considered	

*EXAMINER: Signature indicates all documents listed above have been considered,except for citations through which a line is drawn. Draw line through citation if not considered. Include a copy of this form with next communication to applicant. 1. If known, enter kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16. See MPEP 901.04(a). 2. Enter the country or patent office that issued the document, by two-letter code under WIPO standard ST.3. See MPEP 1851. 3. For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4. If known, enter the kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 . See MPEP 901.04(a). 5. Check mark indicates translation attached. 6. Check mark indicates evidence of publication attached.

Electronic Patent Application Fee Transmittal

Application Number:	16582486
Filing Date:	
Title of Invention:	
First Named Inventor/Applicant Name:	
Filer:	Ngam Fung David Chan
Attorney Docket Number:	

Filed as Large Entity

Filing Fees for

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
DOCUMENT FEE FOR THIRD-PARTY SUBMISSIONS	1818	1	180	180
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**180**

Electronic Acknowledgement Receipt

EFS ID:	39454692
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	
First Named Inventor/Applicant Name:	
Correspondence Address:	- - - - - - - - - -
Filer:	Ngam Fung David Chan
Filer Authorized By:	
Attorney Docket Number:	
Receipt Date:	15-MAY-2020
Filing Date:	
Time Stamp:	23:33:28
Application Type:	

Payment information:

Submitted with Payment	yes
Payment Type	DA
Payment was successfully received in RAM	$180

RAM confirmation Number	E20205EN33265094
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Evidence of Publication	90014448_Request_for_Reexamination_of_US10464992.pdf	3648837 59743e6cc699e0ce373f602d0ada159ea86d42ff	no	78
Warnings:					
Information:					
2	Evidence of Publication	90014448_Communication_of_Reexamination_of_US10464992.pdf	801642 6f1b2051d98753e31509e429acee0ad8140e3552	no	21
Warnings:					
Information:					
3	Concise Description of Relevance	Third_Party_Submission_Against_US16_582486.pdf	273108 01bbb38a7b3d8d4b27503efcd50cab63c5d766fd	no	35
Warnings:					
Information:					
4	Concise Description of Relevance	Concise-description-generated.pdf	35135 2b51a40cc12dd722d3ad32ce26acf7084a25ce25	no	4
Warnings:					
Information:					
5	Third-Party Submission Under 37 CFR 1.290	Third-party-preissuance-submission.pdf	49132 2a99241cbcd7e11af00ae07c51a4cab9d4345c45	no	3
Warnings:					
Information:					

6	Request for Notification of Non-compliant Third-Party Submission	Third-party-notification-request.pdf	19572 55f1785c765ea974b10be4fb000c9b0853f7b1fd	no	1
Warnings:					
Information:					
7	Fee Worksheet (SB06)	fee-info.pdf	29373 20aeeed3a671a7b9692f74615f1593214560ed6d	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	4856799	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9	3381

96387 7590 05/19/2020

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

EXAMINER
LOCKARD, JON MCCLELLAND

ART UNIT	PAPER NUMBER
1647	

NOTIFICATION DATE	DELIVERY MODE
05/19/2020	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@bozpat.com

UNITED STATES DEPARTMENT OF COMMERCE
U.S. Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450

APPLICATION NO./ CONTROL NO.	FILING DATE	FIRST NAMED INVENTOR/ PATENT IN REEXAMINATION	ATTORNEY DOCKET NO.
16/582,486	09/25/2019	FURFINE et al.	REGN-024CON9

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY SUITE 200
REDWOOD CITY, CA 94065

EXAMINER	
MARIANNE C SEIDEL	
ART UNIT	PAPER
1600	20200518

DATE MAILED: _____

Please find below and/or attached an Office communication concerning this application or proceeding.

Commissioner for Patents

The third-party submission under 37 CFR 1.290 filed on 5/15/2020 for the instant application has been determined to be compliant with 35 U.S.C. 122(e) and 37 CFR 1.290 and is being entered in the application. Please allow a few days for the submission to be visible in the Patent Application Information Retrieval (PAIR) system.

/MARIANNE C SEIDEL/
Quality Assurance Specialist, Art Unit 1600

PTO-90C (Rev.04-03)

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/582,486	Filing Date 09/25/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	07/13/2020	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 33	Minus	** 24	= 9		x $100 =	900
	Independent (37 CFR 1.16(h))	* 10	Minus	*** 4	= 6		x $460 =	2760
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	3660

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	SLIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/KAREN L VESTAL/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

SECOND PRELIMINARY AMENDMENT Under 37 CFR § 1.115	Attorney Docket No.	REGN-024CON9
	Confirmation No.	3381
	First Named Inventor	Eric Furfine
	Application Number	16/582,486
	Filing Date	September 25, 2019
Address to: Mail Stop Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Group Art Unit	
	Examiner Name	
	Title: "*VEGF Antagonist Formulations Suitable for Intravitreal Administration*"	

Sir:

Prior to the examination of the above-referenced application on the merits, please enter the amendments below.

AMENDMENTS TO THE CLAIMS

1. - 35. (Cancelled)

36. (**New**) A glass vial comprising a formulation comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor that is human Flt1 and Ig domain 3 of a second VEGF receptor selected from the group consisting of human Flk1 and human Flt4, and a multimerizing component; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

37. (**New**) A glass vial comprising a formulation comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises amino acids 27-457 of SEQ ID NO:4; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

38. (**New**) A glass vial comprising a formulation comprising:

40 mg/ml of a vascular endothelial growth factor (VEGF) antagonist fusion protein comprising amino acids 27-457 of SEQ ID NO: 4,

a buffer,

polysorbate, and

a stabilizing agent;

wherein 90% or more of the weight of said VEGF antagonist fusion protein is not present as an aggregate; and

wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

39. (**New**) A glass vial comprising:

a glycosylated vascular endothelial factor (VEGF) antagonist fusion protein comprising amino acids 27-457 of SEQ ID NO:4,

an organic co-solvent,

a phosphate buffer at a pH of between 5.8 and 7.0 formulated as a mixture of mono and dibasic sodium phosphate and a stabilizing agent.

40. (**New**) A glass vial containing a liquid formulation comprising:

a glycosylated vascular endothelial factor (VEGF) antagonist fusion protein, wherein said VEGF antagonist fusion protein is a dimer and comprises an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component,

polysorbate 20,

sucrose, and

a phosphate buffer at a pH of between 5.8 and 7.0 formulated as a mixture of mono and dibasic sodium phosphate in the absence of acid/base titration;

wherein said VEGF antagonist fusion protein is substantially resistant to degradation and aggregation; and

wherein said liquid formulation has a turbidity of 0.01 or lower at OD_{405}.

41. (**New**) A pre-filled syringe comprising a formulation comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor that is human Flt1 and Ig domain 3 of a second VEGF receptor selected from the group consisting of human Flk1 and human Flt4, and a multimerizing component; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

42. (**New**) A pre-filled syringe comprising a formulation comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises amino acids 27-457 of SEQ ID NO:4; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following

storage at 5° C for two months as measured by size exclusion chromatography.

43. (**New**) A pre-filled syringe comprising a formulation comprising:

40 mg/ml of a vascular endothelial growth factor (VEGF) antagonist fusion protein comprising amino acids 27-457 of SEQ ID NO: 4,

a buffer,

polysorbate, and

a stabilizing agent;

wherein 90% or more of the weight of said VEGF antagonist fusion protein is not present as an aggregate; and

wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

44. (**New**) A pre-filled syringe comprising:

a glycosylated vascular endothelial factor (VEGF) antagonist fusion protein comprising amino acids 27-457 of SEQ ID NO:4,

an organic co-solvent,

a phosphate buffer at a pH of between 5.8 and 7.0 formulated as a mixture of mono and dibasic sodium phosphate and a stabilizing agent.

45. (**New**) A pre-filled syringe containing a liquid, said liquid having a turbidity of 0.01 or lower at OD_{405} and comprising:

a glycosylated vascular endothelial factor (VEGF) antagonist fusion protein, wherein said VEGF antagonist fusion protein is a dimer and comprises an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor and Ig domain 3 of a second VEGF receptor, and a multimerizing component,

polysorbate 20,

sucrose, and

a phosphate buffer at a pH of between 5.8 and 7.0 formulated as a mixture of mono and dibasic sodium phosphate in the absence of acid/base titration,

wherein said fusion protein is substantially resistant to degradation and aggregation.

46. (**New**) The glass vial of claim 37, wherein the concentration of said VEGF antagonist fusion protein is 40 mg/ml, and wherein said organic co-solvent comprises polysorbate.

47. (**New**) The glass vial of claim 46, wherein said organic co-solvent comprises 0.01% to 3% polysorbate.

48. (**New**) The glass vial of claim 46, wherein said organic co-solvent comprises 0.01% to 3% polysorbate 20.

49. (**New**) The glass vial of claim 46, wherein said organic co-solvent comprises about 0.03% to about 0.1% polysorbate 20.

50. (**New**) The glass vial of claim 46, wherein said VEGF antagonist fusion protein is in a dimer form.

51. (**New**) The glass vial of claim 48, wherein said buffer comprises a phosphate buffer.

52. (**New**) The glass vial of claim 48, wherein said buffer comprises 5-25 mM buffer.

53. (**New**) The glass vial of claim 48, wherein said buffer comprises a pH between about 5.8-7.0.

54. (**New**) The glass vial of claim 48, wherein said buffer comprises a pH about 6.2-6.3.

55. (**New**) The glass vial of claim 48, wherein said stabilizing agent comprises a sugar.

56. (**New**) The glass vial of claim 55, wherein said sugar is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.

57. (**New**) The glass vial of claim 48, wherein said stabilizing agent comprises 1.0-10% of sucrose.

58. (**New**) The glass vial of claim 48, wherein said stabilizing agent comprises 1.0-7.5% of sucrose.

59. (**New**) The glass vial of claim 48, wherein said formulation further comprises a tonicity agent.

60. (**New**) The glass vial of claim 48, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

61. (**New**) The glass vial of claim 48, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

62. (**New**) The glass vial of claim 48, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

63. (**New**) The glass vial of claim 48, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

64. (**New**) The glass vial of claim 48, wherein said formulation is an ophthalmic formulation.

65. (**New**) The glass vial of claim 48, wherein said formulation does not contain phosphate.

66. (**New**) The glass vial of claim 48, wherein said formulation does not contain trehalose.

67. (**New**) The glass vial of claim 57, wherein said formulation further comprises a tonicity agent.

68. (**New**) The glass vial of claim 57, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

69. (**New**) The glass vial of claim 57, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

70. (**New**) The glass vial of claim 57, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

71. (**New**) The glass vial of claim 57, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

REMARKS UNDER 37 CFR § 1.115

Formal Matters

Claims 36-71 are pending after entry of the amendments set forth herein.

Claims 1-11 were previously canceled and claims 12-35 are canceled herein without prejudice.

New claims 36-71 are supported throughout the originally filed application.

No new matter has been added.

Statement under 37 C.F.R. §§1.56 and 1.2

Applicant(s) hereby advise the Examiner of the status of a co-pending application in compliance with the Applicant's(s') duty to disclose under 37 C.F.R. §§1.56 and 1.2 (see also MPEP §2001.06(b)) as discussed in *McKesson Info. Soln. Inc., v. Bridge Medical Inc.*, 487 F.3d 897; 82 USPQ2d 1865 (Fed. Cir. 2007).

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 11/818,463, filed June 14, 2007 which issued as U.S. Patent No. 7,608,261 on October 27, 2009.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 12/560,885, filed September 16, 2009 which issued as U.S. Patent No. 7,807,164 on October 5, 2010.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 12/833,417, filed July 9, 2010 which issued as U.S. Patent No. 8,092,803 on January 10, 2012.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 13/329,770, filed December 19, 2011 which issued as U.S. Patent No. 8,481,046 on July 9, 2013.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 13/914,996, filed June 11, 2013 which issued as U.S. Patent No. 8,802,107 on August 12, 2014.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 14/330,096, filed July 14, 2014 which issued as U.S. Patent No. 9,340,594 on May 17, 2016.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 15/095,606, filed April 11, 2016 which issued as U.S. Patent No. 9,914,763 on March 13, 2018.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 15/151,776, filed May 11, 2016 which issued as U.S. Patent No. 9,580,489 on February 28, 2017.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 15/879,294, filed January 24, 2018 which issued as U.S. Patent No. 10,400,025 on September 3, 2019.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 16/159,269, filed October 12, 2018 which issued as U.S. Patent No. 10,464,992 on November 5, 2019.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 16/739,559, filed January 10, 2020. No actions have been mailed to date.

Applicants wish to bring to the Examiner's attention U.S. Patent Reexamination Control No. 90/014,448 of U.S. Patent No. 10,464,992, filed February 11, 2020. A Petition Under 37 C.F.R. § 1.182 to Expedite a Concurrent Petition and Petition to Vacate Reexamination Order was filed May 29, 2020 and an Opposition to Petition was filed June 12, 2020.

These documents are available on PAIR, and thus are not provided with this communication. Please inform the undersigned if there is any difficulty in obtaining the documents from PAIR.

CONCLUSION

Applicants submit that all of the claims are in condition for allowance, which action is requested. If the Examiner finds that a telephone conference would expedite the prosecution of this application, please telephone the undersigned at the number provided.

The Commissioner is hereby authorized to charge any underpayment of fees up to a strict limit of $3,000.00 beyond that authorized on the credit card, but not more than $3,000.00 in additional fees due with any communication for the above referenced patent application, including but not limited to any necessary fees for extensions of time, or credit any overpayment of any amount to Deposit Account No. 50-0815, order number REGN-024CON9.

Respectfully submitted,
BOZICEVIC, FIELD & FRANCIS LLP

Date: 13 July 2020

By: /Karl Bozicevic, Reg. No. 28,807/
Karl Bozicevic, Reg. No. 28,807

BOZICEVIC, FIELD & FRANCIS LLP
201 Redwood Shores Parkway, Suite 200
Redwood City, CA 94065
Telephone: (650) 327-3400
Direct: (650) 833-7735
Facsimile: (650) 327-3231

Electronic Patent Application Fee Transmittal

Application Number:	16582486
Filing Date:	25-Sep-2019
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Filer:	Karl Bozicevic/Kimberly Zuehlke
Attorney Docket Number:	REGN-024CON9

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	32	100	3200
INDEPENDENT CLAIMS IN EXCESS OF 3	1201	6	460	2760
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**5960**

Electronic Acknowledgement Receipt

EFS ID:	39984631
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Kimberly Zuehlke
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	13-JUL-2020
Filing Date:	25-SEP-2019
Time Stamp:	18:16:25
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$5960
RAM confirmation Number	E20207CI17002782
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		REGN-024CON9_2020-07-13_prelim_amend.pdf	69174 b31adb689dc9b6806f600a08f08f39cc36c87be4	yes	8

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Preliminary Amendment	1	1
	Claims	2	6
	Applicant Arguments/Remarks Made in an Amendment	7	8

Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32614 89ce7cb9fa833748f67bbbd2b049057b5a249e5e	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	101788	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9	3381

96387 7590 01/06/2021

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

EXAMINER
LOCKARD, JON MCCLELLAND

ART UNIT	PAPER NUMBER
1647	

NOTIFICATION DATE	DELIVERY MODE
01/06/2021	ELECTRONIC

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

docket@bozpat.com

Office Action Summary	Application No. 16/582,486	Applicant(s) FURFINE et al.	
	Examiner JON M LOCKARD	Art Unit 1647	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTHS FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☑ Responsive to communication(s) filed on 13 July 2020.

☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2a)☐ This action is **FINAL.** 2b) ☑ This action is non-final.

3)☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

4)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims*

5) ☑ Claim(s) 36-71 is/are pending in the application.

5a) Of the above claim(s) _____ is/are withdrawn from consideration.

6) ☐ Claim(s) _____ is/are allowed.

7) ☑ Claim(s) 36-71 is/are rejected.

8) ☐ Claim(s) _____ is/are objected to.

9) ☐ Claim(s) _____ are subject to restriction and/or election requirement

* If any claims have been determined allowable, you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see http://www.uspto.gov/patents/init_events/pph/index.jsp or send an inquiry to **PPHfeedback@uspto.gov.**

Application Papers

10)☑ The specification is objected to by the Examiner.

11)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

Certified copies:

a)☐ All b)☐ Some** c)☐ None of the:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

** See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)

2) ☑ Information Disclosure Statement(s) (PTO/SB/08a and/or PTO/SB/08b) Paper No(s)/Mail Date _____.

3) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date _____.

4) ☑ Other: IDS.3P.

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

Status of Application, Amendments, and/or Claims

2. The preliminary amendment filed 13 July 2020 has been received and entered in full. Claims 1-35 have been cancelled, and claims 36-71 have been added. Therefore, claims 36-71 are pending and the subject of this Office Action.

Information Disclosure Statement

3. The information disclosure statement (IDS) submitted on 24 January 2020 has been considered by the examiner.

Specification

4. The disclosure is objected to because of the following informalities:

5. An updated status of the parent nonprovisional applications should be included in the first sentence of the specification.

Double Patenting

6. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim

is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

7. A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the reference application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement. A terminal disclaimer must be signed in compliance with 37 CFR 1.321(b).

8. The USPTO internet Web site contains terminal disclaimer forms which may be used. Please visit http://www.uspto.gov/forms/. The filing date of the application will determine what form should be used. A web-based eTerminal Disclaimer may be filled out completely online using web-screens. An eTerminal Disclaimer that meets all requirements is auto-processed and approved immediately upon submission. For more information about eTerminal Disclaimers, refer to http://www.uspto.gov/patents/process/file/efs/guidance/eTD-info-I.jsp.

9. Claims 36-71 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-7 and 11-17 of U.S. Patent No. 8,092,803. Although the conflicting claims are not identical, they are not patentably distinct from each other because the scope of the ophthalmic formulation of the VEGF antagonist recited in the instant claims is overlapping in scope with the ophthalmic formulation of VEGF antagonist recited in claims 1-7 and 11-17 of U.S. Patent No. 8,092,803. Therefore, the claims are overlapping in scope.

10. Claims 36-71 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-15 and 17 of U.S. Patent No. 7,608,261. Although the conflicting claims are not identical, they are not patentably distinct from each other because the

scope of the ophthalmic formulation of the VEGF antagonist recited in the instant claims is overlapping in scope with the ophthalmic formulation of VEGF antagonist recited in claims 1-15 and 17 of U.S. Patent No. 7,608,261. Therefore, the claims are overlapping in scope.

11. Claims 36-71 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-12 of U.S. Patent No. 9,340,594. Although the conflicting claims are not identical, they are not patentably distinct from each other because the scope of the ophthalmic formulation of the VEGF antagonist recited in the instant claims is overlapping in scope with the ophthalmic formulation of VEGF antagonist recited in claims 1-11 of U.S. Patent No. 9,340,594. Therefore, the claims are overlapping in scope.

12. Claims 36-71 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-12 of U.S. Patent No. 9,914,763. Although the conflicting claims are not identical, they are not patentably distinct from each other because the scope of the ophthalmic formulation of the VEGF antagonist recited in the instant claims is overlapping in scope with the ophthalmic formulation of VEGF antagonist recited in claims 1-12 of U.S. Patent No. 9,914,763. Therefore, the claims are overlapping in scope.

13. Claims 36-71 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-15 of U.S. Pat. No. 10,400,025. Although the conflicting claims are not identical, they are not patentably distinct from each other because the scope of the ophthalmic formulation of the VEGF antagonist recited in the instant claims is overlapping in

scope with the ophthalmic formulation of VEGF antagonist recited in claims 1-15 of U.S. Pat. No. 10,400,025. Therefore, the claims are overlapping in scope.

14. Claims 36-71 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-18 of U.S. Pat. No. 10,464,992. Although the conflicting claims are not identical, they are not patentably distinct from each other because the scope of the ophthalmic formulation of the VEGF antagonist recited in the instant claims is overlapping in scope with the ophthalmic formulation of VEGF antagonist recited in claims 1-18 of U.S. Pat. No. 10,464,992. Therefore, the claims are overlapping in scope.

Summary

15. No claim is allowed.

Advisory Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jon M. Lockard whose telephone number is (571) 272-2717. The examiner can normally be reached on Monday through Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Joanne Hama, can be reached on (571) 272-2911. The fax number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at **866-217-9197** (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/JON M LOCKARD/
Examiner, Art Unit 1647
December 31, 2020

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/582,486	FURFINE et al.
	Examiner	Art Unit
	JON M LOCKARD	1647

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
NONE		12/31/2020	JML

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
STIC Search of SEQ ID NO:4. See search results in SCORE.	12/31/2020	JML
EAST (USPAT, US-PGPUB, EPO, DERWENT): See attached search history.	12/31/2020	JML
STN (MEDLINE, SCISEARCH, EMBASE, BIOSIS): See attached search history.	12/31/2020	JML
PALM: Inventor search.	12/31/2020	JML

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	
				Examiner Name	
Sheet	1	of	2	Attorney Docket Number	REGN-024CON

U.S. PATENT DOCUMENTS

Examiner Initial*	Cite No.	Patent Number Number-Kind Code (*if known*)	Issue Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	**6100071**	2000-08-08	Davis-Smyth et al.	
	2	**6897294**	2005-05-24	Davis-Smyth et al.	
	3	**7052691**	2006-05-30	Sleeman et al.	

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No.	Publication Number Number-Kind Code (*if known*)	Publication Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	**20050281831**	2005-12-22	Davis-Smyth et al.	
	2	**20060217311**	2006-09-28	Dix et al.	
	3	**20080085276**	2008-04-10	Wiegand et al.	
	4	**20140012227**	2014-01-09	Sigg et al.	

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No.	Foreign Document Number Country Code-Number-Kind Code (*if known*)	Publication Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
	1	WO 97/04801	1997-02-13	Genentech, Inc.		
	2	JPH11510170	1999-09-07	Genentech, Inc.	See WO 97/04801 for English Equivalent	X
	3	WO 99/62536	1999-12-09	Celtrix Pharmaceuticals, Inc.		
	4	JP 10273450	1998-10-13	Toagosei Co. Ltd.	See WO 99/62536 for English Equivalent	X
	5	WO 99/62536	1999-12-09	Celtrix Pharmaceuticals, Inc.		
	6	JP2002516871	2002-06-11	Celtrix Pharmaceuticals, Inc.	See WO 99/62536 for English Equivalent	X
	7	WO 2004/091658	2004-10-28	Genentech, Inc.		
	8	WO 2005/000895	2005-01-06	Regeneron Pharmaceuticals, Inc.		
	9	WO 2005011734	2005-02-10	Regeneron Pharmaceuticals, Inc.		
	10	WO 2005/020972	2005-03-10	Eyetech Pharmaceuticals, Inc.		
	11	WO 2006/047325	2006-05-04	Genentech, Inc.		
	12	WO 2006/088650	2006-08-24	Regeneron Pharmaceuticals, Inc.		
	13	WO 2006/104852	2006-10-05	Regeneron Pharmaceuticals, Inc.		

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	
				Examiner Name	
Sheet	2	of	2	Attorney Docket Number	REGN-024CON

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	1	FRASER, Hamis M., et al., "Single Injections of Vascular Endothelial Growth Factor Trap Block Ovulation in the Macaque and Produced Prolonged, Dose-Related Suppression of Ovarian Function," (2004) J. Clin. Endocrin. & Metabol. 90(2):1114-1122	
	2	ANONYMOUS: "Lucentis in the treatment of neovascular (wet) age-related macular degeneration (AMD)", 1 January 2007, pages 1-54	

Examiner Signature	/JON M LOCKARD/	Date Considered	12/31/2020

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L/

PTO/SB/429(08-12)
Approved for use through 07/31/2015. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

U.S. PATENTS				
Cite No	Patent Number	Kind Code[1]	Issue Date (YYYY-MM-DD)	First Named Inventor
1	9340594		2016-05-17	Eric FURFINE
2	7608261		2009-10-27	Eric Furfine
3	9580489		2017-02-28	Eric FURFINE

U.S. PATENT APPLICATION PUBLICATIONS				
Cite No	Publication Number	Kind Code[1]	Publication Date (YYYY-MM-DD)	First Named Inventor

FOREIGN PATENTS AND PUBLISHED FOREIGN PATENT APPLICATIONS						
Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[1]	Publication Date (YYYY-MM-DD)	Applicant, Patentee or First Named Inventor	T[5]
1	WO1998045331	WO		1998-10-15	Manuel Baca	☐

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

2	WO2000075319	WO		2000-12-14	Nicholas J. Papadopoulos	☐

NON-PATENT PUBLICATIONS (e.g., journal article, Office action)

Cite No	Author (if any), title of the publication, page(s) being submitted, publication date, publisher (where available), place of publication (where available).	T[5]	E[6]
1	USPTO Communication on Ex Parte Reexamination of US10464992, pages 1-12, published 04/01/2020, USPTO, PUBLIC PAIR	☐	☒
2	Ex Parte Request for Reexamination of US10464992, pages 1-70, published 02/11/2020, USPTO, PUBLIC PAIR	☐	☒

STATEMENTS

The party making the submission is not an individual who has a duty to disclose information with respect to the above-identified application under 37 CFR 1.56.

This submission complies with the requirements of 35 U.S.C. 122(e) and 37 CFR 1.290.

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

☒ The fee set forth in 37 CFR 1.290(f) has been submitted herewith.

☐ The fee set forth in 37 CFR 1.290(f) is not required because this submission lists three or fewer total items and, to the knowledge of the person signing the statement after making reasonable inquiry, this submission is the first and the only submission under 35 U.S.C 122(e) filed in the above-identified application by the party making the submission or by a party in privity with the party.

☐ This resubmission is being made responsive to a notification of non-compliance issued for an earlier filed third-party submission. The corrections in this resubmission are limited to addressing the non-compliance. As such, the party making this resubmission: (1) requests that the Office apply the previously-paid fee set forth in 37 CFR 1.290(f), or (2) states that no fee is required to accompany this resubmission as the undersigned is again making the fee exemption statement set forth in 37 CFR 1.290(g).

Signature	/Ngam Fung David Chan/		
Name/Print	Ngam Fung David Chan	Registration Number (if applicable)	76820

Examiner Signature	/JON M LOCKARD/	Date Considered	12/31/2020

*EXAMINER: Signature indicates all documents listed above have been considered,except for citations through which a line is drawn. Draw line through citation if not considered. Include a copy of this form with next communication to applicant. 1. If known, enter kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16. See MPEP 901.04(a). 2. Enter the country or patent office that issued the document, by two-letter code under WIPO standard ST.3. See MPEP 1851. 3. For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4. If known, enter the kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 . See MPEP 901.04(a). 5. Check mark indicates translation attached. 6. Check mark indicates evidence of publication attached.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

BIB DATA SHEET

CONFIRMATION NO. 3381

SERIAL NUMBER	FILING or 371(c) DATE RULE	CLASS	GROUP ART UNIT	ATTORNEY DOCKET NO.
16/582,486	09/25/2019	530	1647	REGN-024CON9

APPLICANTS

REGENERON PHARMACEUTICALS, INC., Tarrytown, NY

INVENTORS

Eric FURFINE, Concord, MA;
Daniel DIX, LaGrangeville, NY;
Kenneth GRAHAM, Pleasant Valley, NY;
Kelly FRYE, Mendham, NJ;

**** CONTINUING DATA ***************************

This application is a CON of 16/159,269 10/12/2018 PAT 10464992
which is a CON of 15/879,294 01/24/2018 PAT 10400025
which is a CON of 15/095,606 04/11/2016 PAT 9914763
which is a CON of 14/330,096 07/14/2014 PAT 9340594
which is a CON of 13/914,996 06/11/2013 PAT 8802107
which is a CON of 13/329,770 12/19/2011 PAT 8481046
which is a CON of 12/833,417 07/09/2010 PAT 8092803
which is a CON of 12/560,885 09/16/2009 PAT 7807164
which is a DIV of 11/818,463 06/14/2007 PAT 7608261
which claims benefit of 60/814,484 06/16/2006

**** FOREIGN APPLICATIONS ***************************

**** IF REQUIRED, FOREIGN FILING LICENSE GRANTED ****

10/08/2019

Foreign Priority claimed ❑ Yes ☑ No 35 USC 119(a-d) conditions met ❑ Yes ❑ No Verified and Acknowledged /JON MCCLELLAND LOCKARD/ Examiner's Signature	❑ Met after Allowance Initials	STATE OR COUNTRY	SHEETS DRAWINGS	TOTAL CLAIMS	INDEPENDENT CLAIMS
		MA	0	24	4

ADDRESS

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065
UNITED STATES

TITLE

VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

FILING FEE RECEIVED		
8540	FEES: Authority has been given in Paper No._____ to charge/credit DEPOSIT ACCOUNT No._____ for following:	❑ All Fees ❑ 1.16 Fees (Filing) ❑ 1.17 Fees (Processing Ext. of time) ❑ 1.18 Fees (Issue)

BIB (Rev. 05/07).

		❑ Other _____
		❑ Credit

EAST Search History

/J.L./

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	168	vegfr1r2$ and formulation	US-PGPUB; USPAT; EPO; DERWENT	OR	ON	2020/12/31 22:07
L2	79	l1 and (ophthalmic or intravitreal)	US-PGPUB; USPAT; EPO; DERWENT	OR	ON	2020/12/31 22:07
L3	289	(vegf adj (trap or antagonist)) same ophthalmic	US-PGPUB; USPAT; EPO; DERWENT	OR	ON	2020/12/31 22:08
L4	68	l3 same formulation	US-PGPUB; USPAT; EPO; DERWENT	OR	ON	2020/12/31 22:08
L5	135	l2 or l4	US-PGPUB; USPAT; EPO; DERWENT	OR	ON	2020/12/31 22:08
L6	15	l5 and (ophthalmic adj formulation).clm.	US-PGPUB; USPAT; EPO; DERWENT	OR	ON	2020/12/31 22:08
L7	1,159	(furfine-e$ dix-d$ graham-k$ frye-k$).in.	US-PGPUB; USPAT; EPO; DERWENT	OR	ON	2020/12/31 22:08
L8	10	l6 and l7	US-PGPUB; USPAT; EPO; DERWENT	OR	ON	2020/12/31 22:08

12/31/2020 10:09:32 PM
C:\Users\jlockard\Documents\EAST\Workspaces\16582486.wsp

/J.L./

Inventor Information for 16/582486

Inventor Name	City	State/Country
FURFINE, ERIC	CONCORD	MASSACHUSETTS
DIX, DANIEL	LAGRANGEVILLE	NEW YORK
GRAHAM, KENNETH	PLEASANT VALLEY	NEW YORK
FRYE, KELLY	MENDHAM	NEW JERSEY

Appln Info | Contents | Petition Info | Atty/Agent Info | Continuity Data | Foreign Data | **Inventors** | Applicants | Address | Fees | Post Info | Pre Gr

Search Another: Application # [ ] Search **or Patent #** [ ] Search **or International Registration #** [ ] Search
PCT / [ ] / [ ] Search **or PG PUBS #** [ ] Search
Attorney Docket # [ ] Search
Bar Code # [ ] Search

To Go BACK Use BACK Button on Your BROWSER Tool Bar
Back to PALM | ASSIGNMENT | OASIS | Home page

* * * * * * * * * * * * * * * * STN Columbus * * * * * * * * * * * * * * * *

=> d his

(FILE 'HOME' ENTERED AT 22:12:21 ON 31 DEC 2020)

FILE 'MEDLINE, SCISEARCH, EMBASE, BIOSIS' ENTERED AT 22:12:27 ON 31 DEC 2020

L1	0	S	VEGFR1R2? AND FORMULATION
L2	0	S	VEGFR1R2? AND FORMULATION
L3	0	S	VEGFR1R2 AND OPHTHALMIC
L4	39	S	(VEGF (W) (TRAP OR ANTAGONIST) (P) FORMULATION)
L5	63	S	(VEGF (W) (TRAP OR ANTAGONIST) (P) OPHTHALMIC)
L6	3	S	L5 AND FORMULATION
L7	39	S	L4 OR L6
L8	29	DUP REM	L7 (10 DUPLICATES REMOVED)
		E	FURFINE E/AU
L9	336	S	E3-E8
		E	DIX D/AU
L10	328	S	E3 OR E8 OR E25
		E	GRAHAM K/AU
L11	1007	S	E3 OR E149 OR E151
		E	FRYE K/AU
L12	66	S	E3 OR E20
L13	19	S	(L9 OR L10 OR L11 OR L12) AND VEGF AND FORMULATION
L14	19	DUP REM	L13 (0 DUPLICATES REMOVED)
L15	32	S	L8 OR L14

Doc Code: PA..
Document Description: Power of Attorney

PTO/AIA/82B (07-13)
Approved for use through 01/31/2018. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY BY APPLICANT

I hereby revoke all previous powers of attorney given in the application identified in either the attached transmittal letter or the boxes below.

Application Number	Filing Date
16/582,486	September 25, 2019

(Note: The boxes above may be left blank if information is provided on form PTO/AIA/82A.)

☑ I hereby appoint the Patent Practitioner(s) associated with the following Customer Number as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above: 96387

OR

☐ I hereby appoint Practitioner(s) named in the attached list (form PTO/AIA/82C) as my/our attorney(s) or agent(s), and to transact all business in the United States Patent and Trademark Office connected therewith for the patent application referenced in the attached transmittal letter (form PTO/AIA/82A) or identified above. (Note: Complete form PTO/AIA/82C.)

Please recognize or change the correspondence address for the application identified in the attached transmittal letter or the boxes above to:

☑ The address associated with the above-mentioned Customer Number

OR

☐ The address associated with Customer Number:

OR

☐ Firm or Individual Name					
Address					
City		State		Zip	
Country					
Telephone		Email			

I am the Applicant (if the Applicant is a juristic entity, list the Applicant name in the box):

Regeneron Pharmaceuticals, Inc.

☐ Inventor or Joint Inventor (title not required below)

☐ Legal Representative of a Deceased or Legally Incapacitated Inventor (title not required below)

☑ Assignee or Person to Whom the Inventor is Under an Obligation to Assign (provide signer's title if applicant is a juristic entity)

☐ Person Who Otherwise Shows Sufficient Proprietary Interest (e.g., a petition under 37 CFR 1.46(b)(2) was granted in the application or is concurrently being filed with this document) (provide signer's title if applicant is a juristic entity)

SIGNATURE of Applicant for Patent

The undersigned (whose title is supplied below) is authorized to act on behalf of the applicant (e.g., where the applicant is a juristic entity).

Signature	/Frank R. Cottingham/	Date (Optional)	
Name	Frank R. Cottingham		
Title	Executive Director, Assistant General Counsel, Patents, Regeneron Pharmaceuticals, Inc.		

NOTE: Signature - This form must be signed by the applicant in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. If more than one applicant, use multiple forms.

☑ Total of 1 forms are submitted.

This collection of information is required by 37 CFR 1.131, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 3 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 01/31/2013. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Regeneron Pharmaceuticals, Inc.

Application No./Patent No.: 16/582,486 Filed/Issue Date: September 25, 2019

Titled: VEGF Antagonist Formulations Suitable for Intravitreal Administration

Regeneron Pharmaceuticals, Inc., a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 050903, Frame 0067, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

1. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

2. From: _____ To: _____

   The document was recorded in the United States Patent and Trademark Office at

   Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☑ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Karl Bozicevic, Reg. No. 28,807/	2021-02-18
Signature	Date
Karl Bozicevic	28,807
Printed or Typed Name	Title or Registration Number

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	41957605
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Kimberly Zuehlke
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	18-FEB-2021
Filing Date:	25-SEP-2019
Time Stamp:	14:33:20
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Power of Attorney	5050US11_POA.pdf	173687 545a63b5b2cddd4ca45c85dd9d67fc0f0fae064d	no	1

Warnings:

Information:					
2	Assignee showing of ownership per 37 CFR 3.73	REGN-024CON9_2021-02-18_373c.pdf	118271 c555668e3c65c17b855938ca159a4800 4efb04cb	no	3
Warnings:					
Information:					
			Total Files Size (in bytes):	291958	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Doc Code: ECOMM.AUTH/ECOMM.WTDW
Doc Description: Internet Communications Authorized/Internet Communications Authorization Withdrawn

PTO/SB/439 (11-15)

AUTHORIZATION FOR INTERNET COMMUNICATIONS IN A PATENT APPLICATION OR REQUEST TO WITHDRAW AUTHORIZATION FOR INTERNET COMMUNICATIONS		
	Application No.	16582486
	Filing Date	2019-09-25
	First Named Inventor	FURFINE, Eric
	Art Unit	1647
	Examiner Name	LOCKARD, Jon McClelland
	Practitioner Docket No.	REGN-024CON9

To: Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

I. To authorize permission for Internet Communications.

☑ Recognizing that Internet communications are not secure, I hereby authorize the USPTO to communicate with the undersigned and practitioners in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via video conferencing, instant messaging, or electronic mail. I understand that a copy of these communications will be made of record in the application file. (MPEP 502.03)

II. To withdraw authorization for Internet Communications.

☐ The authorization given on _____, to the USPTO to communicate with the undersigned and any practitioner in accordance with 37 CFR 1.33 and 37 CFR 1.34 concerning any subject matter of this application via Internet communications such as video conferencing, instant messaging, or electronic mail is hereby withdrawn. I understand that the withdrawal is effective when approved rather than when received.

I am the

☐ applicant.

☑ attorney or agent of record. Registration number 28,807.

☐ attorney or agent acting under 37 CFR 1.34. Registration number _____.

/Karl Bozicevic/ — Signature

2021-02-22 — Date

Karl Bozicevic — Typed or printed name

650-833-7735 — Telephone Number

NOTE: This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4 for signature requirements and certifications. Juristic entities must be represented by a patent practitioner (see 37 CFR 1.31, which is applicable to any paper filed on or after September 16, 2012, that is presented on behalf of a juristic entity, regardless of application filing date). Submit multiple forms if more than one signature is required, see below*.

☑ * Total of 1 forms are submitted.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronic Acknowledgement Receipt

EFS ID:	41980044
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Kimberly Zuehlke
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	22-FEB-2021
Filing Date:	25-SEP-2019
Time Stamp:	11:38:26
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Internet Communications Authorized	REGN-024CON9_2021-02-22_sb0439.pdf	105138 8fb7063ae8a23c4a3ea5b9f2b892afa34e0bc67c	no	2

Warnings:

Information:	
Total Files Size (in bytes):	105138

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/SB/06 (09-11)
Approved for use through 1/31/2014. OMB 0651-0032
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 16/582,486	Filing Date 09/25/2019	☐ To be Mailed

ENTITY: ☑ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED - PART I

FOR	(Column 1) NUMBER FILED	(Column 2) NUMBER EXTRA		RATE ($)	FEE ($)
☐ BASIC FEE (37 CFR 1.16(a), (b), or (c))	N/A	N/A		N/A	
☐ SEARCH FEE (37 CFR 1.16(k), (i), or (m))	N/A	N/A		N/A	
☐ EXAMINATION FEE (37 CFR 1.16(o), (p), or (q))	N/A	N/A		N/A	
TOTAL CLAIMS (37 CFR 1.16(i))	minus 20 =	*		x $100 =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*		x $460 =	
☐ APPLICATION SIZE FEE (37 CFR 1.16(s))	If the specification and drawings exceed 100 sheets of paper, the application size fee due is $310 ($155 for small entity) for each additional 50 sheets or fraction thereof. See 35 U.S.C. 41(a)(1)(G) and 37 CFR 1.16(s).				
☐ MULTIPLE DEPENDENT CLAIM PRESENT (37 CFR 1.16(j))					
* If the difference in column 1 is less than zero, enter "0" in column 2.				TOTAL	

APPLICATION AS AMENDED - PART II

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT	03/02/2021	CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 118	Minus	** 36	= 82		x $100 =	8200
	Independent (37 CFR 1.16(h))	* 4	Minus	*** 10	= 0		x $480 =	0
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	8200

		(Column 1)		(Column 2)	(Column 3)			
AMENDMENT		CLAIMS REMAINING AFTER AMENDMENT		HIGHEST NUMBER PREVIOUSLY PAID FOR	PRESENT EXTRA		RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=		x $0 =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=		x $0 =	
	☐ Application Size Fee (37 CFR 1.16(s))							
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))							
							TOTAL ADD'L FEE	

* If the entry in column 1 is less than the entry in column 2, write "0" in column 3.	LIE
** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 20, enter "20".	/TINA J BARDEN/
*** If the "Highest Number Previously Paid For" IN THIS SPACE is less than 3, enter "3".	
The "Highest Number Previously Paid For" (Total or Independent) is the highest number found in the appropriate box in column 1.	

This collection of information is required by 37 CFR 1.16. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

INTERVIEW SUMMARY and AMENDMENT Under 37 CFR § 1.111 Address to: Mail Stop Amendment Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Attorney Docket No.	REGN-024CON9
	Confirmation No.	3381
	First Named Inventor	Eric Furfine
	Application Number	16/582,486
	Filing Date	September 25, 2019
	Group Art Unit	1647
	Examiner Name	Jon McClelland Lockard
	Title: "*VEGF Antagonist Formulations Suitable for Intravitreal Administration*"	

Sir:

This amendment is responsive to the Office Action dated January 6, 2021, for which a three-month period for response was given making this amendment timely filed on or before April 6, 2021.

In view of the remarks put forth below, reconsideration and allowance are respectfully requested.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 14 of this paper.

AMENDMENTS TO THE CLAIMS

1. – 35. (Cancelled)

36. (Currently Amended) A glass vial comprising a**n ophthalmic** formulation **suitable for intravitreal administration** comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor that is human Flt1 and Ig domain 3 of a second VEGF receptor selected from the group consisting of human Flk1 and human Flt4, and a multimerizing component; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

37. (Currently Amended) A glass vial comprising **an ophthalmic** formulation **suitable for intravitreal administration** comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises amino acids 27-457 of SEQ ID NO:4; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

38. – 40. (Cancelled)

41. **(Currently Amended)** A pre-filled syringe comprising a**n ophthalmic** formulation **suitable for intravitreal administration** comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor that is human Flt1 and Ig domain 3 of a second VEGF receptor selected from the group consisting of human Flk1 and human Flt4, and a multimerizing component; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

42. **(Currently Amended)** A pre-filled syringe comprising a**n ophthalmic** formulation **suitable for intravitreal administration** comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises amino acids 27-457 of SEQ ID NO:4; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

43. – 45. (Cancelled)

46. (Previously Presented) The glass vial of claim 37, wherein the concentration of said VEGF antagonist fusion protein is 40 mg/ml, and wherein said organic co-solvent comprises polysorbate.

47. (Previously Presented) The glass vial of claim 46, wherein said organic co-solvent comprises 0.01% to 3% polysorbate.

48. (Previously Presented) The glass vial of claim 46, wherein said organic co-solvent comprises 0.01% to 3% polysorbate 20.

49. (Previously Presented) The glass vial of claim 46, wherein said organic co-solvent comprises about 0.03% to about 0.1% polysorbate 20.

50. (Cancelled)

51. (Previously Presented) The glass vial of claim 48, wherein said buffer comprises a phosphate buffer.

52. (Previously Presented) The glass vial of claim 48, wherein said buffer comprises 5-25 mM buffer.

53. (Previously Presented) The glass vial of claim 48, wherein said buffer comprises a pH between about 5.8-7.0.

54. (Previously Presented) The glass vial of claim 48, wherein said buffer comprises a pH about 6.2-6.3.

55. (Previously Presented) The glass vial of claim 48, wherein said stabilizing agent comprises a sugar.

56. (Previously Presented) The glass vial of claim 55, wherein said sugar is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.

57. (Previously Presented) The glass vial of claim 48, wherein said stabilizing agent comprises 1.0-10% of sucrose.

58. (Previously Presented) The glass vial of claim 48, wherein said stabilizing agent comprises 1.0-7.5% of sucrose.

59. (Previously Presented) The glass vial of claim 48, wherein said formulation further comprises a tonicity agent.

60. (Previously Presented) The glass vial of claim 48, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

61. (Previously Presented) The glass vial of claim 48, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

62. (Previously Presented) The glass vial of claim 48, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

63. (Previously Presented) The glass vial of claim 48, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

64. (Cancelled)

65. (Previously Presented) The glass vial of claim 48, wherein said formulation does not contain phosphate.

66. (Previously Presented) The glass vial of claim 48, wherein said formulation does not contain trehalose.

67. (Previously Presented) The glass vial of claim 57, wherein said formulation further comprises a tonicity agent.

68. (Previously Presented) The glass vial of claim 57, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

69. (Previously Presented) The glass vial of claim 57, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

70. (Previously Presented) The glass vial of claim 57, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

71. (Previously Presented) The glass vial of claim 57, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

72. (New) The glass vial of claim 36, wherein the concentration of said VEGF antagonist fusion protein is 40 mg/ml, and wherein said organic co-solvent comprises polysorbate.

73. (New) The glass vial of claim 72, wherein said organic co-solvent comprises 0.01% to 3% polysorbate.

74. (New) The glass vial of claim 72, wherein said organic co-solvent comprises 0.01% to 3% polysorbate 20.

75. (New) The glass vial of claim 72, wherein said organic co-solvent comprises about 0.03% to about 0.1% polysorbate 20.

76. (New) The glass vial of claim 74, wherein said buffer comprises a phosphate buffer.

77. (New) The glass vial of claim 74, wherein said buffer comprises 5-25 mM buffer.

78. (New) The glass vial of claim 74, wherein said buffer comprises a pH between about 5.8-7.0.

79. (New) The glass vial of claim 74, wherein said buffer comprises a pH about 6.2-6.3.

80. (New) The glass vial of claim 74, wherein said stabilizing agent comprises a sugar.

81. (New) The glass vial of claim 80, wherein said sugar is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.

82. (New) The glass vial of claim 74, wherein said stabilizing agent comprises 1.0-10% of sucrose.

83. (New) The glass vial of claim 74, wherein said stabilizing agent comprises 1.0-7.5% of sucrose.

84. (New) The glass vial of claim 74, wherein said formulation further comprises a tonicity agent.

85. (New) The glass vial of claim 74, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

86. (New) The glass vial of claim 74, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

87. (New) The glass vial of claim 74, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

88. (New) The glass vial of claim 74, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

89. (New) The glass vial of claim 74, wherein said formulation does not contain phosphate.

90. (New) The glass vial of claim 74, wherein said formulation does not contain trehalose.

91. (New) The glass vial of claim 82, wherein said formulation further comprises a tonicity agent.

92. (New) The glass vial of claim 82, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

93. (New) The glass vial of claim 82, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

94. (New) The glass vial of claim 82, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

95. (New) The glass vial of claim 82, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

96. (New) The glass vial of claim 36, wherein said stabilizing agent comprises sucrose.

97. (New) The glass vial of claim 96, wherein said stabilizing agent comprises 1.0-10% of sucrose.

98. (New) The glass vial of claim 96, wherein the organic co-solvent is polysorbate 20.

99. (New) The glass vial of claim 98, wherein said Ig domain 3 of human VEGF receptor 2 comprises amino acids 131-230 of SEQ ID NO:4.

100. (New) The glass vial of claim 98, wherein said Ig domain 3 of human VEGF receptor 2 consists essentially of amino acids 131-230 of SEQ ID NO:4.

101. (New) The glass vial of claim 100, wherein said formulation further comprises a tonicity agent.

102. (New) The glass vial of claim 101, wherein said tonicity agent comprises sodium chloride.

103. (New) The glass vial of claim 98, wherein said formulation comprises 10 mg/mL VEGF antagonist fusion protein.

104. (New) The glass vial of claim 98, wherein said formulation does not contain phosphate.

105. (New) The pre-filled syringe of claim 41, wherein the concentration of said VEGF antagonist fusion protein is 40 mg/ml, and wherein said organic co-solvent comprises polysorbate.

106. (New) The pre-filled syringe of claim 105, wherein said organic co-solvent comprises 0.01% to 3% polysorbate.

107. (New) The pre-filled syringe of claim 105, wherein said organic co-solvent comprises 0.01% to 3% polysorbate 20.

108. (New) The pre-filled syringe of claim 105, wherein said organic co-solvent comprises about 0.03% to about 0.1% polysorbate 20.

109. (New) The pre-filled syringe of claim 107, wherein said buffer comprises a phosphate buffer.

110. (New) The pre-filled syringe of claim 107, wherein said buffer comprises 5-25 mM buffer.

111. (New) The pre-filled syringe of claim 107, wherein said buffer comprises a pH between about 5.8-7.0.

112. (New) The pre-filled syringe of claim 107, wherein said buffer comprises a pH about 6.2-6.3.

113. (New) The pre-filled syringe of claim 107, wherein said stabilizing agent comprises a sugar.

114. (New) The pre-filled syringe of claim 113, wherein said sugar is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.

115. (New) The pre-filled syringe of claim 107, wherein said stabilizing agent comprises 1.0-10% of sucrose.

116. (New) The pre-filled syringe of claim 107, wherein said stabilizing agent comprises 1.0-7.5% of sucrose.

117. (New) The pre-filled syringe of claim 107, wherein said formulation further comprises a tonicity agent.

118. (New) The pre-filled syringe of claim 107, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

119. (New) The pre-filled syringe of claim 107, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

120. (New) The pre-filled syringe of claim 107, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

121. (New) The pre-filled syringe of claim 107, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

122. (New) The pre-filled syringe of claim 107, wherein said formulation does not contain phosphate.

123. (New) The pre-filled syringe of claim 107, wherein said formulation does not contain trehalose.

124. (New) The pre-filled syringe of claim 115, wherein said formulation further comprises a tonicity agent.

125. (New) The pre-filled syringe of claim 115, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

126. (New) The pre-filled syringe of claim 115, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

127. (New) The pre-filled syringe of claim 115, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

128. (New) The pre-filled syringe of claim 115, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

129. (New) The pre-filled syringe of claim 41, wherein said stabilizing agent comprises sucrose.

130. (New) The pre-filled syringe of claim 129, wherein said stabilizing agent comprises 1.0-10% of sucrose.

131. (New) The pre-filled syringe of claim 129, wherein the organic co-solvent is polysorbate 20.

132. (New) The pre-filled syringe of claim 131, wherein said Ig domain 3 of human VEGF receptor 2 comprises amino acids 131-230 of SEQ ID NO:4.

133. (New) The pre-filled syringe of claim 131, wherein said Ig domain 3 of human VEGF receptor 2 consists essentially of amino acids 131-230 of SEQ ID NO:4.

134. (New) The pre-filled syringe of claim 133, wherein said formulation further comprises a tonicity agent.

135. (New) The pre-filled syringe of claim 134, wherein said tonicity agent comprises sodium chloride.

136. (New) The pre-filled syringe of claim 131, wherein said formulation comprises 10 mg/mL VEGF antagonist fusion protein.

137. (New) The pre-filled syringe of claim 131, wherein said formulation does not contain phosphate.

138. (New) The pre-filled syringe of claim 42, wherein the concentration of said VEGF antagonist fusion protein is 40 mg/ml, and wherein said organic co-solvent comprises polysorbate.

139. (New) The pre-filled syringe of claim 138, wherein said organic co-solvent comprises 0.01% to 3% polysorbate.

140. (New) The pre-filled syringe of claim 138, wherein said organic co-solvent comprises 0.01% to 3% polysorbate 20.

141. (New) The pre-filled syringe of claim 138, wherein said organic co-solvent comprises about 0.03% to about 0.1% polysorbate 20.

142. (New) The pre-filled syringe of claim 140, wherein said buffer comprises a phosphate buffer.

143. (New) The pre-filled syringe of claim 140, wherein said buffer comprises 5-25 mM buffer.

144. (New) The pre-filled syringe of claim 140, wherein said buffer comprises a pH between about 5.8-7.0.

145. (New) The pre-filled syringe of claim 140, wherein said buffer comprises a pH about 6.2-6.3.

146. (New) The pre-filled syringe of claim 140, wherein said stabilizing agent comprises a sugar.

147. (New) The pre-filled syringe of claim 146, wherein said sugar is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.

148. (New) The pre-filled syringe of claim 140, wherein said stabilizing agent comprises 1.0-10% of sucrose.

149. (New) The pre-filled syringe of claim 140, wherein said stabilizing agent comprises 1.0-7.5% of sucrose.

150. (New) The pre-filled syringe of claim 140, wherein said formulation further comprises a tonicity agent.

151. (New) The pre-filled syringe of claim 140, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

152. (New) The pre-filled syringe of claim 140, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

153. (New) The pre-filled syringe of claim 140, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

154. (New) The pre-filled syringe of claim 140, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

155. (New) The pre-filled syringe of claim 140, wherein said formulation does not contain phosphate.

156. (New) The pre-filled syringe of claim 140, wherein said formulation does not contain trehalose.

157. (New) The pre-filled syringe of claim 148, wherein said formulation further comprises a tonicity agent.

158. (New) The pre-filled syringe of claim 148, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

159. (New) The pre-filled syringe of claim 148, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

160. (New) The pre-filled syringe of claim 148, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

161. (New) The pre-filled syringe of claim 148, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

REMARKS UNDER 37 CFR § 1.115

Formal Matters

Claims 36, 37, 41, 42, 46-49, 51-63 and 65-161 are pending after entry of the amendments set forth herein.

Claims 1-35 were previously canceled and claims 38-40, 43-45, 50 and 64 are canceled herein without prejudice.

Claims 36, 37, 41 and 42 are amended. Support for the amended claims can be found throughout the originally filed application.

New claims 72-161 have been added. The new claims supported throughout the originally filed application.

The independent claims have been amended to specifically indicate that the formulation is an ophthalmic formulation suitable for intravitreal administration. This amendment is supported throughout the originally filed application, including, for example, at Abstract, ¶¶ [0002], [0007], [0037], [0048].

No new matter has been added.

Interview Summary

Applicants express thanks to Examiner Lockard for conducting the telephone interview on February 23, 2021.

During the interview applicants proposed claim amendments to the independent claims relating to specifying the formulation as being ophthalmic.

The undersigned attorney also indicated that a Terminal Disclaimer would be filed with respect to U.S. Patents 8,092,803 and 10,464,992.

Distinguishing features between the claims of the other patents cited in support of the double patenting rejections were pointed out. The Examiner said that those distinctions would be further reviewed.

No specific agreement was reached, and Examiner requested that the specific amendments be filed with applicants' comments.

Obviousness Type Double Patenting Rejections

Claims 36-71 were rejected under the doctrine of obviousness-type double patenting over claims 1-7 and 11-17 of issued U.S. Patent 8,092,803.

Without acquiescing to the validity of the rejection and merely to expedite prosecution of the application applicants have attached hereto a Terminal Disclaimer with respect to U.S. Patent 8,092,803 thereby rendering the rejection moot.

Claims 36-71 were rejected for obviousness-type double patenting over claims 1-15 of US patent 10,464,992.

Without acquiescing to the validity of the rejection and merely to expedite prosecution of the application applicants have attached hereto a Terminal Disclaimer with respect to U.S. Patent 10,464,992 thereby rendering the rejection moot.

Claims 36-71 were rejected for obviousness type-double patenting over claims 1-15 and 17 of issued U.S. Patent 7,608,261.

The rejection is respectfully traversed as applied and as it might be applied to the presently pending claims. All the independent claims include an element relating to the stability of the protein conformation in storage over a period of time. This element is not contained within any of the claims of the '261 patent.

In view of distinguishing features between the claims as amended and the claims of the '261 patent the rejection should be reconsidered and withdrawn.

Claims 36-71 were rejected for obviousness-type double patenting over claims 1-12 of issued U.S. Patent 9,340,594.

The claims 1-12 of the '594 patent do not include elements relating to the percentage of the VEGF antagonist which maintains its conformation following storage over a given period of time. All the independent claims include an element relating to the stability of the protein conformation in storage over a period of time. In view of such the rejection should be reconsidered and withdrawn.

Claims 36-71 were rejected for obviousness-type double patenting over claims 1-12 of issued U.S. Patent 9,914,763. The rejection is traversed as applied and as it might be applied to the amended claims.

The claims of the '763 patent do not include elements relating to the stability of the VEGF antagonist over time when stored which element is included in the claims of the present application by

amendment. All the independent claims include an element relating to the stability of the protein conformation in storage over a period of time. In view of such the rejection should be reconsidered and withdrawn.

Claims 36-71 were rejected for obviousness-type double patenting over claims 1-15 of US patent 10,400,025.

The rejection is traversed as applied and as it might be applied to the presently pending claims.

None of the claims of the '025 patent include an element relating to the stability of the VEGF antagonist over time when stored. All the independent claims include an element relating to the stability of the protein conformation in storage over a period of time.

In view of the differences between the claims now pending and the claims of the '025 patent the rejection should be reconsidered and withdrawn.

Statement under 37 C.F.R. §§1.56 and 1.2

Applicant(s) hereby advise the Examiner of the status of a co-pending application in compliance with the Applicant's(s') duty to disclose under 37 C.F.R. §§1.56 and 1.2 (see also MPEP §2001.06(b)) as discussed in *McKesson Info. Soln. Inc., v. Bridge Medical Inc.*, 487 F.3d 897; 82 USPQ2d 1865 (Fed. Cir. 2007).

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 11/818,463, filed June 14, 2007 which issued as U.S. Patent No. 7,608,261 on October 27, 2009.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 12/560,885, filed September 16, 2009 which issued as U.S. Patent No. 7,807,164 on October 5, 2010.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 12/833,417, filed July 9, 2010 which issued as U.S. Patent No. 8,092,803 on January 10, 2012.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 13/329,770, filed December 19, 2011 which issued as U.S. Patent No. 8,481,046 on July 9, 2013.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 13/914,996, filed June 11, 2013 which issued as U.S. Patent No. 8,802,107 on August 12, 2014.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 14/330,096, filed July 14, 2014 which issued as U.S. Patent No. 9,340,594 on May 17, 2016.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 15/095,606, filed April 11, 2016 which issued as U.S. Patent No. 9,914,763 on March 13, 2018.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 15/151,776, filed May 11, 2016 which issued as U.S. Patent No. 9,580,489 on February 28, 2017.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 15/879,294, filed January 24, 2018 which issued as U.S. Patent No. 10,400,025 on September 3, 2019.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 16/159,269, filed October 12, 2018 which issued as U.S. Patent No. 10,464,992 on November 5, 2019.

Applicants wish to bring to the Examiner's attention U.S. Patent Application No. 16/739,559, filed January 10, 2020. No actions have been mailed to date.

Applicants wish to bring to the Examiner's attention U.S. Patent Reexamination Control No. 90/014,448 of U.S. Patent No. 10,464,992, filed February 11, 2020. A Petition Under 37 C.F.R. § 1.182 to Expedite a Concurrent Petition and Petition to Vacate Reexamination Order was filed May 29, 2020 and an Opposition to Petition was filed June 12, 2020.

Applicants wish to bring to the Examiner's attention Inter Partes Review Application No. IPR2021-00402 of U.S. Patent No. 10,464,992, filed on January 7, 2021.

These documents are available on PAIR, and thus are not provided with this communication. Please inform the undersigned if there is any difficulty in obtaining the documents from PAIR.

CONCLUSION

Applicants submit that all the claims are in condition for allowance, which action is requested. If the Examiner finds that a telephone conference would expedite the prosecution of this application, please telephone the undersigned at the number provided.

The Commissioner is hereby authorized to charge any underpayment of fees up to a strict limit of $3,000.00 beyond that authorized on the credit card, but not more than $3,000.00 in additional fees due with any communication for the above referenced patent application, including but not limited to any necessary fees for extensions of time, or credit any overpayment of any amount to Deposit Account No. 50-0815, order number REGN-024CON9.

Respectfully submitted,
BOZICEVIC, FIELD & FRANCIS LLP

Date: 2 March 2021

By: /Karl Bozicevic, Reg. No. 28,807/
Karl Bozicevic, Reg. No. 28,807

Enclosure: Termimal Disclaimer to
U.S. Patent Nos. 8,092,803 and 10,464,992

BOZICEVIC, FIELD & FRANCIS LLP
201 Redwood Shores Parkway, Suite 200
Redwood City, CA 94065
Telephone: (650) 327-3400
Direct: (650) 833-7735
Facsimile: (650) 327-3231

PTO/AIA/26 (04-14)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

TERMINAL DISCLAIMER TO OBVIATE A DOUBLE PATENTING REJECTION OVER A "PRIOR" PATENT	Docket Number (Optional) REGN-024CON9

In re Application of: Regeneron Pharmaceuticals, Inc.

Application No.: 16/582,486

Filed: September 25, 2019

For: VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

The applicant, Regeneron Pharmaceuticals, Inc., owner of 100 percent interest in the instant application hereby disclaims, except as provided below, the terminal part of the statutory term of any patent granted on the instant application which would extend beyond the expiration date of the full statutory term of **prior patent** No. 8092803 & 10464992 as the term of said **prior patent** is presently shortened by any terminal disclaimer. The applicant hereby agrees that any patent so granted on the instant application shall be enforceable only for and during such period that it and the **prior patent** are commonly owned. This agreement runs with any patent granted on the instant application and is binding upon the grantee, its successors or assigns.

In making the above disclaimer, the applicant does not disclaim the terminal part of the term of any patent granted on the instant application that would extend to the expiration date of the full statutory term of the **prior patent**, "as the term of said **prior patent** is presently shortened by any terminal disclaimer," in the event that said **prior patent** later:

expires for failure to pay a maintenance fee;
is held unenforceable;
is found invalid by a court of competent jurisdiction;
is statutorily disclaimed in whole or terminally disclaimed under 37 CFR 1.321;
has all claims canceled by a reexamination certificate;
is reissued; or
is in any manner terminated prior to the expiration of its full statutory term as presently shortened by any terminal disclaimer.

Check either box 1 or 2 below, if appropriate.

1. ☐ The undersigned is the applicant. If the applicant is an assignee, the undersigned is authorized to act on behalf of the assignee.

I hereby acknowledge that any willful false statements made are punishable under 18 U.S.C. 1001 by fine or imprisonment of not more than five (5) years, or both.

2. ☑ The undersigned is an attorney or agent of record. Reg. No. 28807

/Karl Bozicevic, Reg. No. 28,807/ — Signature
2 March 2021 — Date

Karl Bozicevic — Typed or printed name

Partner — Title
650-833-7735 — Telephone Number

☑ Terminal disclaimer fee under 37 CFR 1.20(d) included.

WARNING: Information on this form may become public. Credit card information should not be included on this form. Provide credit card information and authorization on PTO-2038.

This collection of information is required by 37 CFR 1.321. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Electronically Filed 3/2/2021

SUPPLEMENTAL INFORMATION DISCLOSURE STATEMENT	Attorney Docket No.	REGN-024CON9
	Confirmation No.	3381
	First Named Inventor	Eric Furfine
	Application Number	16/582,486
	Filing Date	September 25, 2019
	Group Art Unit	1647
Address to: Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Examiner Name	Jon McClelland Lockard
	Title: "*VEGF Antagonist Formulations Suitable for Intravitreal Administration*"	

Sir:

Applicants submit herewith documents which may be material to the examination of this application and in respect of which there may be a duty to disclose in accordance with 37 C.F.R. § 1.56. This submission is not intended to constitute an admission that any document referred to therein is "prior art" for this invention unless specifically designated as such. A listing of the documents is shown on enclosed Form PTO/SB/08A and a copies of the non-U.S.-patents and publications are also enclosed.

The Examiner is requested to make the documents listed on the enclosed PTO/SB/08A of record in this application. Applicants would appreciate the Examiner initialing and returning the initialed copy of form PTO/SB/08A, indicating the documents cited therein have been considered and made of record herein.

Statements

☒ **No statement**

☐ **PTA Statement under 37 CFR § 1.704(d)(1):** Each item of information contained in the information disclosure statement filed herewith:

(i) Was first cited in any communication from a patent office in a counterpart foreign or international application or from the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the information disclosure statement; or

(ii) Is a communication that was issued by a patent office in a counterpart foreign or international application or by the Office, and this communication was not received by any individual designated in § 1.56(c) more than thirty days prior to the filing of the information disclosure statement.

☐ **IDS Statement under 37 CFR § 1.97(e)(1):** Each item of information contained in the information disclosure statement was first cited in any communication from a foreign patent office in a counterpart foreign application not more than three months prior to the filing of the information disclosure statement; or

☐ **IDS Statement under 37 CFR § 1.97(e)(2):** No item of information contained in the information disclosure statement was cited in a communication from a foreign patent office in a counterpart foreign application, and, to the knowledge of the person signing the certification after making reasonable inquiry, no item of information contained in the information disclosure statement was known to any individual designated in § 1.56(c) more than three months prior to the filing of the information disclosure statement.

Fees

☐ No fee is believed to be due.

☒ The appropriate fee set forth in 37 C.F.R. §1.17(p) accompanies this information disclosure statement.

The Commissioner is hereby authorized to charge any underpayment of fees up to a strict limit of $3,000.00 beyond that authorized on the credit card, but not more than $3,000.00 in additional fees due with any communication for the above referenced patent application, including but not limited to any necessary fees for extensions of time, or credit any overpayment of any amount to Deposit Account No. 50-0815, order number REGN-024CON9.

Respectfully submitted,
BOZICEVIC, FIELD & FRANCIS LLP

Date: March 2, 2021

By: /Karl Bozicevic, Reg. No. 28,807/
Karl Bozicevic
Reg. No. 28,807

BOZICEVIC, FIELD & FRANCIS LLP
201 Redwood Shores Parkway, Suite 200
Redwood City, CA 94065
Telephone: (650) 327-3400
Facsimile: (650) 327-3231

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	1647
				Examiner Name	Jon McClelland Lockard
Sheet	1	of	3	Attorney Docket Number	REGN-024CON9

U.S. PATENT DOCUMENTS

Examiner Initial*	Cite No.	Patent Number Number-Kind Code (*if known*)	Issue Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	6,171,586 B1	01/09/2001	Lam *et al.*	
	2	8,110,546 B2	02/07/2012	Dix *et al.*	
	3	10,464,992 B2	11/05/2019	Furfine *et al.*	

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No.	Publication Number **Number-Kind Code** (*if known*)	Publication Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	2003/0113316 A1	06/19/2003	Kaisheva *et al.*	
	2	2003/0138417 A1	07/24/2003	Kaisheva *et al.*	
	3	2004/0197324 A1	10/07/2004	Liu *et al.*	
	4				

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No.	Foreign Document Number Country Code-Number-Kind Code (*if known*)	Publication Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
	1	W0 97/04801	02/13/1997	Genetech, Inc.		
	2					

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	1	Petition for *Inter Partes* Review of U.S. Patent No. 10,464,992, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 59 pgs.	
	2	File History of U.S. Patent No. 10,464,992, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 124 pgs.	
	3	Declaration of Dr. Reiner Gentz, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 76 pgs.	
	4	Fraser *et al.*, "Single Injections of Vascular Endothelial Growth Factor Trap Block Ovulation in the Macaque and Produce a Prolonged, Dose-Related Suppression of Ovarian Function," *J. Clin. Endocrinol. & Metab.*, 90(2):1114-1122 (2004)	
	5	Wulff *et al.*, "Prevention of Thecal Angiogenesis, Antral Follicular Growth, and Ovulation in the Primate by Treatment with Vascular Endothelial Growth Factor Trap R1R2," *Endocrinology*, 143(7):2797-2807 (2002)	
	6	Certificate of Correction dated March 3, 2020, in U.S. Patent No. 10,464,992, 1 pg.	
	7	Holash *et al.*, "VEGF-Trap: A VEGF blocker with potent antitumor effects," *PNAS*, 99(17):11393-11398 (2002)	
	8	Response to Office Action in U.S. Patent Application No. 12/835,065 filed November 22, 2011, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 4 pgs.	
	9	Declaration Pursuant to 37 C.F.R. § 1.131 of Daniel B. Dix, Kelly Frye, and Susan Kautz in Support of Response to Office Action in U.S. Patent Application No. 12/835,065 filed November 22, 2011, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 11 pgs.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	1647
				Examiner Name	Jon McClelland Lockard
Sheet	2	of	3	Attorney Docket Number	REGN-024CON9

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	10	Resume of Reiner Gentz, Ph.D., as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 3 pgs.	
	11	Rudge *et al.*, "VEGF Trap as a Novel Antiangiogenic Treatment Currently in Clinical Trials for Cancer and Eye Diseases, and VelociGene®-based Discovery of the Next Generation of Angiogenesis Targets," *Cold Spring Harbor Symposia on Quantitative Biology*, 70:411-418 (2004)	
	12	Chi *et al.*, "Physical Stability of Proteins in Aqueous Solution: Mechanism and Driving Forces in Nonnative Protein Aggregation," *Pharmaceutical Research*, 20(9):1325-1336 (2003)	
	13	Bontempo, "Preformulation Development of Parenteral Biopharmaceuticals," *Drugs and the Pharmaceutical Sciences*, 85:91-108 (1997)	
	14	"Guidance for Industry Q1A(R2) Stability Testing of New Drug Substances and Products," U.S. Department of Health and Human Services, Food and Drug Administration, Rockville, MD, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 25 pgs.	
	15	Parkins *et al.*, "The formulation of biopharmaceutical products," *Pharmaceutical Science & Technology Today*, 3(4):129-137 (2000)	
	16	Randolph *et al.*, "Surfactant-Protein Interactions," *Rational Design of Stable Protein Formulations*, pp. 159-175, Springer, Boston, MA (2002)	
	17	"Phosphate buffer," Cold Spring Harbor Protocols, 2006:pdb.rec8543, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 1 pg.	
	18	LUCENTIS® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 14 pgs.	
	19	AVASTIN® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 37 pgs.	
	20	REMICADE® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 58 pgs.	
	21	XOLAIR® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 17 pgs.	
	22	RAPTIVA® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 36 pgs.	
	23	SIMULECT® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 7 pgs.	
	24	HERCEPTIN® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 2 pgs.	
	25	Andersen *et al.*, "Recombinant protein expression for therapeutic applications," *Current Opinion in Biotechnology*, 13:117-123 (2002)	
	26	Janeway *et al.*, "The structure of a typical antibody molecule," Immunobiology: The Immune System in Health and Disease, 5th edition, New York: Garland Science, 6 pgs. (2001)	
	27	Drug Vehicle (Code C927), National Cancer Institute (NCI), retrieved January 6, 2021, from <https://ncithesaurus.nci.nih.gov/ncitbrowser/ConceptReport j sp?dictionary=NCI_Thesaurus&ns=ncit&code=C927 >, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 2 pgs.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	1647
				Examiner Name	Jon McClelland Lockard
Sheet	3	of	3	Attorney Docket Number	REGN-024CON9

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	28	Controls in SCI experiments, RegenBase, retrieved January 6, 2021, from <http://regenbase.org/control-groups.html>, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 2 pgs.	
	29		

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

PCT WORLD INTELLECTUAL PROPERTY ORGANIZATION
International Bureau

INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 :
A61K 39/00, 39/395, C07K 1/00

A1

(11) International Publication Number: **WO 97/04801**

(43) International Publication Date: 13 February 1997 (13.02.97)

(21) International Application Number: PCT/US96/12251

(22) International Filing Date: 23 July 1996 (23.07.96)

(30) Priority Data:

08/508,014	27 July 1995 (27.07.95)	US
08/615,369	14 March 1996 (14.03.96)	US

(71) Applicant: GENENTECH, INC. [US/US]; 460 Point San Bruno Boulevard, South San Francisco, CA 94080-4990 (US).

(72) Inventors: ANDYA, James; Apartment D, 227 Richmond Drive, Millbrae, CA 94030 (US). CLELAND, Jeffrey, L.; 844 Cordilleras Avenue, San Carlos, CA 94070 (US). HSU, Chung, C.; 13120 Delson Court, Los Altos Hills, CA 94022 (US). LAM, Xanthe, M.; 280 Denslowe Drive, San Francisco, CA 94132 (US). OVERCASHIER, David, E.; 130 Vallejo Street, El Granada, CA 94018 (US). SHIRE, Steven, J.; 2417 Lincoln Avenue, Belmont, CA 94002 (US). YANG, Janet, Yu-Feng; 1860 Dale Avenue, San Mateo, CA 94401 (US). WU, Sylvia, Sau-Yan; 1438 Filbert Street #203, San Francisco, CA 94109 (US).

(74) Agents: LEE, Wendy, M. et al.; Genentech, Inc., 460 Point San Bruno Boulevard, South San Francisco, CA 94080-4990 (US).

(81) Designated States: AL, AM, AT, AU, AZ, BB, BG, BR, BY, CA, CH, CN, CZ, DE, DK, EE, ES, FI, GB, GE, HU, IL, IS, JP, KE, KG, KP, KR, KZ, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, TJ, TM, TR, TT, UA, UG, UZ, VN, ARIPO patent (KE, LS, MW, SD, SZ, UG), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, ML, MR, NE, SN, TD, TG).

Published
With international search report.
Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.

(54) Title: STABILE ISOTONIC LYOPHILIZED PROTEIN FORMULATION

(57) Abstract

A stable lyophilized protein formulation is described which can be reconstituted with a suitable diluent to generate a high protein concentration reconstituted formulation which is suitable for subcutaneous administration. For example, anti-IgE and anti-HER2 antibody formulations have been prepared by lyophilizing these antibodies in the presence of a lyoprotectant. The lyophilized mixture thus formed is reconstituted to a high protein concentration without apparent loss of stability of the protein.

FOR THE PURPOSES OF INFORMATION ONLY

Codes used to identify States party to the PCT on the front pages of pamphlets publishing international applications under the PCT.

AM	Armenia	**GB**	United Kingdom	**MW**	Malawi
AT	Austria	**GE**	Georgia	**MX**	Mexico
AU	Australia	**GN**	Guinea	**NE**	Niger
BB	Barbados	**GR**	Greece	**NL**	Netherlands
BE	Belgium	**HU**	Hungary	**NO**	Norway
BF	Burkina Faso	**IE**	Ireland	**NZ**	New Zealand
BG	Bulgaria	**IT**	Italy	**PL**	Poland
BJ	Benin	**JP**	Japan	**PT**	Portugal
BR	Brazil	**KE**	Kenya	**RO**	Romania
BY	Belarus	**KG**	Kyrgystan	**RU**	Russian Federation
CA	Canada	**KP**	Democratic People's Republic of Korea	**SD**	Sudan
CF	Central African Republic			**SE**	Sweden
CG	Congo	**KR**	Republic of Korea	**SG**	Singapore
CH	Switzerland	**KZ**	Kazakhstan	**SI**	Slovenia
CI	Côte d'Ivoire	**LI**	Liechtenstein	**SK**	Slovakia
CM	Cameroon	**LK**	Sri Lanka	**SN**	Senegal
CN	China	**LR**	Liberia	**SZ**	Swaziland
CS	Czechoslovakia	**LT**	Lithuania	**TD**	Chad
CZ	Czech Republic	**LU**	Luxembourg	**TG**	Togo
DE	Germany	**LV**	Latvia	**TJ**	Tajikistan
DK	Denmark	**MC**	Monaco	**TT**	Trinidad and Tobago
EE	Estonia	**MD**	Republic of Moldova	**UA**	Ukraine
ES	Spain	**MG**	Madagascar	**UG**	Uganda
FI	Finland	**ML**	Mali	**US**	United States of America
FR	France	**MN**	Mongolia	**UZ**	Uzbekistan
GA	Gabon	**MR**	Mauritania	**VN**	Viet Nam

Stabile isotonic lyophilized protein formulation

Background of the Invention

Field of the Invention

This invention is directed to a lyophilized protein formulation. In particular, it relates to a stable lyophilized protein formulation which can be reconstituted with a diluent to generate a stable reconstituted formulation suitable for subcutaneous administration.

Description of Related Disclosures

In the past ten years, advances in biotechnology have made it possible to produce a variety of proteins for pharmaceutical applications using recombinant DNA techniques. Because proteins are larger and more complex than traditional organic and inorganic drugs (*i.e.* possessing multiple functional groups in addition to complex three-dimensional structures), the formulation of such proteins poses special problems. For a protein to remain biologically active, a formulation must preserve intact the conformational integrity of at least a core sequence of the protein's amino acids while at the same time protecting the protein's multiple functional groups from degradation. Degradation pathways for proteins can involve chemical instability (*i.e.* any process which involves modification of the protein by bond formation or cleavage resulting in a new chemical entity) or physical instability (*i.e.* changes in the higher order structure of the protein). Chemical instability can result from deamidation, racemization, hydrolysis, oxidation, beta elimination or disulfide exchange. Physical instability can result from denaturation, aggregation, precipitation or adsorption, for example. The three most common protein degradation pathways are protein aggregation, deamidation and oxidation. Cleland *et al. Critical Reviews in Therapeutic Drug Carrier Systems* 10(4): 307-377 (1993).

Freeze-drying is a commonly employed technique for preserving proteins which serves to remove water from the protein preparation of interest. Freeze-drying, or lyophilization, is a process by which the material to be dried is first frozen and then the ice or frozen solvent is removed by sublimation in a vacuum environment. An excipient may be included in pre-lyophilized formulations to enhance stability during the freeze-drying process and/or to improve stability of the lyophilized product upon storage. Pikal, M. *Biopharm.* 3(9)26-30 (1990) and Arakawa *et al. Pharm. Res.* 8(3):285-291 (1991).

It is an object of the present invention to provide a lyophilized protein formulation which is stable upon storage and delivery. It is a further object to provide a stable reconstituted protein formulation which is suitable for subcutaneous administration. In certain embodiments, it is an object to provide a multi-use formulation which is stable for at least the time over which it will be administered to a patient.

Summary of the Invention

This invention is based on the discovery that a stable lyophilized protein formulation can be prepared using a lyoprotectant (preferably a sugar such as sucrose or trehalose), which lyophilized formulation can be reconstituted to generate a stable reconstituted formulation having a protein concentration which is significantly higher (*e.g.* from about 2-40 times higher, preferably 3-10 times higher and most preferably 3-6 times higher) than the protein concentration in the pre-lyophilized formulation. In particular, while the protein concentration in the pre-lyophilized formulation may be 5 mg/mL or less, the protein concentration in the reconstituted formulation is generally 50 mg/mL or more. Such high protein concentrations in the reconstituted formulation are considered to be particularly useful where the formulation is intended for subcutaneous administration.

Despite the very high protein concentration in the reconstituted formulation, it has been found that the reconstituted formulation is stable (*i.e.* fails to display significant or unacceptable levels of chemical or physical instability of the protein) at 2-8°C for at least about 30 days. In certain embodiments, the reconstituted formulation is isotonic. In spite of the use of lower concentrations of the lyoprotectant to achieve such isotonic formulations upon reconstitution, it was discovered herein that the protein in the lyophilized formulation essentially retains its physical and chemical stability and integrity upon lyophilization and storage.

When reconstituted with a diluent comprising a preservative (such as bacteriostatic water for injection, BWFI), the reconstituted formulation may be used as a multi-use formulation. Such a formulation is useful, for example, where the patient requires frequent subcutaneous administrations of the protein to treat a chronic medical condition. The advantage of a multi-use formulation is that it facilitates ease of use for the patient, reduces waste by allowing complete use of vial contents, and results in a significant cost savings for the manufacturer since several doses are packaged in a single vial (lower filling and shipping costs).

Based on the observations described herein, in one aspect the invention provides a stable isotonic reconstituted formulation comprising a protein in an amount of at least about 50 mg/mL and a diluent, which reconstituted formulation has been prepared from a lyophilized mixture of a protein and a lyoprotectant, wherein the protein concentration in the reconstituted formulation is about 2-40 times greater than the protein concentration in the mixture before lyophilization.

In another embodiment, the invention provides a stable reconstituted formulation comprising an antibody in an amount of at least about 50 mg/mL and a diluent, which reconstituted formulation has been prepared from a lyophilized mixture of an antibody and a lyoprotectant, wherein the antibody concentration in the reconstituted formulation is about 2-40 times greater than the antibody concentration in the mixture before lyophilization.

The ratio of lyoprotectant:protein in the lyophilized formulation of the preceding paragraphs depends, for example, on both the protein and lyoprotectant of choice, as well as the desired protein concentration and isotonicity of the reconstituted formulation. In the case of a full length antibody (as the protein) and trehalose or sucrose (as the lyoprotectant) for generating a high protein concentration isotonic reconstituted formulation, the ratio may, for example, be about 100-1500 mole trehalose or sucrose:1 mole antibody.

Generally, the pre-lyophilized formulation of the protein and lyoprotectant will further include a buffer which provides the formulation at a suitable pH, depending on the protein in the formulation. For this purpose, it has been found to be desirable to use a histidine buffer in that, as demonstrated below, this appears to have lyoprotective properties.

The formulation may further include a surfactant (*e.g.* a polysorbate) in that it has been observed herein that this can reduce aggregation of the reconstituted protein and/or reduce the formation of particulates in the reconstituted formulation. The surfactant can be added to the pre-lyophilized formulation, the lyophilized formulation and/or the reconstituted formulation (but preferably the pre-lyophilized formulation) as desired.

The invention further provides a method for preparing a stable isotonic reconstituted formulation comprising reconstituting a lyophilized mixture of a protein and a lyoprotectant in a diluent such that the protein concentration in the reconstituted formulation is at least 50 mg/mL, wherein the protein concentration in the

reconstituted formulation is about 2-40 times greater than the protein concentration in the mixture before lyophilization.

In yet a further embodiment, the invention provides a method for preparing a formulation comprising the steps of: (a) lyophilizing a mixture of a protein and a lyoprotectant; and (b) reconstituting the lyophilized mixture of step (a) in a diluent such that the reconstituted formulation is isotonic and stable and has a protein concentration of at least about 50 mg/mL. For example, the protein concentration in the reconstituted formulation may be from about 80 mg/mL to about 300 mg/mL. Generally, the protein concentration in the reconstituted formulation is about 2-40 times greater than the protein concentration in the mixture before lyophilization.

An article of manufacture is also provided herein which comprises: (a) a container which holds a lyophilized mixture of a protein and a lyoprotectant; and (b) instructions for reconstituting the lyophilized mixture with a diluent to a protein concentration in the reconstituted formulation of at least about 50 mg/mL. The article of manufacture may further comprise a second container which holds a diluent (*e.g.* bacteriostatic water for injection (BWFI) comprising an aromatic alcohol).

The invention further provides a method for treating a mammal comprising administering a therapeutically effective amount of a reconstituted formulation disclosed herein to a mammal, wherein the mammal has a disorder requiring treatment with the protein in the formulation. For example, the formulation may be administered subcutaneously.

One useful anti-HER2 antibody pre-lyophilized formulation as discovered in the experiments detailed below was found to comprise anti-HER2 in amount from about 5-40 mg/mL (*e.g.* 20-30 mg/mL) and sucrose or trehalose in an amount from about 10-100 mM (*e.g.* 40-80 mM), a buffer (*e.g.* histidine, pH 6 or succinate, pH 5) and a surfactant (*e.g.* a polysorbate). The lyophilized formulation was found to be stable at 40°C for at least 3 months and stable at 30°C for at least 6 months. This anti-HER2 formulation can be reconstituted with a diluent to generate a formulation suitable for intravenous administration comprising anti-HER2 in an amount from about 10-30 mg/mL which is stable at 2-8°C for at least about 30 days. Where higher concentrations of the anti-HER2 antibody are desired (for example where subcutaneous delivery of the antibody is the intended mode of administration to the patient), the lyophilized formulation may be reconstituted to yield a stable reconstituted formulation having a protein concentration of 50 mg/mL or more.

One desirable anti-IgE antibody pre-lyophilized formulation discovered herein has anti-IgE in amount from about 5-40 mg/mL (*e.g.* 20-30 mg/mL) and sucrose or trehalose in an amount from about 60-300 mM (*e.g.* 80-170 mM), a buffer (preferably histidine, pH 6) and a surfactant (such as a polysorbate). The lyophilized anti-IgE formulation is stable at 30°C for at least 1 year. This formulation can be reconstituted to yield a formulation comprising anti-IgE in an amount from about 15-45 mg/mL (*e.g.* 15-25 mg/mL) suitable for intravenous administration which is stable at 2-8°C for at least 1 year. Alternatively, where higher concentrations of anti-IgE in the formulation are desired, the lyophilized formulation can be reconstituted in order to generate a stable formulation having an anti-IgE concentration of ≥50 mg/mL.

Brief Description of the Drawings

Figure 1 shows the effect of reconstitution volume on the stability of lyophilized rhuMAb HER2. The lyophilized formulation was prepared from a pre-lyophilization formulation comprising 25 mg/mL protein, 60

mM trehalose, 5 mM sodium succinate, pH 5.0, and 0.01% Tween 20™. The lyophilized cake was incubated at 40°C and then reconstituted with 4.0 (○) or 20.0 mL (●) of BWFI. The fraction of intact protein in the reconstituted formulation was measured by native size exclusion chromatography and defined as the peak area of the native protein relative to the total peak area including aggregates.

Figure 2 illustrates the effect of trehalose concentration on the stability of lyophilized rhuMAb HER2. The protein was lyophilized at 25 mg/mL in 5 mM sodium succinate, pH 5.0 (circles) or 5 mM histidine, pH 6.0 (squares) and trehalose concentrations ranging from 60 mM (360 molar ratio) to 200 mM (1200 molar ratio). The lyophilized protein was incubated at 40°C for either 30 days (closed symbols) or 91 days (open symbols). The amount of intact protein was measured after reconstitution of the lyophilized protein with 20 mL BWFI.

Figure 3 demonstrates the effect of trehalose concentration on the long term stability of lyophilized rhuMAb HER2 stored at 40°C. The protein was lyophilized at either 25 mg/mL in 5 mM sodium succinate, pH 5.0, 0.01% Tween 20™, and 60 mM trehalose (■) or 5 mM histidine, pH 6.0, 0.01% Tween 20™, and 60 mM trehalose (□) or 21 mg/mL in 10 mM sodium succinate, pH 5.0, 0.2% Tween 20™ and 250 mM trehalose (●). The lyophilized protein was incubated at 40°C and then reconstituted with 20 mL of BWFI. The amount of intact protein was measured after reconstitution.

Figure 4 shows the stability of rhuMAb HER2 lyophilized in 38.4 mM mannitol (7 mg/mL), 20.4 mM sucrose (7 mg/mL), 5 mM histidine, pH 6.0, 0.01% Tween 20™. The lyophilized protein was incubated at 40°C and then reconstituted with either 4.0 mL (○) or 20 mL (●) of BWFI. The amount of intact protein was measured after reconstitution.

Figure 5 demonstrates stability of reconstituted rhuMAb HER2 lyophilized in 5 mM sodium succinate, pH 5.0, 60 mM trehalose, 0.01% Tween 20™. Samples were reconstituted with either 4.0 mL (squares) or 20.0 mL (circles) of BWFI (20 mL:0.9% benzyl alcohol; 4 mL:1.1% benzyl alcohol) and then stored at 5°C (solid symbols) or 25°C (open symbols). The % native protein was defined as the peak area of the native (not degraded) protein relative to the total peak area as measured by cation exchange chromatography.

Figure 6 shows stability of reconstituted rhuMAb HER2 lyophilized in 5 mM histidine, pH 6.0, 60 mM trehalose, 0.01% Tween 20. Samples were reconstituted with either 4.0 mL (squares) or 20.0 mL (circles) of BWFI (20 mL:0.9% benzyl alcohol; 4 mL:1.1% benzyl alcohol) and then stored at 5°C (solid symbols) or 25 °C (open symbols). The % native protein was defined as the peak area of the native (not degraded) protein relative to the total peak area as measured by cation exchange chromatography.

Figure 7 reveals stability of reconstituted rhuMAb HER2 lyophilized in 5 mM histidine, pH 6.0, 38.4 mM mannitol, 20.4 mM sucrose, 0.01% Tween 20. Samples were reconstituted with either 4.0 mL (squares) or 20.0 mL (circles) of BWFI (20 mL:0.9% benzyl alcohol; 4 mL:1.1% benzyl alcohol) and then stored at 5°C (solid symbols) or 25 °C (open symbols). The % native protein was defined as the peak area of the native (not degraded) protein relative to the total peak area as measured by cation exchange chromatography.

Figure 8 shows stability of reconstituted rhuMAb HER2 lyophilized in 10 mM sodium succinate, pH 5.0, 250 mM trehalose, 0.2% Tween 20. Samples were reconstituted with 20.0 mL of BWFI (0.9% benzyl alcohol) and then stored at 5°C (●) or 25 °C (○). The % native protein was defined as the peak area of the native (not degraded) protein relative to the total peak area as measured by cation exchange chromatography.

Figure 9 shows aggregation of rhuMAb E25 formulated into buffers ranging from pH 5 to pH 7 at 10 mM buffer concentration and 5 mg/mL antibody concentration. Samples were lyophilized and assayed at time zero and after 4 weeks, 8 weeks, and 52 weeks of storage at 2-8°C. The buffers were: potassium phosphate pH 7.0 (○); sodium phosphate pH 7.0 (□); histidine pH 7.0 (◇); sodium succinate pH 6.5 (●); sodium succinate pH 6.0 (■); sodium succinate pH 5.5 (♦); and sodium succinate pH 5.0 (▲).

Figure 10 depicts aggregation of rhuMAb E25 lyophilized in 5 mM histidine buffer at both pH 6 and pH 7 and assayed following storage as follows. The buffer was at: pH 6.0 stored at 2-8°C (○); pH 6 stored at 25°C (□); pH 6 stored at 40°C (◇); pH 7 stored at 2-8°C (●); pH 7 stored at 25°C (■); and pH 7 stored at 40°C (♦).

Figure 11 illustrates aggregation of 5 mg/mL rhuMAb E25 formulated into 10 mM sodium succinate at pH 5.0 with lyoprotectant added at a concentration of 275 mM (isotonic). The lyoprotectants were: control, no lyoprotectant (○); mannitol (□); lactose (◇); maltose (●); trehalose (■); and sucrose (♦). Samples were lyophilized and assayed at time zero and after 4 weeks, 8 weeks, and 52 weeks of storage at 2-8°C.

Figure 12 shows aggregation of 5 mg/mL rhuMAb E25 formulated into 10 mM sodium succinate at pH 5.0 with lyoprotectant added at a concentration of 275 mM (isotonic). The lyoprotectants were: control, no lyoprotectant (○); mannitol (□); lactose (◇); maltose (●); trehalose (■); and sucrose (♦). Samples were lyophilized and assayed at time zero and after 4 weeks, 8 weeks, and 52 weeks of storage at 40°C.

Figure 13 depicts hydrophobic interaction chromatography of 20 mg/mL rhuMAb E25 lyophilized in histidine buffer at pH 6 with an isotonic concentration (*i.e.* 275 mM) of lactose stored for 24 weeks at 2-8, 25 or 40°C and reconstituted to 20 mg/mL.

Figure 14 shows hydrophobic interaction chromatography of 20 mg/mL rhuMAb E25 lyophilized in histidine buffer at pH 6 stored for 24 weeks at 2-8, 25 or 40°C and reconstituted to 20 mg/mL.

Figure 15 illustrates hydrophobic interaction chromatography of 20 mg/mL rhuMAb E25 lyophilized in histidine buffer at pH 6 with an isotonic concentration (*i.e.* 275 mM) of sucrose and stored for 24 weeks at 2-8, 25 or 40°C and reconstituted to 20 mg/mL.

Figure 16 illustrates the effect of sugar concentration on rhuMAb E25 formulated at 20 mg/mL in 5 mM histidine at pH 6.0. Sucrose (●) and trehalose (□) were added to the formulation at molar ratios ranging from 0 to 2010 (isotonic) (see Table 1 below). Samples were lyophilized and assayed after 12 weeks of storage at 50°C.

TABLE 1

Moles of Sugar: E25 antibody	Sugar conc. (mM)
0	0
260	34.4
380	51.6
510	68.8
760	103.1
1020	137.5
1530	206.3

2010	275

Figure 17 reveals aggregation of rhuMAb E25 formulated at 25 mg/mL into 5 mM histidine at pH 6 with 85 mM sucrose (○); 85 mM trehalose (□); 161 mM sucrose (♦) or 161 mM trehalose (▲). Samples were lyophilized and stored at 2-8° C followed by reconstitution with 0.9% benzyl alcohol to 100 mg/mL antibody in 20 mM histidine at pH 6 with isotonic (340 mM) and hypertonic (644 mM) sugar concentration.

Figure 18 shows aggregation of rhuMAb E25 formulated at 25 mg/mL into 5 mM histidine at pH 6 with 85 mM sucrose (○); 85 mM trehalose (□); 161 mM sucrose (♦) or 161 mM trehalose (▲). Samples were lyophilized and stored at 30° C followed by reconstitution with 0.9% benzyl alcohol to 100 mg/mL antibody in 20 mM histidine at pH 6 with isotonic (340 mM) and hypertonic (644 mM) sugar concentration.

Figure 19 illustrates aggregation of rhuMAb E25 formulated at 25 mg/mL into 5 mM histidine at pH 6 with 85 mM sucrose (○); 85 mM trehalose (□); 161 mM sucrose (♦) or 161 mM trehalose (▲). Samples were lyophilized and stored at 50° C followed by reconstitution with 0.9% benzyl alcohol to 100 mg/mL antibody in 20 mM histidine at pH 6 with isotonic (340 mM) and hypertonic (644 mM) sugar concentration.

Detailed Description of the Preferred Embodiments

I. Definitions

By "protein" is meant a sequence of amino acids for which the chain length is sufficient to produce the higher levels of tertiary and/or quaternary structure. This is to distinguish from "peptides" or other small molecular weight drugs that do not have such structure. Typically, the protein herein will have a molecular weight of at least about 15-20 kD, preferably at least about 20 kD.

Examples of proteins encompassed within the definition herein include mammalian proteins, such as, *e.g.*, growth hormone, including human growth hormone and bovine growth hormone; growth hormone releasing factor; parathyroid hormone; thyroid stimulating hormone; lipoproteins; α-1-antitrypsin; insulin A-chain; insulin B-chain; proinsulin; follicle stimulating hormone; calcitonin; luteinizing hormone; glucagon; clotting factors such as factor VIIIC, factor IX, tissue factor, and von Willebrands factor; anti-clotting factors such as Protein C; atrial natriuretic factor; lung surfactant; a plasminogen activator, such as urokinase or tissue-type plasminogen activator (t-PA); bombazine; thrombin; tumor necrosis factor-α and -β; enkephalinase; RANTES (regulated on activation normally T-cell expressed and secreted); human macrophage inflammatory protein (MIP-1-α); serum albumin such as human serum albumin; mullerian-inhibiting substance; relaxin A-chain; relaxin B-chain; prorelaxin; mouse gonadotropin-associated peptide; DNase; inhibin; activin; vascular endothelial growth factor (VEGF); receptors for hormones or growth factors; an integrin; protein A or D; rheumatoid factors; a neurotrophic factor such as bone-derived neurotrophic factor (BDNF), neurotrophin-3, -4, -5, or -6 (NT-3, NT-4, NT-5, or NT-6), or a nerve growth factor such as NGF-β; platelet-derived growth factor (PDGF); fibroblast growth factor such as aFGF and bFGF; epidermal growth factor (EGF); transforming growth factor (TGF) such as TGF-α and TGF-β, including TGF-β1, TGF-β2, TGF-β3, TGF-β4, or TGF-β5; insulin-like growth factor-I and -II (IGF-I and IGF-II); des(1-3)-IGF-I (brain IGF-I); insulin-like growth factor binding proteins; CD proteins such as CD3, CD4, CD8, CD19 and CD20; erythropoietin (EPO); thrombopoietin (TPO); osteoinductive factors; immunotoxins; a bone morphogenetic protein (BMP); an interferon such as interferon-α, -β, and -γ; colony stimulating factors (CSFs), *e.g.*, M-CSF, GM-CSF, and G-CSF; interleukins (ILs), *e.g.*, IL-1 to IL-10; superoxide

dismutase; T-cell receptors; surface membrane proteins; decay accelerating factor (DAF); a viral antigen such as, for example, a portion of the AIDS envelope; transport proteins; homing receptors; addressins; regulatory proteins; immunoadhesins; antibodies; and biologically active fragments or variants of any of the above-listed polypeptides.

The protein which is formulated is preferably essentially pure and desirably essentially homogeneous (*i.e.* free from contaminating proteins etc). "Essentially pure" protein means a composition comprising at least about 90% by weight of the protein, based on total weight of the composition, preferably at least about 95% by weight. "Essentially homogeneous" protein means a composition comprising at least about 99% by weight of protein, based on total weight of the composition.

In certain embodiments, the protein is an antibody. The antibody may bind to any of the above-mentioned molecules, for example. Exemplary molecular targets for antibodies encompassed by the present invention include CD proteins such as CD3, CD4, CD8, CD19, CD20 and CD34; members of the HER receptor family such as the EGF receptor, HER2, HER3 or HER4 receptor; cell adhesion molecules such as LFA-1, Mo1, p150,95, VLA-4, ICAM-1, VCAM and αv/β3 integrin including either α or β subunits thereof (*e.g.* anti-CD11a, anti-CD18 or anti-CD11b antibodies); growth factors such as VEGF; IgE; blood group antigens; flk2/flt3 receptor; obesity (OB) receptor; protein C etc.

The term "antibody" is used in the broadest sense and specifically covers monoclonal antibodies (including full length antibodies which have an immunoglobulin Fc region), antibody compositions with polyepitopic specificity, bispecific antibodies, diabodies, and single-chain molecules, as well as antibody fragments (*e.g.*, Fab, $F(ab')_2$, and Fv).

The term "monoclonal antibody" as used herein refers to an antibody obtained from a population of substantially homogeneous antibodies, *i.e.*, the individual antibodies comprising the population are identical except for possible naturally occurring mutations that may be present in minor amounts. Monoclonal antibodies are highly specific, being directed against a single antigenic site. Furthermore, in contrast to conventional (polyclonal) antibody preparations which typically include different antibodies directed against different determinants (epitopes), each monoclonal antibody is directed against a single determinant on the antigen. In addition to their specificity, the monoclonal antibodies are advantageous in that they are synthesized by the hybridoma culture, uncontaminated by other immunoglobulins. The modifier "monoclonal" indicates the character of the antibody as being obtained from a substantially homogeneous population of antibodies, and is not to be construed as requiring production of the antibody by any particular method. For example, the monoclonal antibodies to be used in accordance with the present invention may be made by the hybridoma method first described by Kohler *et al., Nature*, 256: 495 (1975), or may be made by recombinant DNA methods (see, *e.g.*, U.S. Patent No. 4,816,567). The "monoclonal antibodies" may also be isolated from phage antibody libraries using the techniques described in Clackson *et al., Nature,* 352:624-628 (1991) and Marks *et al., J. Mol. Biol.*, 222:581-597 (1991), for example.

The monoclonal antibodies herein specifically include "chimeric" antibodies (immunoglobulins) in which a portion of the heavy and/or light chain is identical with or homologous to corresponding sequences in antibodies derived from a particular species or belonging to a particular antibody class or subclass, while the remainder of the chain(s) is identical with or homologous to corresponding sequences in antibodies derived from

another species or belonging to another antibody class or subclass, as well as fragments of such antibodies, so long as they exhibit the desired biological activity (U.S. Patent No. 4,816,567; Morrison *et al., Proc. Natl. Acad. Sci. USA*, 81:6851-6855 (1984)).

"Humanized" forms of non-human (*e.g.*, murine) antibodies are chimeric immunoglobulins, immunoglobulin chains or fragments thereof (such as Fv, Fab, Fab', $F(ab')_2$ or other antigen-binding subsequences of antibodies) which contain minimal sequence derived from non-human immunoglobulin. For the most part, humanized antibodies are human immunoglobulins (recipient antibody) in which residues from a complementarity determining region (CDR) of the recipient are replaced by residues from a CDR of a non-human species (donor antibody) such as mouse, rat or rabbit having the desired specificity, affinity, and capacity. In some instances, Fv framework region (FR) residues of the human immunoglobulin are replaced by corresponding non-human residues. Furthermore, humanized antibodies may comprise residues which are found neither in the recipient antibody nor in the imported CDR or framework sequences. These modifications are made to further refine and optimize antibody performance. In general, the humanized antibody will comprise substantially all of at least one, and typically two, variable domains, in which all or substantially all of the CDR regions correspond to those of a non-human immunoglobulin and all or substantially all of the FR regions are those of a human immunoglobulin sequence. The humanized antibody optimally also will comprise at least a portion of an immunoglobulin constant region (Fc), typically that of a human immunoglobulin. For further details, see Jones *et al., Nature*, 321:522-525 (1986); Reichmann *et al., Nature*, 332:323-329 (1988); and Presta, *Curr. Op. Struct. Biol.*, 2:593-596 (1992). The humanized antibody includes a Primatized™ antibody wherein the antigen-binding region of the antibody is derived from an antibody produced by immunizing macaque monkeys with the antigen of interest.

A "stable" formulation is one in which the protein therein essentially retains its physical and chemical stability and integrity upon storage. Various analytical techniques for measuring protein stability are available in the art and are reviewed in *Peptide and Protein Drug Delivery*, 247-301, Vincent Lee Ed., Marcel Dekker, Inc., New York, New York, Pubs. (1991) and Jones, A. *Adv. Drug Delivery Rev.* 10: 29-90 (1993). Stability can be measured at a selected temperature for a selected time period. For rapid screening, the formulation may be kept at 40°C for 2 weeks to 1 month, at which time stability is measured. Where the formulation is to be stored at 2-8°C, generally the formulation should be stable at 30°C or 40°C for at least 1 month and/or stable at 2-8°C for at least 2 years. Where the formulation is to be stored at 30°C, generally the formulation should be stable for at least 2 years at 30°C and/or stable at 40°C for at least 6 months. For example, the extent of aggregation following lyophilization and storage can be used as an indicator of protein stability (see Examples herein). For example, a "stable" formulation may be one wherein less than about 10% and preferably less than about 5% of the protein is present as an aggregate in the formulation. In other embodiments, any increase in aggregate formation following lyophilization and storage of the lyophilized formulation can be determined. For example, a "stable" lyophilized formulation may be one wherein the increase in aggregate in the lyophilized formulation is less than about 5% and preferably less than about 3%, when the lyophilized formulation is stored at 2-8° C for at least one year. In other embodiments, stability of the protein formulation may be measured using a biological activity assay (see, *e.g.*, Example 2 below).

A "reconstituted" formulation is one which has been prepared by dissolving a lyophilized protein formulation in a diluent such that the protein is dispersed in the reconstituted formulation. The reconstituted formulation in suitable for administration (*e.g.* parenteral administration) to a patient to be treated with the protein of interest and, in certain embodiments of the invention, may be one which is suitable for subcutaneous administration.

By "isotonic" is meant that the formulation of interest has essentially the same osmotic pressure as human blood. Isotonic formulations will generally have an osmotic pressure from about 250 to 350mOsm. Isotonicity can be measured using a vapor pressure or ice-freezing type osmometer, for example.

A "lyoprotectant" is a molecule which, when combined with a protein of interest, significantly prevents or reduces chemical and/or physical instability of the protein upon lyophilization and subsequent storage. Exemplary lyoprotectants include sugars such as sucrose or trehalose; an amino acid such as monosodium glutamate or histidine; a methylamine such as betaine; a lyotropic salt such as magnesium sulfate; a polyol such as trihydric or higher sugar alcohols, *e.g.* glycerin, erythritol, glycerol, arabitol, xylitol, sorbitol, and mannitol; propylene glycol; polyethylene glycol; Pluronics; and combinations thereof. The preferred lyoprotectant is a non-reducing sugar, such as trehalose or sucrose.

The lyoprotectant is added to the pre-lyophilized formulation in a "lyoprotecting amount" which means that, following lyophilization of the protein in the presence of the lyoprotecting amount of the lyoprotectant, the protein essentially retains its physical and chemical stability and integrity upon lyophilization and storage.

The "diluent" of interest herein is one which is pharmaceutically acceptable (safe and non-toxic for administration to a human) and is useful for the preparation of a reconstituted formulation. Exemplary diluents include sterile water, bacteriostatic water for injection (BWFI), a pH buffered solution (*e.g.* phosphate-buffered saline), sterile saline solution, Ringer's solution or dextrose solution.

A "preservative" is a compound which can be added to the diluent to essentially reduce bacterial action in the reconstituted formulation, thus facilitating the production of a multi-use reconstituted formulation, for example. Examples of potential preservatives include octadecyldimethylbenzyl ammonium chloride, hexamethonium chloride, benzalkonium chloride (a mixture of alkylbenzyldimethylammonium chlorides in which the alkyl groups are long-chain compounds), and benzethonium chloride. Other types of preservatives include aromatic alcohols such as phenol, butyl and benzyl alcohol, alkyl parabens such as methyl or propyl paraben, catechol, resorcinol, cyclohexanol, 3-pentanol, and m-cresol. The most preferred preservative herein is benzyl alcohol.

A "bulking agent" is a compound which adds mass to the lyophilized mixture and contributes to the physical structure of the lyophilized cake (*e.g.* facilitates the production of an essentially uniform lyophilized cake which maintains an open pore structure). Exemplary bulking agents include mannitol, glycine, polyethylene glycol and xorbitol.

"Treatment" refers to both therapeutic treatment and prophylactic or preventative measures. Those in need of treatment include those already with the disorder as well as those in which the disorder is to be prevented.

"Mammal" for purposes of treatment refers to any animal classified as a mammal, including humans, domestic and farm animals, and zoo, sports, or pet animals, such as dogs, horses, cats, cows, *etc.* Preferably, the mammal is human.

A "disorder" is any condition that would benefit from treatment with the protein. This includes chronic and acute disorders or diseases including those pathological conditions which predispose the mammal to the disorder in question. Non-limiting examples of disorders to be treated herein include carcinomas and allergies.

II. Modes for Carrying out the Invention

A. Protein Preparation

The protein to be formulated is prepared using techniques which are well established in the art including synthetic techniques (such as recombinant techniques and peptide synthesis or a combination of these techniques) or may be isolated from an endogenous source of the protein. In certain embodiments of the invention, the protein of choice is an antibody. Techniques for the production of antibodies follow.

(i) Polyclonal antibodies.

Polyclonal antibodies are generally raised in animals by multiple subcutaneous (sc) or intraperitoneal (ip) injections of the relevant antigen and an adjuvant. It may be useful to conjugate the relevant antigen to a protein that is immunogenic in the species to be immunized, *e.g.*, keyhole limpet hemocyanin, serum albumin, bovine thyroglobulin, or soybean trypsin inhibitor using a bifunctional or derivatizing agent, for example, maleimidobenzoyl sulfosuccinimide ester (conjugation through cysteine residues), N-hydroxysuccinimide (through lysine residues), glutaraldehyde, succinic anhydride, $SOCl_2$, or $R^1N=C=NR$, where R and R^1 are different alkyl groups.

Animals are immunized against the antigen, immunogenic conjugates, or derivatives by combining 1 mg or 1 µg of the peptide or conjugate (for rabbits or mice, respectively) with 3 volumes of Freund's complete adjuvant. One month later the animals are boosted with 1/5 to 1/10 the original amount of peptide or conjugate in Freund's complete adjuvant by subcutaneous injection at multiple sites. Seven to 14 days later the animals are bled and the serum is assayed for antibody titer. Animals are boosted until the titer plateaus. Preferably, the animal is boosted with the conjugate of the same antigen, but conjugated to a different protein and/or through a different cross-linking reagent. Conjugates also can be made in recombinant cell culture as protein fusions. Also, aggregating agents such as alum are suitably used to enhance the immune response.

(ii) Monoclonal antibodies.

Monoclonal antibodies are obtained from a population of substantially homogeneous antibodies, *i.e.*, the individual antibodies comprising the population are identical except for possible naturally occurring mutations that may be present in minor amounts. Thus, the modifier "monoclonal" indicates the character of the antibody as not being a mixture of discrete antibodies.

For example, the monoclonal antibodies may be made using the hybridoma method first described by Kohler *et al., Nature,* 256:495 (1975), or may be made by recombinant DNA methods (U.S. Patent No. 4,816,567).

In the hybridoma method, a mouse or other appropriate host animal, such as a hamster, is immunized as hereinabove described to elicit lymphocytes that produce or are capable of producing antibodies that will specifically bind to the protein used for immunization. Alternatively, lymphocytes may be immunized *in vitro*. Lymphocytes then are fused with myeloma cells using a suitable fusing agent, such as polyethylene glycol, to form a hybridoma cell (Goding, *Monoclonal Antibodies: Principles and Practice*, pp.59-103 (Academic Press, 1986)).

The hybridoma cells thus prepared are seeded and grown in a suitable culture medium that preferably contains one or more substances that inhibit the growth or survival of the unfused, parental myeloma cells. For example, if the parental myeloma cells lack the enzyme hypoxanthine guanine phosphoribosyl transferase (HGPRT or HPRT), the culture medium for the hybridomas typically will include hypoxanthine, aminopterin, and thymidine (HAT medium), which substances prevent the growth of HGPRT-deficient cells.

Preferred myeloma cells are those that fuse efficiently, support stable high-level production of antibody by the selected antibody-producing cells, and are sensitive to a medium such as HAT medium. Among these, preferred myeloma cell lines are murine myeloma lines, such as those derived from MOPC-21 and MPC-11 mouse tumors available from the Salk Institute Cell Distribution Center, San Diego, California USA, and SP-2 cells available from the American Type Culture Collection, Rockville, Maryland USA. Human myeloma and mouse-human heteromyeloma cell lines also have been described for the production of human monoclonal antibodies (Kozbor, *J. Immunol.*, 133:3001 (1984); Brodeur *et al., Monoclonal Antibody Production Techniques and Applications*, pp. 51-63 (Marcel Dekker, Inc., New York, 1987)).

Culture medium in which hybridoma cells are growing is assayed for production of monoclonal antibodies directed against the antigen. Preferably, the binding specificity of monoclonal antibodies produced by hybridoma cells is determined by immunoprecipitation or by an *in vitro* binding assay, such as radioimmunoassay (RIA) or enzyme-linked immunoabsorbent assay (ELISA).

The binding affinity of the monoclonal antibody can, for example, be determined by the Scatchard analysis of Munson *et al., Anal. Biochem.*, 107:220 (1980).

After hybridoma cells are identified that produce antibodies of the desired specificity, affinity, and/or activity, the clones may be subcloned by limiting dilution procedures and grown by standard methods (Goding, *Monoclonal Antibodies: Principles and Practice*, pp.59-103 (Academic Press, 1986)). Suitable culture media for this purpose include, for example, D-MEM or RPMI-1640 medium. In addition, the hybridoma cells may be grown *in vivo* as ascites tumors in an animal.

The monoclonal antibodies secreted by the subclones are suitably separated from the culture medium, ascites fluid, or serum by conventional immunoglobulin purification procedures such as, for example, protein A-Sepharose, hydroxylapatite chromatography, gel electrophoresis, dialysis, or affinity chromatography.

DNA encoding the monoclonal antibodies is readily isolated and sequenced using conventional procedures (*e.g.*, by using oligonucleotide probes that are capable of binding specifically to genes encoding the heavy and light chains of murine antibodies). The hybridoma cells serve as a preferred source of such DNA. Once isolated, the DNA may be placed into expression vectors, which are then transfected into host cells such as *E. coli* cells, simian COS cells, Chinese hamster ovary (CHO) cells, or myeloma cells that do not otherwise produce immunoglobulin protein, to obtain the synthesis of monoclonal antibodies in the recombinant host cells. Review articles on recombinant expression in bacteria of DNA encoding the antibody include Skerra *et al., Curr. Opinion in Immunol.*, 5:256-262 (1993) and Plückthun, *Immunol. Revs.*, 130:151-188 (1992).

In a further embodiment, antibodies can be isolated from antibody phage libraries generated using the techniques described in McCafferty *et al., Nature*, 348:552-554 (1990). Clackson *et al., Nature*, 352:624-628 (1991) and Marks *et al., J. Mol. Biol.*, 222:581-597 (1991) describe the isolation of murine and human antibodies, respectively, using phage libraries. Subsequent publications describe the production of high affinity

(nM range) human antibodies by chain shuffling (Marks *et al.*, *Bio/Technology*, 10:779-783 (1992)), as well as combinatorial infection and *in vivo* recombination as a strategy for constructing very large phage libraries (Waterhouse *et al.*, *Nuc. Acids. Res.*, 21:2265-2266 (1993)). Thus, these techniques are viable alternatives to traditional monoclonal antibody hybridoma techniques for isolation of monoclonal antibodies.

The DNA also may be modified, for example, by substituting the coding sequence for human heavy- and light-chain constant domains in place of the homologous murine sequences (U.S. Patent No. 4,816,567; Morrison, *et al.*, *Proc. Natl Acad. Sci. USA*, 81:6851 (1984)), or by covalently joining to the immunoglobulin coding sequence all or part of the coding sequence for a non-immunoglobulin polypeptide.

Typically such non-immunoglobulin polypeptides are substituted for the constant domains of an antibody, or they are substituted for the variable domains of one antigen-combining site of an antibody to create a chimeric bivalent antibody comprising one antigen-combining site having specificity for an antigen and another antigen-combining site having specificity for a different antigen.

Chimeric or hybrid antibodies also may be prepared *in vitro* using known methods in synthetic protein chemistry, including those involving crosslinking agents. For example, immunotoxins may be constructed using a disulfide-exchange reaction or by forming a thioether bond. Examples of suitable reagents for this purpose include iminothiolate and methyl-4-mercaptobutyrimidate. *(iii)*

Humanized and human antibodies.

Methods for humanizing non-human antibodies are well known in the art. Generally, a humanized antibody has one or more amino acid residues introduced into it from a source which is non-human. These non-human amino acid residues are often referred to as "import" residues, which are typically taken from an "import" variable domain. Humanization can be essentially performed following the method of Winter and co-workers (Jones *et al.*, *Nature*, 321:522-525 (1986); Riechmann *et al.*, *Nature*, 332:323-327 (1988); Verhoeyen *et al.*, *Science*, 239:1534-1536 (1988)), by substituting rodent CDRs or CDR sequences for the corresponding sequences of a human antibody. Accordingly, such "humanized" antibodies are chimeric antibodies (U.S. Patent No. 4,816,567), wherein substantially less than an intact human variable domain has been substituted by the corresponding sequence from a non-human species. In practice, humanized antibodies are typically human antibodies in which some CDR residues and possibly some FR residues are substituted by residues from analogous sites in rodent antibodies.

The choice of human variable domains, both light and heavy, to be used in making the humanized antibodies is very important to reduce antigenicity. According to the so-called "best-fit" method, the sequence of the variable domain of a rodent antibody is screened against the entire library of known human variable-domain sequences. The human sequence which is closest to that of the rodent is then accepted as the human framework (FR) for the humanized antibody (Sims *et al.*, *J. Immunol.*, 151:2296 (1993); Chothia *et al.*, *J. Mol. Biol.*, 196:901 (1987)). Another method uses a particular framework derived from the consensus sequence of all human antibodies of a particular subgroup of light or heavy chains. The same framework may be used for several different humanized antibodies (Carter *et al.*, *Proc. Natl. Acad. Sci. USA*, 89:4285 (1992); Presta *et al.*, *J. Immnol.*, 151:2623 (1993)).

It is further important that antibodies be humanized with retention of high affinity for the antigen and other favorable biological properties. To achieve this goal, according to a preferred method, humanized

antibodies are prepared by a process of analysis of the parental sequences and various conceptual humanized products using three-dimensional models of the parental and humanized sequences. Three-dimensional immunoglobulin models are commonly available and are familiar to those skilled in the art. Computer programs are available which illustrate and display probable three-dimensional conformational structures of selected candidate immunoglobulin sequences. Inspection of these displays permits analysis of the likely role of the residues in the functioning of the candidate immunoglobulin sequence, *i.e.*, the analysis of residues that influence the ability of the candidate immunoglobulin to bind its antigen. In this way, FR residues can be selected and combined from the recipient and import sequences so that the desired antibody characteristic, such as increased affinity for the target antigen(s), is achieved. In general, the CDR residues are directly and most substantially involved in influencing antigen binding.

Alternatively, it is now possible to produce transgenic animals (*e.g.*, mice) that are capable, upon immunization, of producing a full repertoire of human antibodies in the absence of endogenous immunoglobulin production. For example, it has been described that the homozygous deletion of the antibody heavy-chain joining region (J_H) gene in chimeric and germ-line mutant mice results in complete inhibition of endogenous antibody production. Transfer of the human germ-line immunoglobulin gene array in such germ-line mutant mice will result in the production of human antibodies upon antigen challenge. See, *e.g.*, Jakobovits *et al.*, *Proc. Natl. Acad. Sci. USA*, 90:2551 (1993); Jakobovits *et al.*, *Nature*, 362:255-258 (1993); Bruggermann *et al.*, *Year in Immuno.*, 7:33 (1993). Human antibodies can also be derived from phage-display libraries (Hoogenboom *et al.*, *J. Mol. Biol.*, 227:381 (1991); Marks *et al.*, *J. Mol. Biol.*, 222:581-597 (1991)).

(iv) Bispecific antibodies

Bispecific antibodies (BsAbs) are antibodies that have binding specificities for at least two different epitopes. Such antibodies can be derived from full length antibodies or antibody fragments (*e.g.* $F(ab')_2$ bispecific antibodies).

Methods for making bispecific antibodies are known in the art. Traditional production of full length bispecific antibodies is based on the coexpression of two immunoglobulin heavy chain-light chain pairs, where the two chains have different specificities (Millstein *et al.*, *Nature*, 305:537-539 (1983)). Because of the random assortment of immunoglobulin heavy and light chains, these hybridomas (quadromas) produce a potential mixture of 10 different antibody molecules, of which only one has the correct bispecific structure. Purification of the correct molecule, which is usually done by affinity chromatography steps, is rather cumbersome, and the product yields are low. Similar procedures are disclosed in WO 93/08829 and in Traunecker *et al.*, *EMBO J.*, 10:3655-3659 (1991).

According to a different approach, antibody variable domains with the desired binding specificities (antibody-antigen combining sites) are fused to immunoglobulin constant domain sequences. The fusion preferably is with an immunoglobulin heavy chain constant domain, comprising at least part of the hinge, CH2, and CH3 regions. It is preferred to have the first heavy-chain constant region (CH1) containing the site necessary for light chain binding, present in at least one of the fusions. DNAs encoding the immunoglobulin heavy chain fusions and, if desired, the immunoglobulin light chain, are inserted into separate expression vectors, and are co-transfected into a suitable host organism. This provides for great flexibility in adjusting the mutual proportions of the three polypeptide fragments in embodiments when unequal ratios of the three polypeptide chains used in

the construction provide the optimum yields. It is, however, possible to insert the coding sequences for two or all three polypeptide chains in one expression vector when the expression of at least two polypeptide chains in equal ratios results in high yields or when the ratios are of no particular significance.

In a preferred embodiment of this approach, the bispecific antibodies are composed of a hybrid immunoglobulin heavy chain with a first binding specificity in one arm, and a hybrid immunoglobulin heavy chain-light chain pair (providing a second binding specificity) in the other arm. It was found that this asymmetric structure facilitates the separation of the desired bispecific compound from unwanted immunoglobulin chain combinations, as the presence of an immunoglobulin light chain in only one half of the bispecific molecule provides for a facile way of separation. This approach is disclosed in WO 94/04690 published March 3, 1994. For further details of generating bispecific antibodies see, for example, Suresh *et al., Methods in Enzymology*, 121:210 (1986).

Bispecific antibodies include cross-linked or "heteroconjugate" antibodies. For example, one of the antibodies in the heteroconjugate can be coupled to avidin, the other to biotin. Such antibodies have, for example, been proposed to target immune system cells to unwanted cells (US Patent No. 4,676,980), and for treatment of HIV infection (WO 91/00360, WO 92/200373). Heteroconjugate antibodies may be made using any convenient cross-linking methods. Suitable cross-linking agents are well known in the art, and are disclosed in US Patent No. 4,676,980, along with a number of cross-linking techniques.

Techniques for generating bispecific antibodies from antibody fragments have also been described in the literature. The following techniques can also be used for the production of bivalent antibody fragments which are not necessarily bispecific. For example, Fab' fragments recovered from *E. coli* can be chemically coupled *in vitro* to form bivalent antibodies. See, Shalaby *et al., J. Exp. Med.*, 175:217-225 (1992).

Various techniques for making and isolating bivalent antibody fragments directly from recombinant cell culture have also been described. For example, bivalent heterodimers have been produced using leucine zippers. Kostelny *et al., J. Immunol.*, 148(5):1547-1553 (1992). The leucine zipper peptides from the Fos and Jun proteins were linked to the Fab' portions of two different antibodies by gene fusion. The antibody homodimers were reduced at the hinge region to form monomers and then re-oxidized to form the antibody heterodimers. The "diabody" technology described by Hollinger *et al., Proc. Natl. Acad. Sci. USA*, 90:6444-6448 (1993) has provided an alternative mechanism for making bispecific/bivalent antibody fragments. The fragments comprise a heavy-chain variable domain (V_H) connected to a light-chain variable domain (V_L) by a linker which is too short to allow pairing between the two domains on the same chain. Accordingly, the V_H and V_L domains of one fragment are forced to pair with the complementary V_L and V_H domains of another fragment, thereby forming two antigen-binding sites. Another strategy for making bispecific/bivalent antibody fragments by the use of single-chain Fv (sFv) dimers has also been reported. See Gruber *et al., J. Immunol.*, 152:5368 (1994).

B. Preparation of the Lyophilized Formulation

After preparation of the protein of interest as described above, a "pre-lyophilized formulation" is produced. The amount of protein present in the pre-lyophilized formulation is determined taking into account the desired dose volumes, mode(s) of administration etc. Where the protein of choice is an intact antibody (such as an anti-IgE or anti-HER2 antibody), from about 2 mg/mL to about 50 mg/mL, preferably from about 5 mg/mL to about 40 mg/mL and most preferably from about 20-30 mg/mL is an exemplary starting protein concentration.

The protein is generally present in solution. For example, the protein may be present in a pH-buffered solution at a pH from about 4-8, and preferably from about 5-7. Exemplary buffers include histidine, phosphate, Tris, citrate, succinate and other organic acids. The buffer concentration can be from about 1 mM to about 20 mM, or from about 3 mM to about 15 mM, depending, for example, on the buffer and the desired isotonicity of the formulation (*e.g.* of the reconstituted formulation). The preferred buffer is histidine in that, as demonstrated below, this can have lyoprotective properties. Succinate was shown to be another useful buffer.

The lyoprotectant is added to the pre-lyophilized formulation. In preferred embodiments, the lyoprotectant is a non-reducing sugar such as sucrose or trehalose. The amount of lyoprotectant in the pre-lyophilized formulation is generally such that, upon reconstitution, the resulting formulation will be isotonic. However, hypertonic reconstituted formulations may also be suitable. In addition, the amount of lyoprotectant must not be too low such that an unacceptable amount of degradation/aggregation of the protein occurs upon lyophilization. Where the lyoprotectant is a sugar (such as sucrose or trehalose) and the protein is an antibody, exemplary lyoprotectant concentrations in the pre-lyophilized formulation are from about 10 mM to about 400 mM, and preferably from about 30 mM to about 300 mM, and most preferably from about 50 mM to about 100 mM.

The ratio of protein to lyoprotectant is selected for each protein and lyoprotectant combination. In the case of an antibody as the protein of choice and a sugar (*e.g.,* sucrose or trehalose) as the lyoprotectant for generating an isotonic reconstituted formulation with a high protein concentration, the molar ratio of lyoprotectant to antibody may be from about 100 to about 1500 moles lyoprotectant to 1 mole antibody, and preferably from about 200 to about 1000 moles of lyoprotectant to 1 mole antibody, for example from about 200 to about 600 moles of lyoprotectant to 1 mole antibody.

In preferred embodiments of the invention, it has been found to be desirable to add a surfactant to the pre-lyophilized formulation. Alternatively, or in addition, the surfactant may be added to the lyophilized formulation and/or the reconstituted formulation. Exemplary surfactants include nonionic surfactants such as polysorbates (*e.g.* polysorbates 20 or 80); poloxamers (*e.g.* poloxamer 188); Triton; sodium dodecyl sulfate (SDS); sodium laurel sulfate: sodium octyl glycoside; lauryl-, myristyl-, linoleyl-, or stearyl-sulfobetaine; lauryl-, myristyl-, linoleyl- or stearyl-sarcosine; linoleyl-, myristyl-, or cetyl-betaine; lauroamidopropyl-, cocamidopropyl-, linoleamidopropyl-, myristamidopropyl-, palmidopropyl-, or isostearamidopropyl-betaine (*e.g.* lauroamidopropyl); myristamidopropyl-, palmidopropyl-, or isostearamidopropyl-dimethylamine; sodium methyl cocoyl-, or disodium methyl oleyl-taurate; and the MONAQUAT™ series (Mona Industries, Inc., Paterson, New Jersey), polyethyl glycol, polypropyl glycol, and copolymers of ethylene and propylene glycol (*e.g.* Pluronics, PF68 etc). The amount of surfactant added is such that it reduces aggregation of the reconstituted protein and minimizes the formation of particulates after reconstitution. For example, the surfactant may be present in the pre-lyophilized formulation in an amount from about 0.001-0.5%, and preferably from about 0.005-0.05%.

In certain embodiments of the invention, a mixture of the lyoprotectant (such as sucrose or trehalose) and a bulking agent (*e.g.* mannitol or glycine) is used in the preparation of the pre-lyophilization formulation. The bulking agent may allow for the production of a uniform lyophilized cake without excessive pockets therein etc.

Other pharmaceutically acceptable carriers, excipients or stabilizers such as those described in *Remington's Pharmaceutical Sciences* 16th edition, Osol, A. Ed. (1980) may be included in the pre-lyophilized formulation (and/or the lyophilized formulation and/or the reconstituted formulation) provided that they do not adversely affect the desired characteristics of the formulation. Acceptable carriers, excipients or stabilizers are nontoxic to recipients at the dosages and concentrations employed and include: additional buffering agents; preservatives; co-solvents; antioxidants including ascorbic acid and methionine; chelating agents such as EDTA; metal complexes (*e.g.* Zn-protein complexes); biodegradable polymers such as polyesters; and/or salt-forming counterions such as sodium.

The formulation herein may also contain more than one protein as necessary for the particular indication being treated, preferably those with complementary activities that do not adversely affect the other protein. For example, it may be desirable to provide two or more antibodies which bind to the HER2 receptor or IgE in a single formulation. Furthermore, anti-HER2 and anti-VEGF antibodies may be combined in the one formulation. Such proteins are suitably present in combination in amounts that are effective for the purpose intended.

The formulations to be used for *in vivo* administration must be sterile. This is readily accomplished by filtration through sterile filtration membranes, prior to, or following, lyophilization and reconstitution. Alternatively, sterility of the entire mixture may be accomplished by autoclaving the ingredients, except for protein, at about 120° C for about 30 minutes, for example.

After the protein, lyoprotectant and other optional components are mixed together, the formulation is lyophilized. Many different freeze-dryers are available for this purpose such as Hull50™ (Hull, USA) or GT20™ (Leybold-Heraeus, Germany) freeze-dryers. Freeze-drying is accomplished by freezing the formulation and subsequently subliming ice from the frozen content at a temperature suitable for primary drying. Under this condition, the product temperature is below the eutectic point or the collapse temperature of the formulation. Typically, the shelf temperature for the primary drying will range from about -30 to 25° C (provided the product remains frozen during primary drying) at a suitable pressure, ranging typically from about 50 to 250mTorr. The formulation, size and type of the container holding the sample (*e.g.*, glass vial) and the volume of liquid will mainly dictate the time required for drying, which can range from a few hours to several days (*e.g.* 40-60hrs). A secondary drying stage may be carried out at about 0-40° C, depending primarily on the type and size of container and the type of protein employed. However, it was found herein that a secondary drying step may not be necessary. For example, the shelf temperature throughout the entire water removal phase of lyophilization may be from about 15-30° C (*e.g.*, about 20° C). The time and pressure required for secondary drying will be that which produces a suitable lyophilized cake, dependent, *e.g.*, on the temperature and other parameters. The secondary drying time is dictated by the desired residual moisture level in the product and typically takes at least about 5 hours (*e.g.* 10-15 hours). The pressure may be the same as that employed during the primary drying step. Freeze-drying conditions can be varied depending on the formulation and vial size.

In some instances, it may be desirable to lyophilize the protein formulation in the container in which reconstitution of the protein is to be carried out in order to avoid a transfer step. The container in this instance may, for example, be a 3, 5, 10, 20, 50 or 100cc vial.

As a general proposition, lyophilization will result in a lyophilized formulation in which the moisture content thereof is less than about 5%, and preferably less than about 3%.

C. **Reconstitution of the Lyophilized Formulation**

At the desired stage, typically when it is time to administer the protein to the patient, the lyophilized formulation may be reconstituted with a diluent such that the protein concentration in the reconstituted formulation is at least 50 mg/mL, for example from about 50 mg/mL to about 400 mg/mL, more preferably from about 80 mg/mL to about 300 mg/mL, and most preferably from about 90 mg/mL to about 150 mg/mL. Such high protein concentrations in the reconstituted formulation are considered to be particularly useful where subcutaneous delivery of the reconstituted formulation is intended. However, for other routes of administration, such as intravenous administration, lower concentrations of the protein in the reconstituted formulation may be desired (for example from about 5-50 mg/mL, or from about 10-40 mg/mL protein in the reconstituted formulation). In certain embodiments, the protein concentration in the reconstituted formulation is significantly higher than that in the pre-lyophilized formulation. For example, the protein concentration in the reconstituted formulation may be about 2-40 times, preferably 3-10 times and most preferably 3-6 times (*e.g.* at least three fold or at least four fold) that of the pre-lyophilized formulation.

Reconstitution generally takes place at a temperature of about 25°C to ensure complete hydration, although other temperatures may be employed as desired. The time required for reconstitution will depend, *e.g.*, on the type of diluent, amount of excipient(s) and protein. Exemplary diluents include sterile water, bacteriostatic water for injection (BWFI), a pH buffered solution (*e.g.* phosphate-buffered saline), sterile saline solution, Ringer's solution or dextrose solution. The diluent optionally contains a preservative. Exemplary preservatives have been described above, with aromatic alcohols such as benzyl or phenol alcohol being the preferred preservatives. The amount of preservative employed is determined by assessing different preservative concentrations for compatibility with the protein and preservative efficacy testing. For example, if the preservative is an aromatic alcohol (such as benzyl alcohol), it can be present in an amount from about 0.1-2.0% and preferably from about 0.5-1.5%, but most preferably about 1.0-1.2%.

Preferably, the reconstituted formulation has less than 6000 particles per vial which are ≥ 10 μm in size.

D. **Administration of the Reconstituted Formulation**

The reconstituted formulation is administered to a mammal in need of treatment with the protein, preferably a human, in accord with known methods, such as intravenous administration as a bolus or by continuous infusion over a period of time, by intramuscular, intraperitoneal, intracerobrospinal, subcutaneous, intra-articular, intrasynovial, intrathecal, oral, topical, or inhalation routes.

In preferred embodiments, the reconstituted formulation is administered to the mammal by subcutaneous (*i.e.* beneath the skin) administration. For such purposes, the formulation may be injected using a syringe. However, other devices for administration of the formulation are available such as injection devices (*e.g.* the Inject-ease™ and Genject™ devices); injector pens (such as the GenPen ™); needleless devices (*e.g.* MediJector™ and BioJector™); and subcutaneous patch delivery systems.

The appropriate dosage ("therapeutically effective amount") of the protein will depend, for example, on the condition to be treated, the severity and course of the condition, whether the protein is administered for preventive or therapeutic purposes, previous therapy, the patient's clinical history and response to the protein, the type of protein used, and the discretion of the attending physician. The protein is suitably administered to the patient at one time or over a series of treatments and may be administered to the patient at any time from

diagnosis onwards. The protein may be administered as the sole treatment or in conjunction with other drugs or therapies useful in treating the condition in question.

Where the protein of choice is an antibody, from about 0.1-20 mg/kg is an initial candidate dosage for administration to the patient, whether, for example, by one or more separate administrations. However, other dosage regimens may be useful. The progress of this therapy is easily monitored by conventional techniques.

In the case of an anti-HER2 antibody, a therapeutically effective amount of the antibody may be administered to treat or prevent cancer characterized by overexpression of the HER2 receptor. It is contemplated that a reconstituted formulation of the anti-HER2 antibody may be used to treat breast, ovarian, stomach, endometrial, salivary gland, lung, kidney, colon and/or bladder cancer. For example, the anti-HER2 antibody may be used to treat ductal carcinoma *in situ* (DCIS). Exemplary dosages of the anti-HER2 antibody are in the range 1-10 mg/kg by one or more separate administrations.

Uses for an anti-IgE formulation include the treatment or prophylaxis of IgE-mediated allergic diseases, parasitic infections, interstitial cystitis and asthma, for example. Depending on the disease or disorder to be treated, a therapeutically effective amount (*e.g.* from about 1-15 mg/kg) of the anti-IgE antibody is administered to the patient.

E. Articles of Manufacture

In another embodiment of the invention, an article of manufacture is provided which contains the lyophilized formulation of the present invention and provides instructions for its reconstitution and/or use. The article of manufacture comprises a container. Suitable containers include, for example, bottles, vials (*e.g.* dual chamber vials), syringes (such as dual chamber syringes) and test tubes. The container may be formed from a variety of materials such as glass or plastic. The container holds the lyophilized formulation and the label on, or associated with, the container may indicate directions for reconstitution and/or use. For example, the label may indicate that the lyophilized formulation is reconstituted to protein concentrations as described above. The label may further indicate that the formulation is useful or intended for subcutaneous administration. The container holding the formulation may be a multi-use vial, which allows for repeat administrations (*e.g.* from 2-6 administrations) of the reconstituted formulation. The article of manufacture may further comprise a second container comprising a suitable diluent (*e.g.* BWFI). Upon mixing of the diluent and the lyophilized formulation, the final protein concentration in the reconstituted formulation will generally be at least 50 mg/mL. The article of manufacture may further include other materials desirable from a commercial and user standpoint, including other buffers, diluents, filters, needles, syringes, and package inserts with instructions for use.

The invention will be more fully understood by reference to the following examples. They should not, however, be construed as limiting the scope of the invention. All literature citations are incorporated by reference.

EXAMPLE 1

ANTI-HER2 FORMULATION

Overexpression of the *HER2* proto-oncogene product ($p185^{HER2}$) has been associated with a variety of aggressive human malignancies. The murine monoclonal antibody known as muMAb4D5 is directed against the extracellular domain (ECD) of $p185^{HER2}$. The muMAb4D5 molecule has been humanized in an attempt to improve its clinical efficacy by reducing immunogenicity and allowing it to support human effector functions

(see WO 92/22653). This example describes the development of a lyophilized formulation comprising full length humanized antibody huMAb4D5-8 described in WO 92/22653.

In the development of a lyophilized formulation, excipients and buffers are initially screened by measuring the stability of the protein after lyophilization and reconstitution. The lyophilized protein in each formulation is also subjected to accelerated stability studies to determine the potential stability of the protein over its shelf-life. These accelerated studies are usually performed at temperatures above the proposed storage conditions and the data are then used to estimate the activation energy for the degradation reactions assuming Arrhenius kinetics (Cleland *et al.*, *Critical Reviews in Therapeutic Drug Carrier Systems* 10(4): 307-377 (1993)). The activation energy is then used to calculate the expected shelf-life of the protein formulation at the proposed storage conditions.

In early screening studies, the stability of several lyophilized recombinant humanized anti-HER2 antibody (rhuMAb HER2) formulations was investigated after incubation at 5° C (proposed storage condition) and 40° C (accelerated stability condition). In the liquid state, rhuMAb HER2 was observed to degrade by deamidation (30Asn of light chain) and isoaspartate formation via a cyclic imide intermediate, succinimide (102Asp of heavy chain). The deamidation was minimized at pH 5.0 resulting in degradation primarily at the succinimide. At pH 6.0, slightly greater deamidation was observed in the liquid protein formulation. The lyophilized formulations were therefore studied with: (a) 5 or 10 mM succinate buffer, pH 5.0 or (b) 5 or 10 mM histidine buffer, pH 6.0. Both buffers contained the surfactant, polysorbate 20 (Tween 20™), which was employed to reduce the potential for aggregation of the reconstituted protein and minimize the formation of particulates after reconstitution. These buffers were used with and without various sugars. The protein was formulated in the buffer at 5.0, 21.0 or 25.0 mg/mL. These formulations were then lyophilized and assessed for protein stability after 2 weeks at 5° C and 40° C. In the lyophilizer, the vials were frozen at a shelf temperature of -55° C for approximately 5 hours followed by primary drying at a shelf temperature of 5° C and 150 mTorr for 30 hours, and drying to 1-2% residual moisture was achieved with secondary drying at a shelf temperature of 20° C for 10 hours. The major degradation route for this protein upon lyophilization was aggregation, and therefore the protein stability was assessed by native size exclusion chromatography to measure the recovery of intact native protein (% intact protein in Table 2 below).

The stabilizing effects of various lyoprotectant sugars on lyophilized protein was measured in 10 mM sodium succinate, pH 5.0 (Table 2). At high sugar concentrations (250-275 mM) and low protein concentration (5.0 mg/mL), trehalose and lactose stabilized the protein against aggregation for the lyophilized protein stored for 2 weeks at 40° C. However, lactose, a reducing sugar, was observed to react with the protein over longer term storage at 40° C. The formulations at 5.0 mg/mL protein containing either sorbitol or mannitol yielded aggregated protein after storage at 40° C for 2 weeks. At the higher protein concentration (21.0 mg/mL), formulations comprising mannitol, or mannitol in combination with sorbitol or glycine, contained aggregated protein after lyophilization and storage at both conditions. In contrast, trehalose and sucrose prevented aggregation at both storage conditions.

The 250 mM trehalose and 250 mM lactose formulations were assessed for long term stability. After 9 months at 40° C or 12 months at 5° C, there was no change in the % intact protein for the trehalose formulation. For the lactose formulation, the % intact protein remained constant (same as initial) after 3 months at 40° C or

6 months at 25° C. The trehalose formulation could be stored at controlled room temperature (15-30° C) for 2 years without a significant change in % intact protein.

The 10 mM histidine, pH 6.0 formulation with mannitol contained less aggregated protein after storage at 40° C for 2 weeks than the 10 mM succinate formulation, pH 5.0 with mannitol. This result may be related to some stabilizing effect contributed by histidine alone. After storage at 40° C for 2 weeks, there was, however, significant aggregation for histidine alone or histidine/mannitol formulations. The addition of sucrose at an equal mass to mannitol (10 mg/mL of each) in the histidine formulation stabilized the protein against aggregation for both storage conditions. The use of glycine with mannitol did not improve the protein stability, while the sucrose/glycine formulation provided the same stability as the sucrose/mannitol formulation. These results further indicated that sucrose was useful for preventing aggregation of the lyophilized protein during storage.

TABLE 2

Composition Prior to Lyophilization		% Intact Protein[a]		
[Protein][b] (mg/mL)	Formulation	Liquid (5° C)	Lyophilized (2 wk, 5° C)	Lyophilized (2wk, 40° C)
	10 mM sodium succinate pH 5.0			
5.0	275 mM trehalose, 0.01% Tween 20™	98.9	99.1	98.9
5.0	275 mM lactose, 0.01% Tween 20™	96.8	96.5	96.6
5.0	275 mM sorbitol, 0.01% Tween 20™	99.4	99.3	95.4
5.0	250 mM mannitol, 0.01% Tween 20™	100.0	99.9	98.8
5.0	250 mM trehalose, 0.01% Tween 20™	100.0	99.9	100.0
5.0	250 mM lactose, 0.01% Tween 20™	100.0	100.0	100.0
21.0	250 mM trehalose, 0.2% Tween 20™	99.3	99.1	99.1
21.0	250 mM sucrose, 0.2% Tween 20™	99.6	99.6	99.7
21.0	250 mM mannitol, 0.01% Tween 20™	100.0	94.6	94.0
21.0	188 mM mannitol/63 mM sorbitol, 0.01% Tween 20™	99.8	98.6	96.5
21.0	250 mM mannitol/25 mM glycine, 0.01% Tween 20™	99.5	96.5	96.4
	10 mM histidine pH 6.0			
21.0	No sugar, 0.01% Tween 20™	100.0	99.9	98.9
21.0	54.9 mM mannitol, 0.01% Tween 20™	100.0	99.9	99.2
21.0	29.2 mM sucrose/266.4 mM glycine, 0.01% Tween 20™	100.0	100.0	99.6
21.0	54.9 mM mannitol/266.4 mM glycine, 0.01% Tween 20™	100.0	99.8	98.9

Composition Prior to Lyophilization		% Intact Protein[a]		
[Protein][b] (mg/mL)	Formulation	Liquid (5° C)	Lyophilized (2 wk, 5° C)	Lyophilized (2wk, 40° C)
21.0	54.9 mM mannitol/29.2 mM sucrose, 0.01% Tween 20™	99.8	100.0	99.7

a. The fraction of intact protein was measured by native size exclusion HPLC and the peak area of the native protein relative to the total peak area including aggregates (TSK3000 SW XL column, TosoHaas, with a flow rate of 1.0 mL/min; elution with phosphate buffered saline; detection at 214 and 280 nm). The protein formulations were analyzed before lyophilization (liquid, 5° C) and after lyophilization and storage at 5° C or 40° C for 2 weeks.
b. Formulations containing 5 mg/mL protein were reconstituted with distilled water (20 mL, 5.0 mg/mL protein), and formulations containing 21 mg/mL protein were reconstituted with bacteriostatic water for injection (BWFI, 0.9% benzyl alcohol; 20 mL, 20 mg/mL protein).

The delivery of a high protein concentration is often required for subcutaneous administration due to the volume limitations (≤ 1.5 mL) and dosing requirements (≥100 mg). However, high protein concentrations (≥ 50 mg/mL) are often difficult to achieve in the manufacturing process since at high concentrations, the protein has a tendency to aggregate during processing and becomes difficult to manipulate (*e.g.* pump) and sterile filter. Alternatively, the lyophilization process may provide a method to allow concentration of the protein. For example, the protein is filled into vials at a volume (Vf) and then lyophilized. The lyophilized protein is then reconstituted with a smaller volume (Vr) of water or preservative (*e.g.* BWFI) than the original volume (*e.g.* Vr = 0.25Vf) resulting in a higher protein concentration in the reconstituted solution. This process also results in the concentration of the buffers and excipients. For subcutaneous administration, the solution is desirably isotonic.

The amount of trehalose in the lyophilized rhuMAb HER2 was reduced to produce an isotonic solution upon reconstitution to yield 100 mg/mL protein. The stabilizing effect of trehalose was determined as a function of concentration for 5 mM sodium succinate, pH 5.0 and 5 mM histidine, pH 6.0 at 25.0 mg/mL protein (Table 3). At trehalose concentrations from 60 to 200 mM, there was no significant aggregation after incubation of the lyophilized protein for 4 weeks at 40° C. These formulations were reconstituted with 20 mL of bacteriostatic water for injection (BWFI, USP, 0.9% benzyl alcohol). Reconstitution of the 50 mM trehalose formulation (5 mM sodium succinate) with 4 mL of BWFI (100 mg/mL protein) after incubation for 4 weeks at 40° C yielded a slight increase in aggregate formation. The preserved reconstituted formulations provided the advantage of multiple withdrawals from the same vial without sterility concerns. When sterile needles are used, these formulations would then allow for several doses from a single vial.

TABLE 3

Composition Prior to Lyophilization		% Intact Protein[a]		
[Protein] (mg/mL)	Formulation	Liquid (5° C)	Lyophilized (4 wk, 5° C)	Lyophilized (4 wk, 40° C)
	5 mM sodium succinate pH 5.0			
25.0	50 mM trehalose, 0.01% Tween 20™ [b]	100.00	100.0	99.5
25.0	60 mM trehalose, 0.01% Tween 20™	100.0	100.0	99.9
25.0	60 mM trehalose, 0.01% Tween 20™	100.0	100.0	99.2
25.0	100 mM trehalose, 0.01% Tween 20™	100.0	100.0	99.7
25.0	150 mM trehalose, 0.01% Tween 20™	100.0	100.0	99.8
25.0	200 mM trehalose, 0.01% Tween 20™	100.0	100.0	100.0
	5 mM histidine pH 6.0			
25.0	38.4 mM mannitol/20.4 mM sucrose, 0.01% Tween 20™	100.0	100.0	99.3
25.0	38.4 mM mannitol/20.4 mM sucrose, 0.01% Tween 20™ [c]	100.0	100.0	99.4
25.0	60 mM trehalose, 0.01% Tween 20™ [d]	100.0	100.0	99.8
25.0	60 mM trehalose, 0.01% Tween 20™	100.0	100.0	99.4
25.0	100 mM trehalose, 0.01% Tween 20™	100.0	100.0	99.6
25.0	150 mM trehalose, 0.01% Tween 20™	100.0	100.0	100.0
25.0	200 mM trehalose, 0.01% Tween 20™	100.0	100.0	100.0

a. The fraction of intact protein was measured by native size exclusion HPLC and defined as the peak area of the native protein relative to the total peak area including aggregates (TSK3000 SW XL column, TosoHaas, with a flow rate of 1.0 mL/min; elution with phosphate buffered saline; detection at 214 and 280 nm). The protein formulations were analyzed before lyophilization (liquid, 5° C) and after lyophilization and storage at 5° C or 40° C for 4 weeks. Formulations were reconstituted with bacteriostatic water for injection (BWFI, USP, 0.9% w/w benzyl alcohol; 20 mL, 22 mg/mL protein).

b. Reconstituted with 4 mL of BWFI (0.9% benzyl alcohol) to yield 100 mg/mL protein.

c. Reconstituted with 4 mL of BWFI (1.1% benzyl alcohol) to yield 100 mg/mL protein.

d. Sample incubated for 2 weeks at 5° C or 40° C and then reconstituted with 20 mL of BWFI (0.9% benzyl alcohol) to yield 22 mg/mL protein.

Currently, rhuMAb HER2 is under investigation as a therapeutic for the treatment of breast cancer. The protein is dosed to patients at 2 mg/kg on a weekly basis. Since the average weight of these patients is 65 kg, the average weekly dose is 130 mg of rhuMAb HER2. For subcutaneous administration, injection volumes of 1.5 mL or less are well tolerated and, therefore, the protein concentration for a weekly subcutaneous administration of rhuMAb HER2 may be approximately 100 mg/mL (130 mg average dose/1.5 mL). As mentioned above, this high protein concentration is difficult to manufacture and maintain in a stable form. To achieve this high protein concentration, rhuMAb HER2 formulated in: (a) 5 mM sodium succinate, pH 5.0 or (b) 5 mM histidine, pH 6.0, was lyophilized at 25 mg/mL protein in 60 mM trehalose, 0.01% Tween 20™. The lyophilization was performed by filling 18 mL of the protein formulation into 50 cc vials. In the lyophilizer, the vials were frozen at a shelf

temperature of -55° C for approximately 5 hours followed by primary drying at a shelf temperature of 5° C and 150 mTorr for 30 hours, and drying to 1-2% residual moisture was achieved with secondary drying at a shelf temperature of 20° C for 10 hours. Thermocouples placed in vials containing the placebo (formulation without protein) indicated that the product in the vials was maintained below -10° C throughout primary drying. Sequential stoppering studies during the lyophilization revealed that the residual moisture after primary drying was usually less than 10%.

The lyophilized protein was then reconstituted with either 4 or 20 mL of BWFI (0.9 or 1.1% benzyl alcohol) to yield concentrated protein solutions:

(a) 4 mL: 102 mg/mL rhuMAb HER2, 245 mM trehalose, 21 mM sodium succinate, pH 5.0 or 21 mM histidine, pH 6.0, 0.04% Tween 20™;

(b) 20 mL: 22 mg/mL rhuMAb HER2, 52 mM trehalose, 4 mM sodium succinate, pH 5.0 or 4 mM histidine, pH 6.0, 0.009% Tween 20™.

After storage of the lyophilized formulations for 4 weeks at 40° C and reconstitution to 22 mg/mL protein, the amount of aggregated protein appeared to increase slightly with decreasing trehalose concentration. The stability of the lyophilized protein was not affected by the volume of reconstitution. As shown in Figure 1, the amount of intact protein after incubation of the lyophilized protein at 40° C was the same for the 60 mM trehalose, 5 mM sodium succinate, pH 5.0, 0.01% Tween 20™ formulation reconstituted with either 4 or 20 mL of BWFI.

The results shown in Table 3 suggested that there may be a relationship between the trehalose concentration and the protein stability. To further assess this relationship, the formulations containing different concentrations of trehalose formulated in either sodium succinate or histidine were incubated for 91 days at 40° C. The stability was then measured as a function of the trehalose to protein molar ratio for each concentration of trehalose. As shown in Figure 2, the protein stability clearly decreased with decreasing trehalose concentration for both formulations. There was no apparent difference between the two buffers, succinate and histidine, in these formulations suggesting that the primary stabilizer under these conditions is trehalose. In addition, the observed decrease in intact protein for both these formulations would be acceptable even at the low trehalose concentration for a formulation that is stored at 2-8° C throughout its shelf-life. However, if controlled room temperature (30° C maxmimum temperature) stability is required, higher trehalose concentrations (≥ 600:1 trehalose:protein) may be needed depending on the stability specifications for the product (*i.e.* the specification for the amount of intact protein remaining after 2 years of storage). Typically, a controlled room temperature storage condition would require stability for 6 months at 40° C which is equivalent to storage at 30° C for 2 years.

As shown in Figure 3, the 250 mM trehalose formulation was unchanged after 6 months at 40° C while both the 60 mM trehalose formulations were less stable. The 60 mM trehalose formulations may then require refrigerated storage if the product specification at the end of its shelf-life is, for example, >98% intact protein by native size exclusion chromatography.

In the previous screening study, sucrose was also observed to prevent aggregation of rhuMAb HER2 after lyophilization and subsequent storage. To achieve isotonic solutions after reconstitution for subcutaneous administration (approximately four-fold concentration of formulation components and protein), the sucrose concentration must be reduced significantly. The equal mass concentration of sucrose and mannitol (bulking

agent) used in the screening studies prevented aggregation of the protein. A lower concentration of sucrose and mannitol (equal mass concentrations) was chosen as a potential subcutaneous formulation of rhuMAb HER2. The protein solution (25 mg/mL protein, 5 mM histidine, pH 6.0, 38.4 mM (7 mg/mL) mannitol, 20.4 mM (7 mg/mL) sucrose, 0.01% Tween 20™) was lyophilized in the same manner as the 60 mM trehalose formulation except that the primary drying cycle was extended to 54 hours. After 4 weeks at 40°C, there was a slight increase in the amount of aggregates after reconstitution with 4.0 or 20.0 mL of BWFI (Table 3). The amount of aggregated protein was the same for reconstitution at 22 or 100 mg/mL protein (Figure 4). Like the 60 mM trehalose formulations, the mannitol/sucrose formulation yielded less intact protein over time at 40°C. The molar ratio of sucrose to protein for this formulation was 120 to 1, indicating that the mannitol/sucrose combination may be more effective than trehalose alone at the same molar ratio of stabilizing sugar (Figures 2 and 4).

In the previous examples, the stability of the lyophilized rhuMAb HER2 formulations was determined as a function of temperature. These studies demonstrated that the trehalose and mannitol/sucrose formulations prevented degradation of the protein in the lyophilized state at high temperatures (40°C). However, these experiments did not address the stability of the protein after reconstitution and storage. Once reconstituted with BWFI, the lyophilized rhuMAb HER2 formulations may be used for several administrations of the drug. In particular, the vial configuration (450 mg rhuMAb HER2) was designed to provide three doses to the average patient (130 mg rhuMAb HER2 per dose). Since the drug is dosed weekly, the vial may be stored at least three weeks after reconstitution. To assure that the rhuMAb HER2 remained stable after reconstitution, stability studies on the reconstituted rhuMAb HER2 formulations were performed at 5°C and 25°C.

For subcutaneous administration, the formulations were reconstituted to 100 mg/mL (4 mL BWFI). At this high protein concentration, the protein may be more susceptible to aggregation than the intravenous dosage form that was reconstituted to 22 mg/mL protein (20 mL BWFI). The four rhuMAb HER2 formulations from the previous example were assessed for aggregation (loss of intact protein). As shown in Tables 4 through 6, there was no difference in stability for formulations reconstituted at 22 and 100 mg/mL protein. Furthermore, these formulations maintained the protein completely intact for up to 90 days at 5 °C and 30 days at 25 °C, indicating that the reconstituted protein could be stored refrigerated for at least 90 days. Unlike the lyophilized protein stability in the previous example, the trehalose concentration in the formulation did not affect the protein stability (Table 7).

TABLE 4

Stability of the reconstituted formulations for rhuMAb HER2 lyophilized at 25 mg/mL protein in 5 mM sodium succinate, pH 5.0, 60 mM trehalose, 0.01% Tween 20™

Time (days)	% Intact Protein			
	22 mg/mL protein		100 mg/mL protein	
	5°C	25°C	5°C	25°C
0	99.9	99.9	99.7	99.7
14	ND	100.0	ND	100.0
30	100.0	100.0	100.0	100.0
91	99.8	ND	100	ND

The samples were reconstituted with 4.0 or 20.0 mL of BWFI (1.1% or 0.9% benzyl alcohol), and then stored at 5°C or 25°C. The % intact protein was defined as the fraction of native peak area as measured by native size exclusion chromatography. ND = not determined.

TABLE 5

Stability of the reconstituted formulations for rhuMAb HER2 lyophilized at 25 mg/mL protein in 5 mM histidine, pH 6.0, 60 mM trehalose, 0.01% Tween 20™

Time (days)	% Intact Protein			
	22 mg/mL protein		100 mg/mL protein	
	5°C	25°C	5°C	25°C
0	100.0	100.0	100.0	100.0
14	ND	100.0	ND	100.0
31	99.3	99.7	100.0	100.0
61	100.0	ND	ND	ND

The samples were reconstituted with 4.0 or 20.0 mL of BWFI (1.1% or 0.9% benzyl alcohol), and then stored at 5°C or 25 °C. The % intact protein was defined as the fraction of native peak area as measured by native size exclusion chromatography. ND = not determined.

TABLE 6

Stability of the reconstituted formulations for rhuMAb HER2 lyophilized at 25 mg/mL protein in 5 mM histidine, pH 6.0, 38.4 mM mannitol, 20.4 mM sucrose, 0.01% Tween 20™

Time (days)	% Intact Protein			
	22 mg/mL protein		100 mg/mL protein	
	5°C	25°C	5°C	25°C
0	99.7	99.7	99.8	99.8
14	ND	100.0	ND	99.8
31	100.0	100.0	100.0	100.0
92	100.0	ND	100.0	ND

The samples were reconstituted with 4.0 or 20.0 mL of BWFI (1.1% or 0.9% benzyl alcohol), and then stored at 5°C or 25 °C. The % intact protein was defined as the fraction of native peak area as measured by native size exclusion chromatography. ND = not determined.

TABLE 7

Stability of the reconstituted formulations for rhuMAb HER2 lyophilized at 21 mg/mL protein in 10 mM sodium succinate, pH 5.0, 250 mM trehalose, 0.2% Tween 20™

Time (days)	% Intact Protein 21 mg/mL protein	
	5°C	25°C
0	99.8	99.8
14	ND	100.0
31	99.9	99.4
92	99.8	ND

The samples were reconstituted with 20.0 mL of BWFI (0.9% benzyl alcohol), and then stored at 5°C or 25°C. The % intact protein was defined as the fraction of native peak area as measured by native size exclusion chromatography. ND = not determined.

As mentioned previously, the major degradation route for rhuMAb HER2 in aqueous solutions is deamidation or succinimide formation. The loss of native protein due to deamidation or succinimide formation was assessed for the four reconstituted rhuMAb HER2 formulations.

Analysis of rhuMAb HER2 deamidation and succinimide formation was performed using cation exchange chromatography. A Bakerbond Wide-Pore Carboxy Sulfon (CSX) column (4.6 x 250 mm) was operated at a flow rate of 1 mL/min. The mobile phase buffers were (A) 0.02 M sodium phosphate, pH 6.9, and (B) 0.02 M sodium phosphate, pH 6.9, 0.2 M NaCl. The chromatography was then performed at 40°C as follows:

TABLE 8

Time (min)	% Buffer B
0	10
55	45
57	100
62	100
62.1	10
63	10

Peak elution was monitored at 214 nm and 75 µg of protein was loaded for each analysis.

Again, there were no differences in stability of the formulations reconstituted at 22 and 100 mg/mL protein (Figures 5 through 7). The protein degradation was more rapid at 25°C than 5°C for each formulation, and the rate of degradation was comparable for all the formulations stored at 5°C. The formulations containing histidine underwent a slightly greater rate of degradation at 25°C than the succinate formulations. The amount of trehalose in the formulation did not affect the degradation rate at either temperature (Figures 5 and 8). These

results indicated that these four formulations provide an acceptable rate of degradation under refrigerated storage conditions (5° C) for the intended period of use (30 days after reconstitution with BWFI).

Multi-use formulations should pass preservative efficacy testing as described by the US Pharmacopeia (USP) for use in the United States. The rhuMAb HER2 lyophilized formulation consisting of 25 mg/mL protein, 5 mM histidine, pH 6.0, 60 mM trehalose, 0.01% Tween 20™ was reconstituted with 20 mL of benzyl alcohol at concentrations between 0.9 and 1.5% w/w. For concentrations at or above 1.3% w/w, the reconstituted solution became cloudy after overnight incubation at room temperature (~25 °C). Reconstitution with the standard BWFI solution (0.9% benzyl alcohol) resulted in a solution that did not consistently pass the preservative challenge tests. However, reconstitution with 1.0 or 1.1% benzyl alcohol was both compatible with the formulation and passed the preservative challenge testing. The manufacturer's specifications for the solution required a range of ± 10%, and therefore, the lyophilized formulations are reconstituted with 1.1% benzyl alcohol (1.1 ± 0.1%).

A single step lyophilization cycle for the rhuMAb HER2 formulation was developed . In the single step lyophilization cycle, rhuMAb HER2 at 25 mg/mL, 60 mM trehalose, 5 mM histidine pH 6 and 0.01% polysorbate 20 was lyophilized at a shelf temperature of 20° C. and a pressure of 150 mTorr. After 47 hours, the residual moisture content of the lyophilized cake was less than 5%. This lyophilization cycle is considered to be useful in that it simplifies the manufacturing process, by eliminating the secondary drying step.

EXAMPLE 2

ANTI-IgE FORMULATION

IgE antibodies bind to specific high-affinity receptors on mast cells, leading to mast cell degranulation and release of mediators, such as histamine, which produce symptoms associated with allergy. Hence, anti-IgE antibodies that block binding of IgE to its high-affinity receptor are of potential therapeutic value in the treatment of allergy. These antibodies must also not bind to IgE once it is bound to the receptor because this would trigger histamine release. This example describes the development of a lyophilized formulation comprising full length humanized anti-IgE antibody MaE11 described in Presta *et al. J. Immunology,* 151: 2623-2632 (1993).

Materials: Highly purified rhuMAb E25 (recombinant humanized anti-IgE antibody MaE11) which did not contain Tween 20™ was used in the formulations described below. Spectra/Por 7 dialysis membranes were purchased from Spectrum (Los Angeles, CA). All other reagents used in this study were obtained from commercial sources and were of analytical grade. Formulation buffers and chromatography mobile phase were prepared by mixing the appropriate amount of buffer and salt with Milli-Q water in a volumetric flask.

Formulation: E25 S Sepharose pool was dialyzed into formulation buffers as specified. Dialysis was accomplished by a minimum of 4 x 2L buffer exchanges over a 48 hour period at 2-8° C. Following dialysis, lyoprotectant was added at a isotonic concentration to some of the formulations as required. Protein concentration following dialysis was determined by UV spectroscopy using a molar absorptivity of 1.60. The dialyzed protein was diluted to the predetermined formulation concentration with an appropriate formulation buffer, sterile filtered using a 0.22 μm Millex-GV filter (Millipore) and dispensed into pre-washed and autoclaved glass vials. The vials were fitted with siliconized teflon lyophilization stoppers and lyophilized using the following conditions: the E25 formulation was frozen to -55° C at 80° C/hour and the vial content was kept frozen for 4 hours. The shelf temperature was ramped to 25° C at 10° C/hour for primary drying. Primary

drying was carried out at 25° C, 50 μ chamber vacuum pressure for 39 hours such that the residual moisture of the lyophilized cake was 1-2%. Following lyophilization, a vial of each formulation was removed for t=0 analysis and the remaining vials were held at various temperatures which include -70° C, 2-8° C, 25° C, 30° C (controlled room temperature) 40° C and 50° C.

Chromatography: Native size exclusion chromatography was carried out on a Bio-Rad Bio-Select™ SEC 250-5 column (300 x 7.8 mm). The column was equilibrated and ran in PBS at a flow rate of 0.5 mL/min using a Hewlett Packard 1090L HPLC equipped with a diode array detector. Molecular weight standards (Bio-Rad, Inc.) consisting of thyroglobulin (670 kd), gamma-globulin (158 kd), ovalbumin (44 kd), and cyanocobalamin (1.35 kd) were used to calibrate the column. The sample load was 25 μg and protein was detected by monitoring the UV absorption at 214 nm using Turbochrom 3 software (PE Nelson, Inc).

Hydrophobic Interaction Chromatography: $F(ab')_2$ fragments of the E25 antibody were chromatographed using a TosoHaas Butyl-NPR column (3.5 x 4.6 mm) and a Hewlett Packard 1090L HPLC equipped with a diode array detector. Elution buffer A was: 20 mM Tris, 2 M ammonium sulfate, 20% (v/v) glycerol, pH 8.0 while elution buffer B was: 20 mM Tris, 20% (v/v) glycerol, pH 8.0. The column was equilibrated with 10% elution buffer B at a flow rate of 1.0 mL/min for a minimum of 20 minutes. The sample load was 5 μg and protein was detected by monitoring the UV absorption at 214 nm using Turbochrom 3 data acquisition software (PE Nelson, Inc). Following injection of the sample, the column was maintained at 10% buffer B for 1 minute followed by a linear gradient of from 10% to 62% buffer B in 20 minutes. The column was washed with 100% buffer B for 5 minutes and re-equilibrated with 10% buffer B for a minimum of 20 minutes between successive sample injections.

Antibody Binding Activity: IgE receptor binding inhibition assay (IE25:2) was carried out as described in Presta *et al.*, *supra*, on samples diluted to 20 μg/mL and 30 μg/mL in assay diluent (phosphate buffered saline, 0.5% BSA, 0.05% polysorbate 20, 0.01% Thimerosol). Each dilution was then assayed in triplicate and the results were multiplied by an appropriate dilution factor to yield an active concentration. The results from 6 assays were averaged. The assay measures the ability of rhuMAb E25 to competitively bind to IgE and thereby prevent IgE from binding to its high affinity receptor which is immobilized to an ELISA plate. The results are divided by the antibody concentration as determined by UV absorption spectroscopy and reported as a specific activity. Previous experiments have shown that this assay is stability indicating.

Particulate Assay: Reconstituted vials of lyophilized rhuMAb E25 were pooled to achieve a volume of approximately 7 mL. A count of the number of particles of size ranging from 2 to 80 μm present in 1 mL of sample was determined using a Hiac/Royco model 8000 counter. The counter was first washed with 1 mL of sample three times followed by the measurement of 1 mL of sample in triplicate. The instrument determines the number of particles per mL that are equal to or greater than 10 μm and the number of particles per mL that are equal to or greater than 25 μm.

The first step in the development of a formulation for the anti-IgE antibody was to determine a suitable buffer and pH for lyophilization and storage of the product. Antibody at a concentration of 5.0 mg/mL was formulated into 10 mM succinate buffers ranging from pH 5.0 to pH 6.5 and into sodium phosphate, potassium phosphate and histidine buffers at pH 7.0. Figure 9 shows increased antibody aggregate was observed in the higher pH formulations both before and after lyophilization. An exception was the histidine formulation at pH

7, where no increase in aggregate was observed upon storage at 2-8°C. Figure 10 shows rhuMAb E25 lyophilized in 5 mM histidine buffer at both pH 6 and pH 7 and stored for 1 year at 2-8°C, 25°C, and 40°C. At each assay time point and storage temperature the pH 6 formulation had less aggregate than the antibody formulated at pH 7. These results show histidine at pH 6 is a particularly useful buffer system for preventing aggregation of the antibody.

To facilitate screening of lyoprotectants, the anti-IgE antibody was formulated into sodium succinate at pH 5 with or without a lyoprotectant. Potential lyoprotectants, added at isotonic concentrations, were grouped into 3 categories:

(a) non-reducing monosaccharide (*i.e.* mannitol);

(b) reducing disaccharides (*i.e.* lactose and maltose); and

(c) non-reducing disaccharides (*i.e.* trehalose and sucrose).

Aggregation of the formulations following storage at 2-8°C and 40°C for one year is shown in Figures 11 and 12. With storage at 2-8°C, the monosaccharide formulation (mannitol) aggregated at a rate similar to the buffer control, while formulations containing the disaccharides were equally effective in controlling aggregation (Figure 11). The results following storage at 40°C where similar with the exception of the sucrose formulation which rapidly aggregated (which correlated with a browning of the freeze-dried cake (Figure 12)). This was later shown to be caused by degradation of sucrose following storage at both acidic pH and high temperature.

Hydrophobic interaction chromatography of the antibody formulated in histidine buffer at pH 6 with lactose shows the antibody is altered following storage for 6 months at 40°C (Figure 13). The chromatography peaks are broadened and the retention time decreases. These changes are not observed with the buffer control and sucrose formulations stored under similar conditions as shown in Figures 14 and 15, respectively. Furthermore, isoelectric focusing showed an acidic shift in the pI of the antibody formulated in lactose and stored at 25°C and 40°C. This indicates that reducing sugars are not suitable as lyoprotectants for the antibody.

Aggregation of lyophilized formulations of anti-IgE at a concentration of 20 mg/mL in 5 mM histidine buffer at pH 6 with various concentrations of sucrose and trehalose following storage for 12 weeks at 50°C is shown in Figure 16. Both sugars have a similar protective effect on aggregation when the sugar concentration is greater than 500 moles of sugar per mole of antibody. From these results, isotonic and hypertonic formulations of both sucrose and trehalose were identified for further development. The formulations are designed to be filled prior to lyophilization at a relatively low concentration of antibody and the lyophilized product is reconstituted with less volume than was filled with bacteriostatic water for injection (BWFI) comprising 0.9% benzyl alcohol. This allows the concentration of the antibody immediately prior to subcutaneous delivery and includes a preservative for a potential multi-use formulation while avoiding interactions between the protein and preservative upon long-term storage.

Isotonic formulation: Anti-IgE at 25 mg/mL formulated in 5 mM histidine buffer at pH 6 with 500 moles of sugar per mole antibody which equals a sugar concentration of 85 mM. This formulation is reconstituted with BWFI (0.9% benzyl alcohol) at a volume which is four times less than was filled. This results in a 100 mg/mL of antibody in 20 mM histidine at pH 6 with an isotonic sugar concentration of 340 mM.

Hypertonic formulation: Anti-IgE at 25 mg/mL formulated in 5 mM histidine buffer at pH 6 with 1000 moles of sugar per mole antibody which equals a sugar concentration of 161 mM. This formulation is reconstituted with BWFI (0.9% benzyl alcohol) at a volume which is four times less than was filled. This results in a 100 mg/mL of antibody in 20 mM histidine at pH 6 with a hypertonic sugar concentration of 644 mM.

Comparisons of the antibody aggregation following storage of the isotonic and hypertonic formulations for up to 36 weeks are shown in Figures 17 to 19. No change in aggregation is observed in either the hypertonic or isotonic formulations with storage at 2-8° C (Figure 17). With storage at controlled room temperature (30° C) increased aggregation is not observed in the hypertonic formulations while an increase in aggregate of from 1 to 2% occurs in the isotonic formulations (Figure 18). Finally, following storage at 50° C a minimal increase in aggregate is observed with the hypertonic formulations, a 4% increase in aggregate occurs with the isotonic trehalose formulation and a 12% increase in aggregate occurs with the isotonic sucrose formulation (Figure 19). These results show the isotonic formulation contains the minimum amount of sugar necessary to maintain the stability of the antibody with storage at a temperature up to 30° C.

The binding activity of the anti-IgE in the isotonic and hypertonic formulations was measured in an IgE receptor inhibition assay. It was discovered that the binding activity of the isotonic and hypertonic sucrose and trehalose formulations was essentially unchanged following storage at -70° C, 2-8° C, 30° C and 50° C for up to 36 weeks.

Lyophilized formulations of proteins are known to contain insoluble aggregates or particulates (Cleland *et al., Critical Reviews in Therapeutic Drug Carrier Systems*, 10 (4):307-377 (1993)). Accordingly, a particulate assay of antibody lyophilized at a concentration of 25 mg/mL in 5 mM histidine, pH 6 with the addition of 85 mM and 161 mM sucrose and trehalose was performed. Polysorbate 20 was added to the formulations at a concentration of 0.005%, 0.01%, and 0.02%. Samples were lyophilized and assayed following reconstitution to 100 mg/mL antibody in 20 mM histidine, pH 6 with 340 mM and 644 mM sugar. The polysorbate 20 concentration following reconstitution was 0.02%, 0.04%, and 0.08%.

Table 9 below shows the number of particles of size equal to or greater than 10 μm and equal to or greater than 25 μm from the isotonic and hypertonic sucrose and trehalose formulations. Polysorbate 20 was added to the formulations at concentrations of 0.005%, 0.01%, and 0.02% prior to lyophilization. The results show that the addition of Tween™ to the formulation significantly reduces the number of particles in each size range tested. The US Pharmacopeia (USP) specification for small volume injections are not more than 6,000 particles of greater than or equal to 10 μm and not more than 600 particles of greater than or equal to 25 μm per container (Cleland *et al., supra*). With the addition of polysorbate 20, both the hypertonic and isotonic formulations pass this specification.

TABLE 9

Formulation	Polysorbate 20	Particles per mL	
		≥ 10 µm	≥ 25 µM
Isotonic Sucrose	None	16,122	28
	0.005%	173	2
	0.01%	224	5
	0.02%	303	6
Hypertonic Sucrose	None	14,220	84
	0.005%	73	6
	0.01%	51	0
	0.02%		6
Isotonic Trehalose	None	33,407	24
	0.005%	569	4
	0.01%	991	16
	0.02%	605	9
Hypertonic Trehalose	None	24,967	28
	0.005%	310	11
	0.01%	209	6
	0.02%	344	6

One formulation developed for the anti-IgE antibody (*i.e.* 143 mg vial isotonic formulation of rhuMAb E25) which is considered to be useful for subcutaneous delivery of this antibody is shown in Table 10 below. A 10 cc vial is filled with 5.7 mL of rhuMAb E25 at a concentration of 25 mg/mL formulated in 5 mM histidine at pH 6.0 with 0.01% polysorbate 20. Sucrose is added as a lyoprotectant at a concentration of 85 mM which corresponds to a molar ratio of sugar to antibody of 500 to 1. The vial is lyophilized and reconstituted with 0.9% benzyl alcohol to one quarter of the volume of the fill or 1.2 mL. The final concentration of components in the formulation is increased four fold to 100 mg/mL rhuMAb E25 in 20 mM histidine at pH 6 with 0.04% polysorbate 20 and 340 mM sucrose (isotonic) and 0.9% benzyl alcohol. The formulation contains histidine buffer at pH 6 because of its demonstrated protective effect on antibody aggregation. Sucrose was added as the lyoprotectant because of previous use in the pharmaceutical industry. The concentration of sugar was chosen to result in an isotonic formulation upon reconstitution. Finally, polysorbate 20 is added to prevent the formation of insoluble aggregates.

TABLE 10

Pre-lyophilized Formulation (Fill 5.7 mL into 10 cc vial)	Reconstituted Formulation (1.2 mL 0.9% Benzyl Alcohol)
25 mg/mL rhuMAb E25	100 mg/mL rhuMAb E25
5 mM Histidine, pH 6.0	20 mM Histidine, pH 6.0
85 mM Sucrose	340 mM Sucrose
0.01% Polysorbate 20	0.04% Polysorbate 20
-	0.9% Benzyl Alcohol

WHAT IS CLAIMED IS:

1. A stable isotonic reconstituted formulation comprising a protein in an amount of at least about 50 mg/mL and a diluent, which reconstituted formulation has been prepared from a lyophilized mixture of a protein and a lyoprotectant, wherein the protein concentration in the reconstituted formulation is about 2-40 times greater than the protein concentration in the mixture before lyophilization.

2. The formulation of claim 1 wherein the lyoprotectant is sucrose or trechalose.

3. The formulation of claim 1 which further comprises a buffer.

4. The formulation of claim 3 wherein the buffer is histidine or succinate.

5. The formulation of claim 1 which further comprises a surfactant.

6. A stable reconstituted formulation comprising an antibody in an amount of at least about 50 mg/mL and a diluent, which reconstituted formulation has been prepared from a lyophilized mixture of an antibody and a lyoprotectant, wherein the antibody concentration in the reconstituted formulation is about 2-40 times greater than the antibody concentration in the mixture before lyophilization.

7. The formulation of claim 6 wherein the antibody is an anti-IgE antibody or anti-HER2 antibody.

8. The formulation of claim 6 which is isotonic.

9. A method for preparing a stable isotonic reconstituted formulation comprising reconstituting a lyophilized mixture of a protein and a lyoprotectant in a diluent such that the protein concentration in the reconstituted formulation is at least 50 mg/mL, wherein the protein concentration in the reconstituted formulation is about 2-40 times greater than the protein concentration in the mixture before lyophilization.

10. A method for preparing a formulation comprising the steps of:

(a) lyophilizing a mixture of a protein and a lyoprotectant; and

(b) reconstituting the lyophilized mixture of step (a) in a diluent such that the reconstituted formulation is isotonic and stable and has a protein concentration of at least about 50 mg/mL.

11. The method of claim 10 wherein the protein concentration in the reconstituted formulation is from about 80 mg/mL to about 300 mg/mL.

12. The method of claim 10 wherein the protein concentration in the reconstituted formulation is about 2-40 times greater than the protein concentration in the mixture before lyophilization.

13. The method of claim 10 wherein lyophilization is performed at a shelf temperature maintained at about 15-30°C throughout the entire lyophilization process.

14. An article of manufacture comprising:

(a) a container which holds a lyophilized mixture of a protein and a lyoprotectant; and

(b) instructions for reconstituting the lyophilized mixture with a diluent to a protein concentration in the reconstituted formulation of at least about 50 mg/mL.

15. The article of manufacture of claim 14 further comprising a second container which holds a diluent.

16. The article of manufacture of claim 15 wherein the diluent is bacteriostatic water for injection (BWFI) comprising an aromatic alcohol.

17. A formulation comprising a lyophilized mixture of a lyoprotectant and an antibody, wherein the molar ratio of lyoprotectant:antibody is about 100-1500 mole lyoprotectant:1 mole antibody.

18. Use of the formulation of claim 1 in the preparation of a medicament for treating a mammal which has a disorder requiring treatment with the protein in the formulation.

19. Use as in claim 18 wherein the formulation is for subcutaneous administration.

20. A formulation comprising anti-HER2 antibody in amount from about 5-40 mg/mL, sucrose or trehalose in an amount from about 10-100 mM, a buffer and a surfactant.

21. The formulation of claim 20 further comprising a bulking agent.

22. The formulation of claim 20 which is lyophilized and stable at 30° C for at least 6 months.

23. The formulation of claim 20 which is reconstituted with a diluent such that the anti-HER2 antibody concentration in the reconstituted formulation is from about 10-30 mg/mL, wherein the reconstituted formulation is stable at 2-8° C for at least about 30 days.

24. A formulation comprising anti-IgE antibody in amount from about 5-40 mg/mL, sucrose or trehalose in an amount from about 80-300 mM, a buffer and a surfactant.

25. The formulation of claim 24 which is lyophilized and stable at about 30° C for at least 1 year.

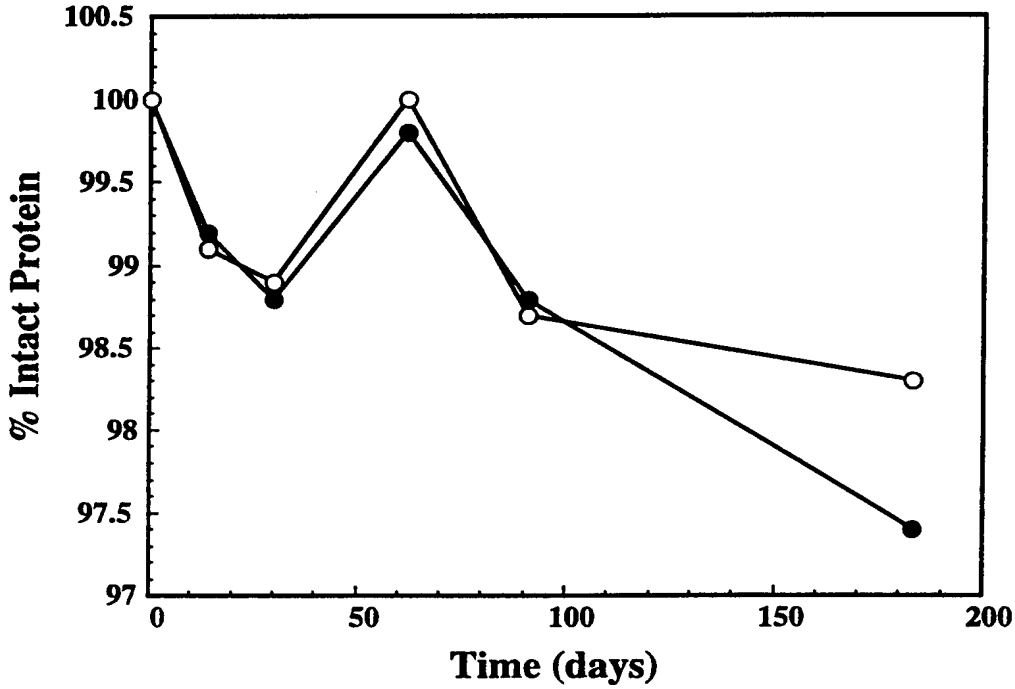

100.5
100
99.5
99
98.5
98
97.5
97
% Intact Protein
0
50
100
150
200
Time (days)

FIG. 1

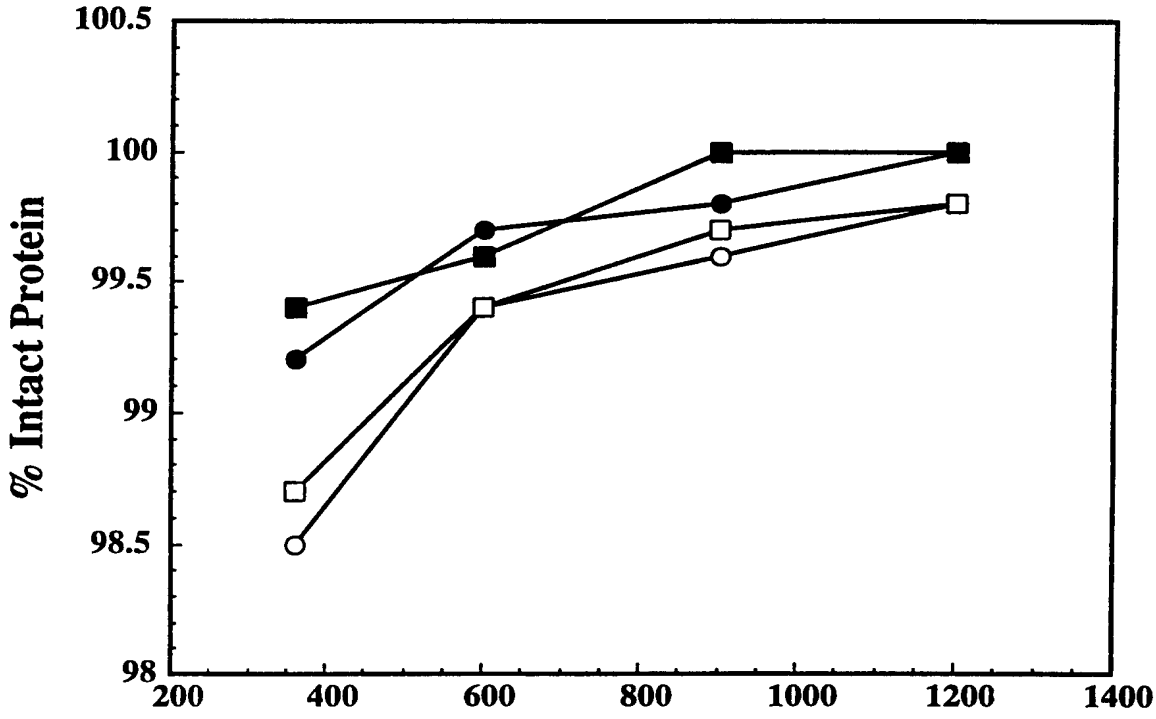

100.5
100
99.5
99
98.5
98
% Intact Protein
200
400
600
800
1000
1200
1400
[Trehalose]/[Protein] (molar ratio)

FIG. 2

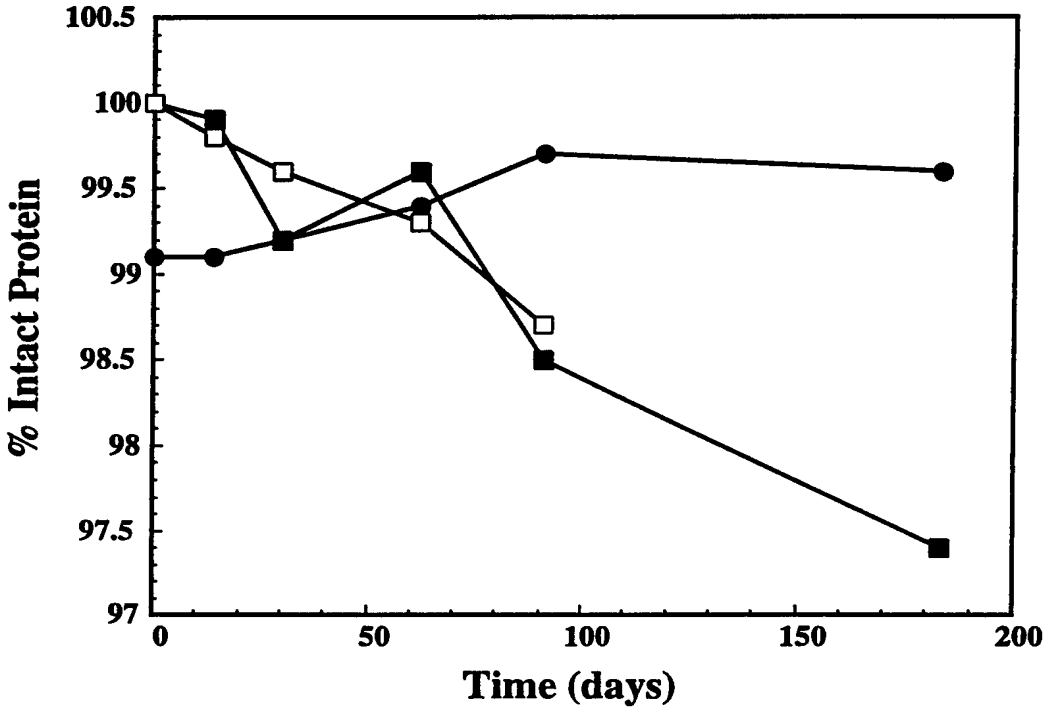

100.5
100
99.5
99
98.5
98
97.5
97
% Intact Protein
0
50
100
150
200
Time (days)

FIG. 3

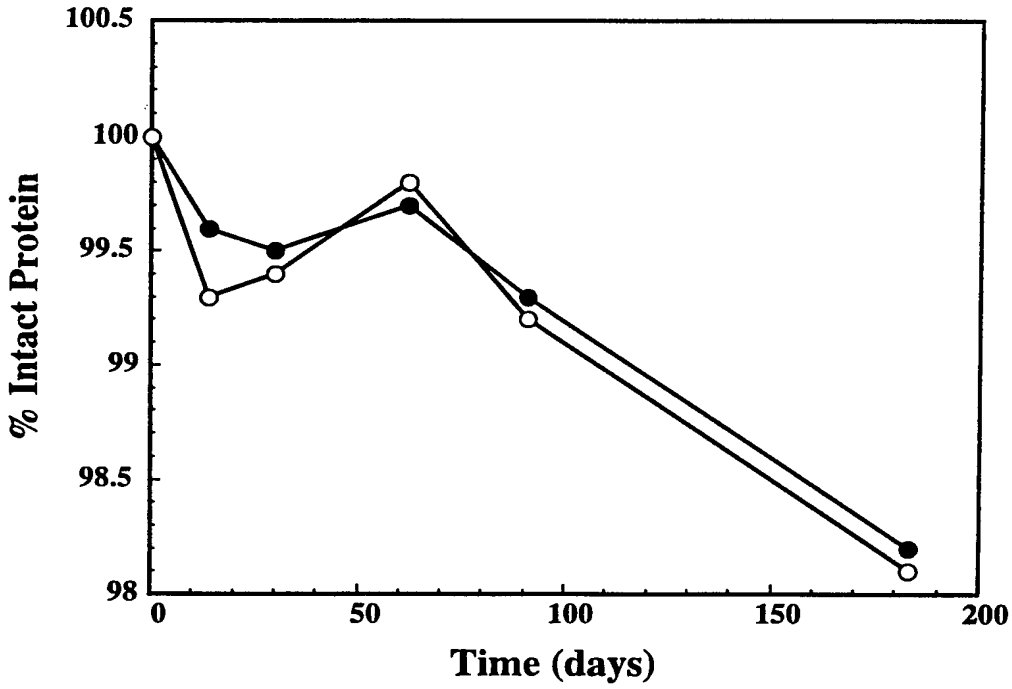

100.5
100
99.5
99
98.5
98
% Intact Protein
0
50
100
150
200
Time (days)

FIG. 4

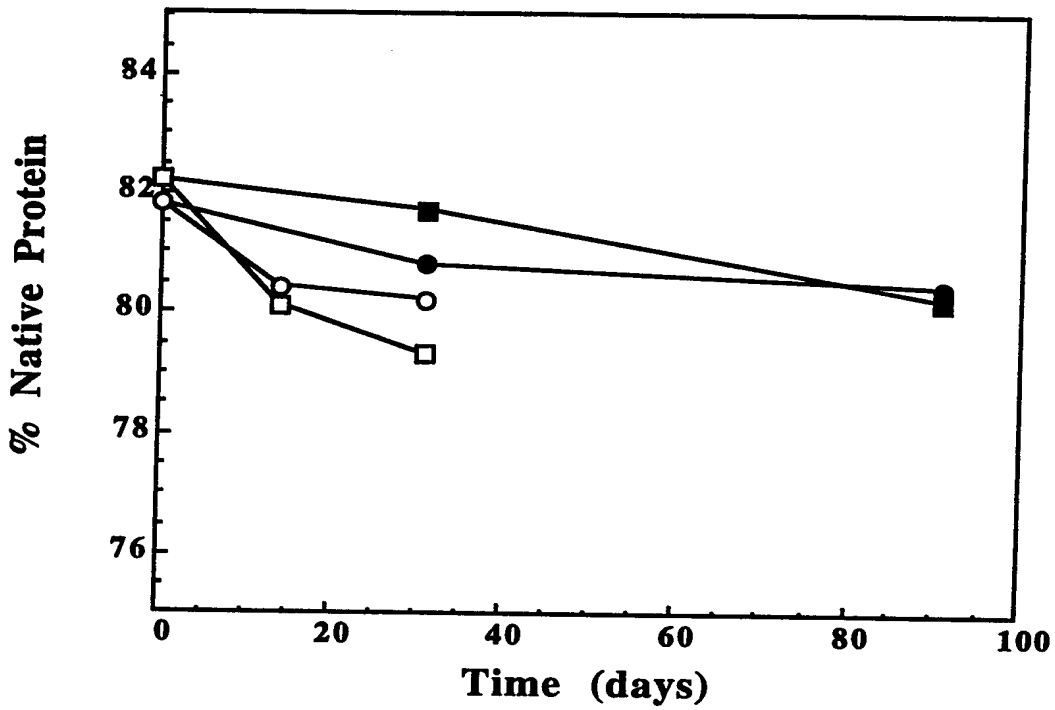

% Native Protein
84
82
80
78
76
0
20
40
60
80
100
Time (days)

FIG. 5

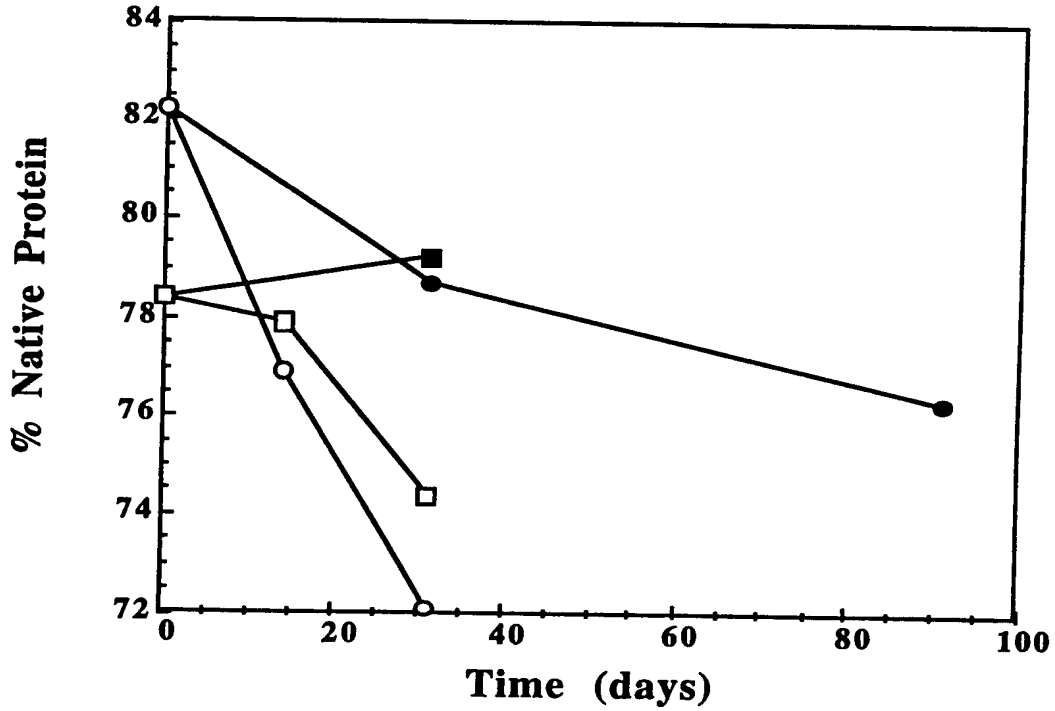

% Native Protein
84
82
80
78
76
74
72
0
20
40
60
80
100
Time (days)

FIG. 6

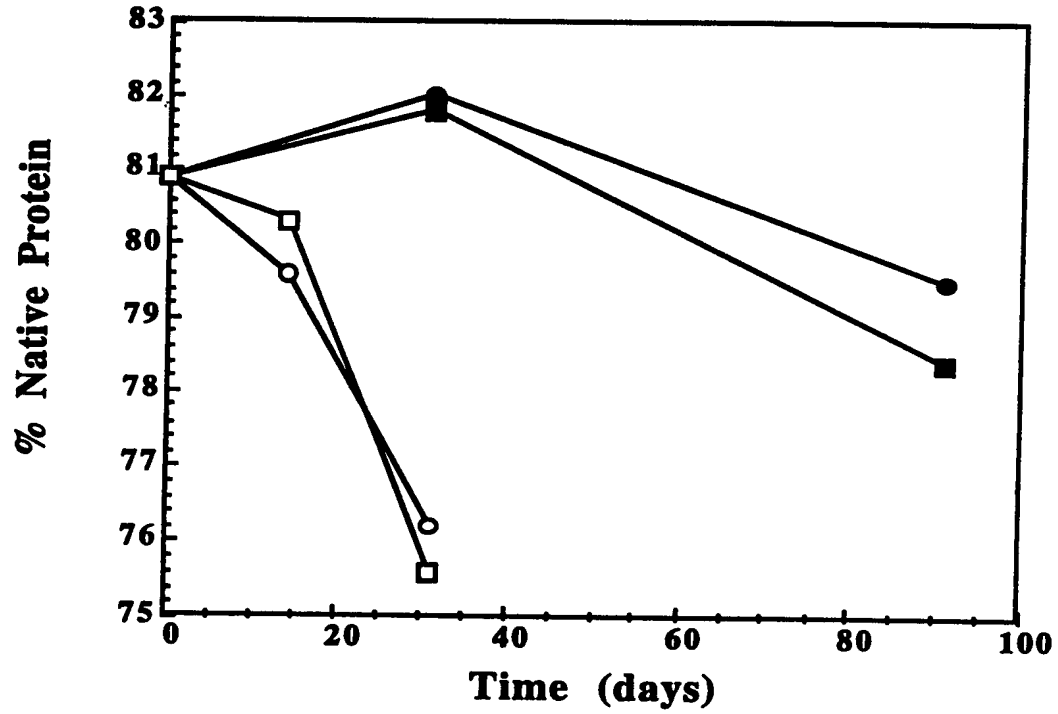

% Native Protein
83
82
81
80
79
78
77
76
75
0
20
40
60
80
100
Time (days)

FIG. 7

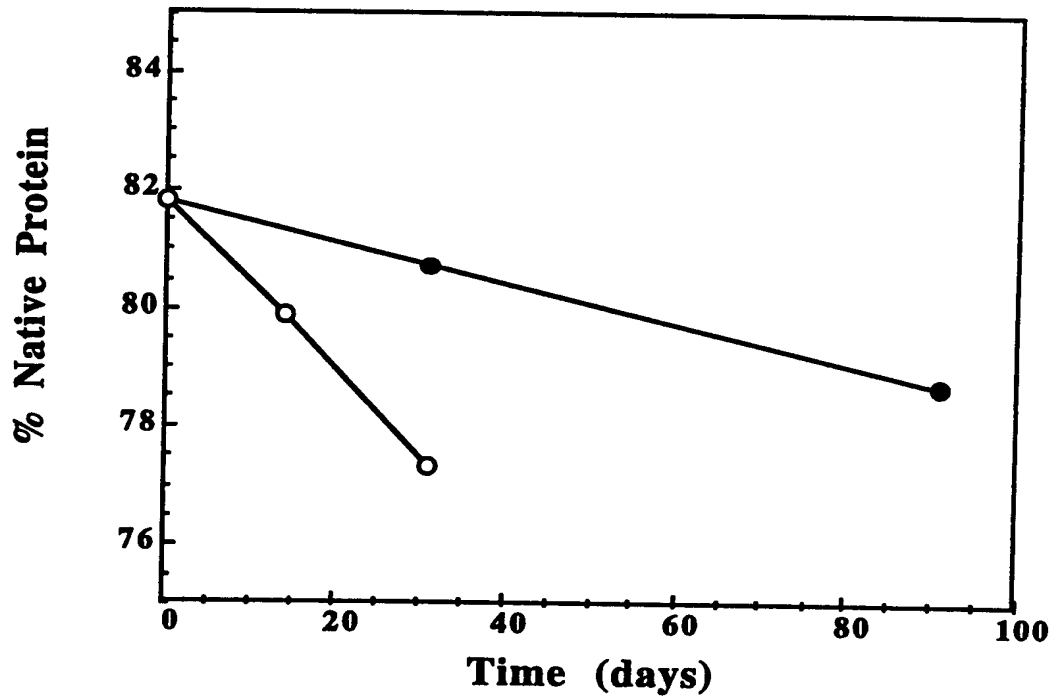

% Native Protein
84
82
80
78
76
0
20
40
60
80
100
Time (days)

FIG. 8

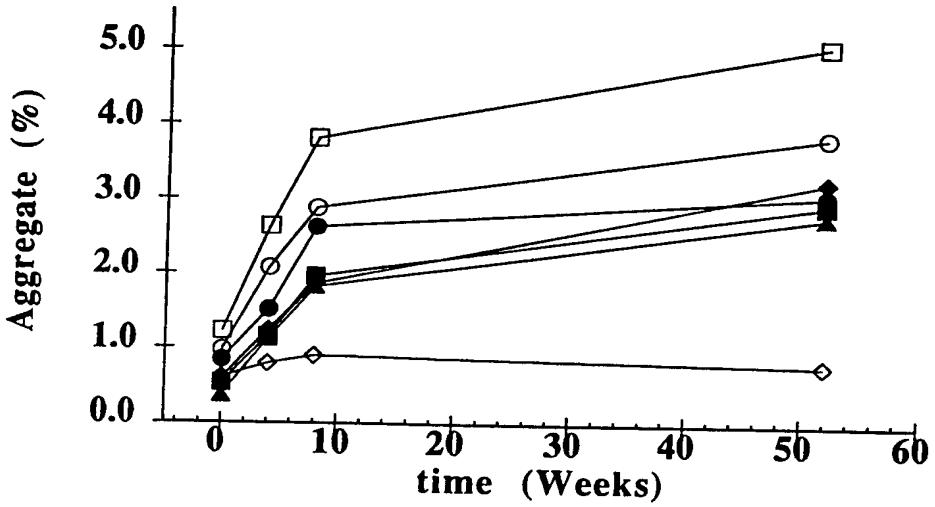

Aggregate (%)
5.0
4.0
3.0
2.0
1.0
0.0
0
10
20
30
40
50
60
time (Weeks)

FIG. 9

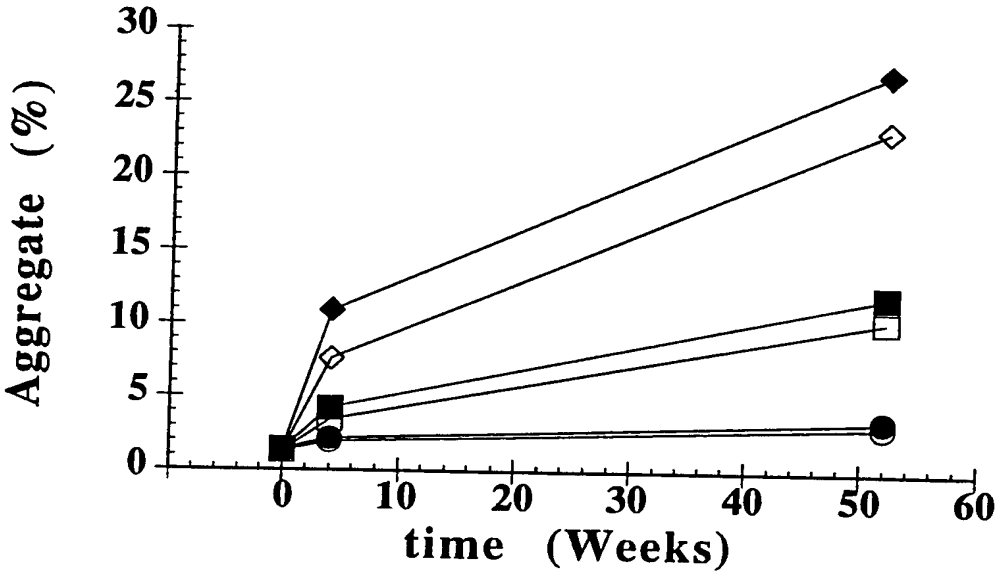

Aggregate (%)
30
25
20
15
10
5
0
0
10
20
30
40
50
60
time (Weeks)

FIG. 10

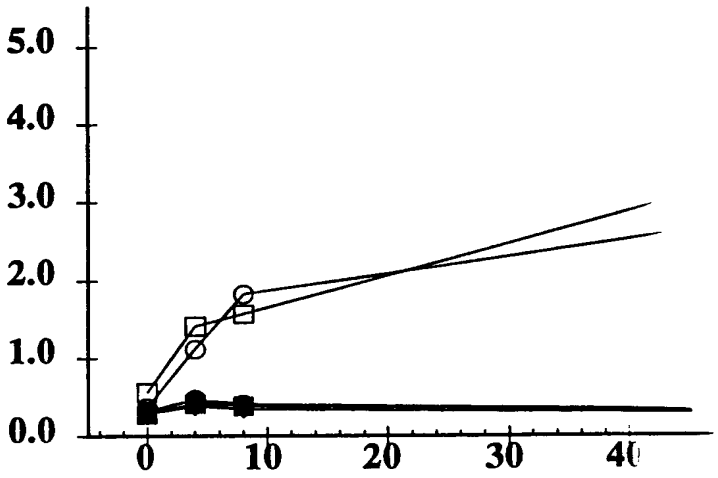


FIG. 11

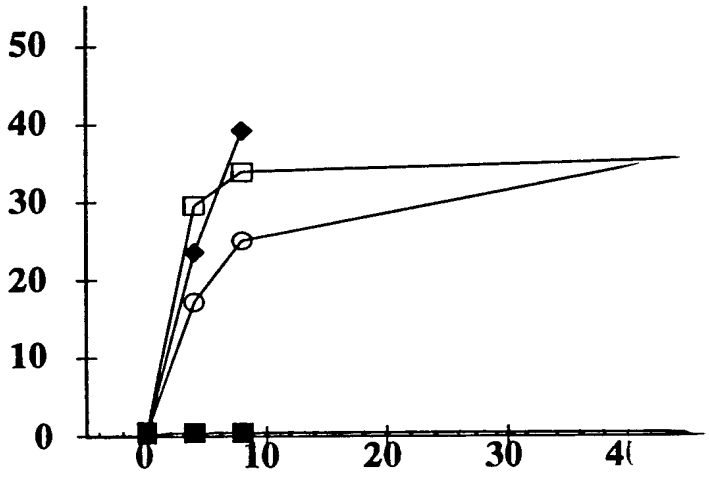


FIG. 12

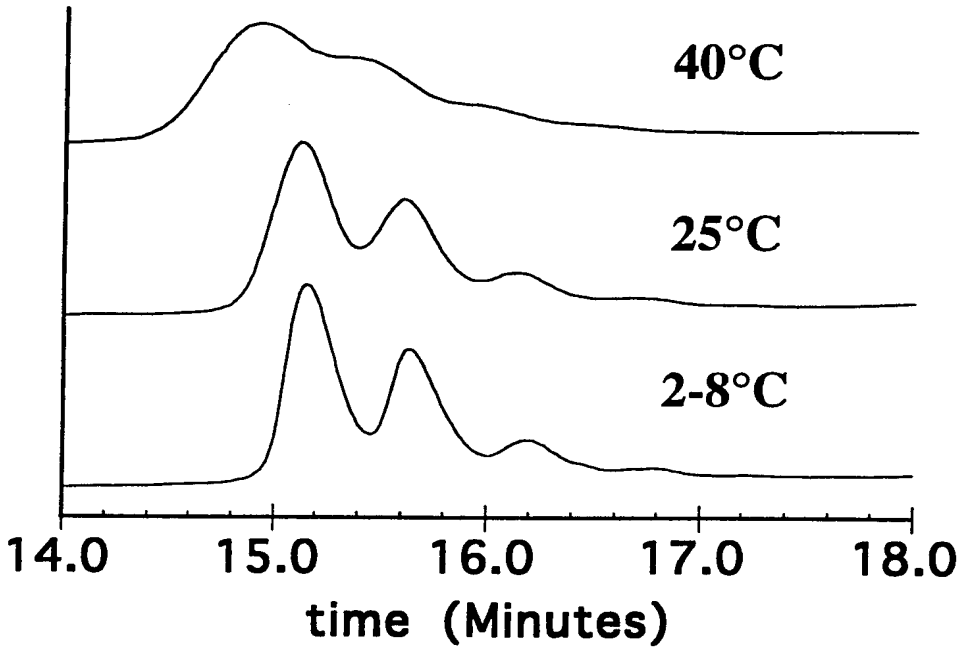

40°C
25°C
2-8°C
14.0
15.0
16.0
17.0
18.0
time (Minutes)

FIG. 13

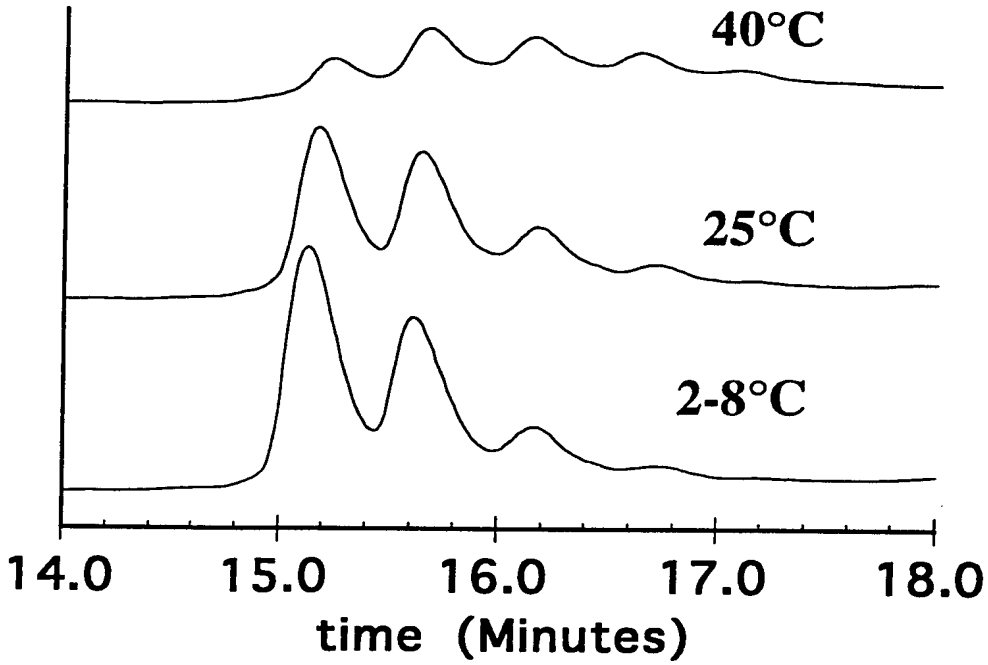

40°C
25°C
2-8°C
14.0
15.0
16.0
17.0
18.0
time (Minutes)

FIG. 14

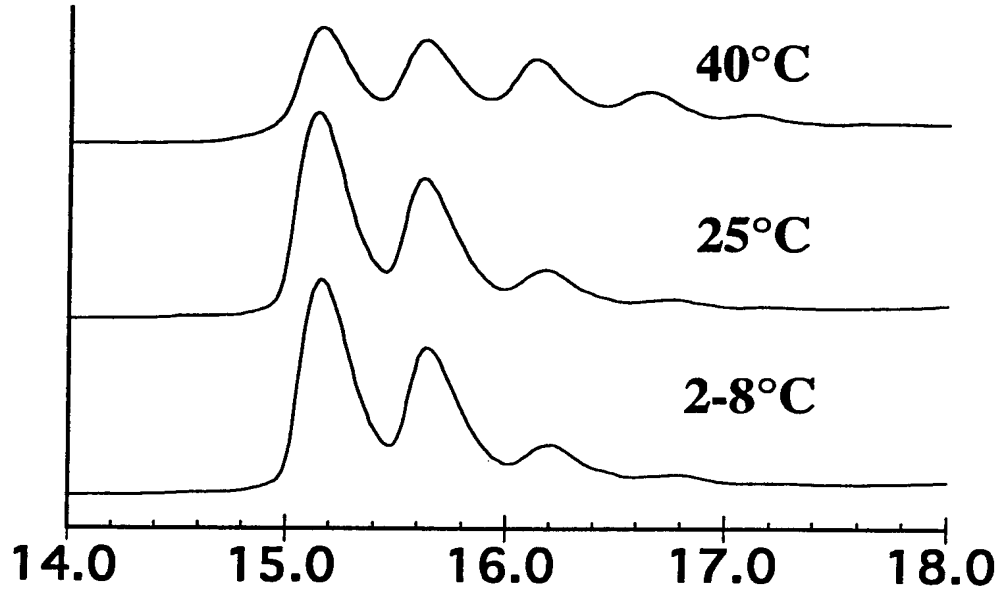

40°C
25°C
2-8°C
14.0
15.0
16.0
17.0
18.0
time (Minutes)

FIG. 15

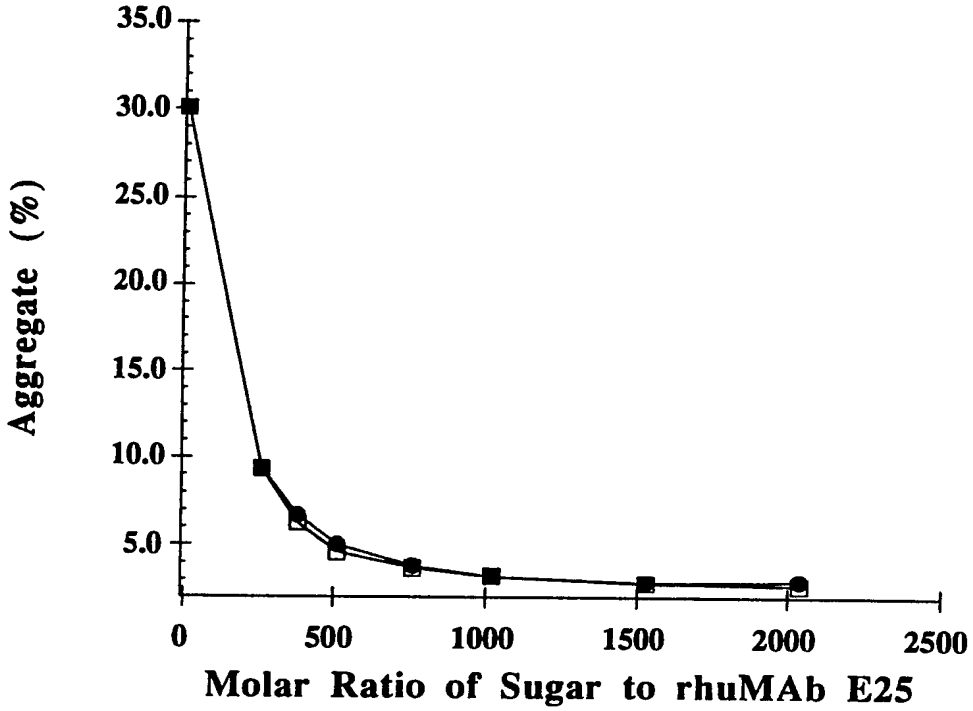

35.0
30.0
25.0
20.0
15.0
10.0
5.0
Aggregate (%)
0
500
1000
1500
2000
2500
Molar Ratio of Sugar to rhuMAb E25

FIG. 16

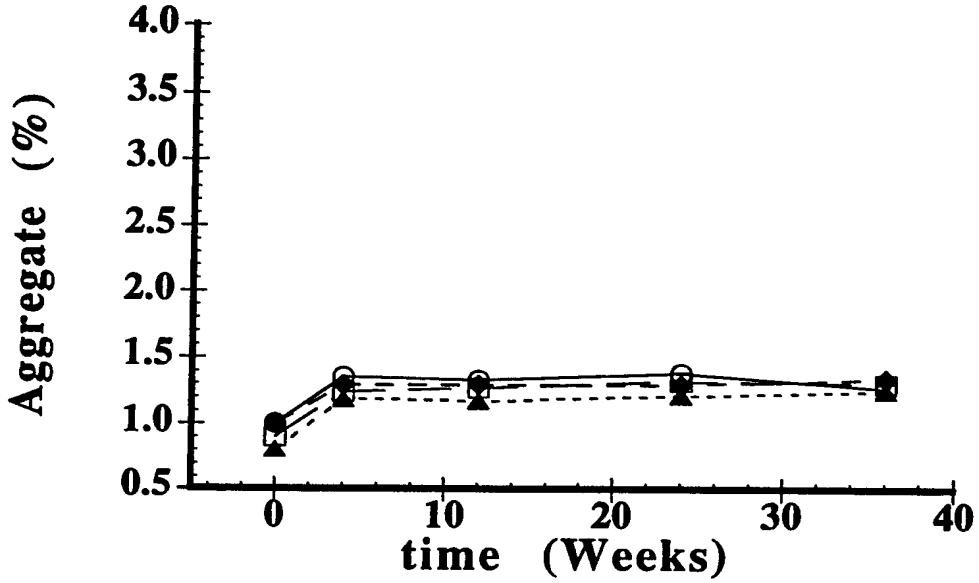

Aggregate (%)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
10
20
30
40
time (Weeks)

FIG. 17

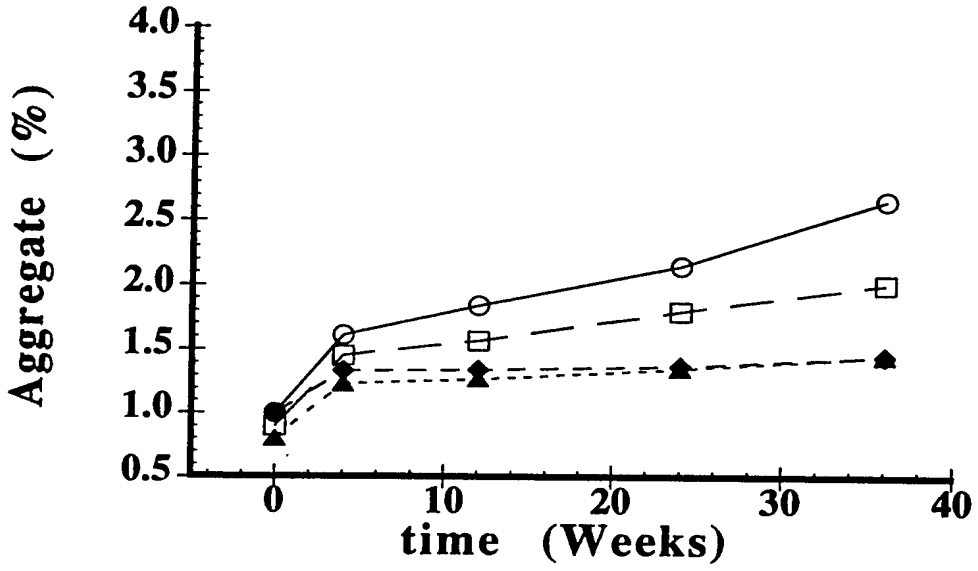

Aggregate (%)
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
10
20
30
40
time (Weeks)

FIG. 18

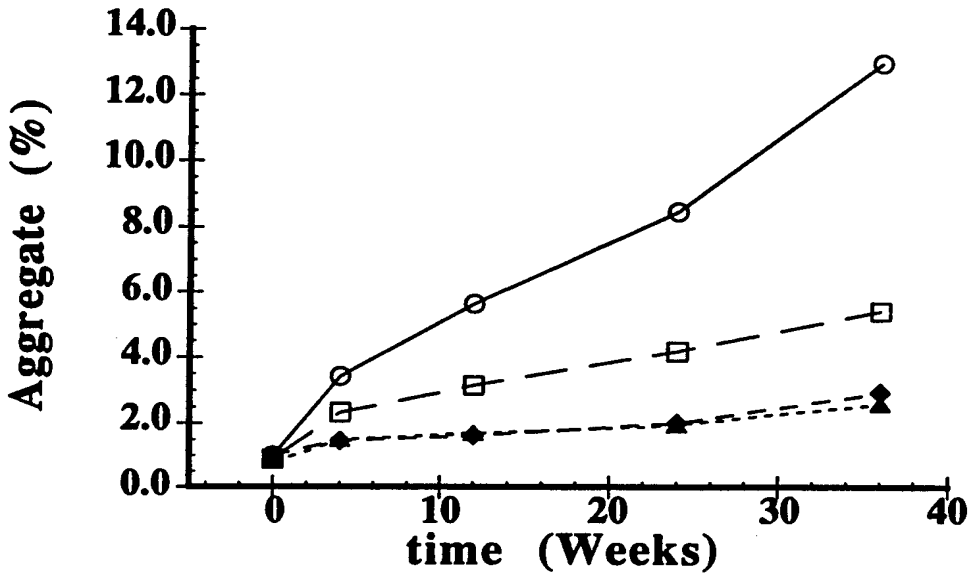


FIG. 19

INTERNATIONAL SEARCH REPORT

Inter onal Application No
PCT/US 96/12251

A. CLASSIFICATION OF SUBJECT MATTER
IPC 6 A61K39/00 A61K39/395 C07K1/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 6 A61K C07K

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	EP 0 661 060 A (IMMUNO AG) 5 July 1995 see the whole document ---	1,3,6, 8-12
A	WO 89 09402 A (TORAY INDUSTRIES INC.) 5 October 1989 see the whole document ---	1-3,6, 10,12
A	JOURNAL OF IMMUNOLOGICAL METHODS, vol. 181, no. 1, 12 April 1995, AMSTERDAM, NL, pages 37-43, XP002019425 P. DRABER ET AL.: "Stability of monoclonal IgM antibodies freeze-dried in the presence of trehalose." see abstract --- -/--	1-3,6, 10,12

[X] Further documents are listed in the continuation of box C.

[X] Patent family members are listed in annex.

* Special categories of cited documents :

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

1

Date of the actual completion of the international search	Date of mailing of the international search report
25 November 1996	03.12.96

Name and mailing address of the ISA	Authorized officer
European Patent Office, P.B. 5818 Patentlaan 2 NL - 2280 HV Rijswijk Tel. (+31-70) 340-2040, Tx. 31 651 epo nl, Fax (+31-70) 340-3016	Nooij, F

Form PCT/ISA/210 (second sheet) (July 1992)

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	JOURNAL OF IMMUNOASSAY, vol. 16, no. 2, May 1995, NEW YORK, NY, USA, pages 183-197, XP000611616 K. NIELSEN ET AL.: "Stability of freeze-dried horseradish peroxidase-conjugated monoclonal antibodies used in diagnostic serology." see the whole document -----	1-3,6, 10,12

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No
PCT/US 96/12251

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
EP-A-661060	05-07-95	DE-C-	4344824	31-08-95
		CA-A-	2138853	29-06-95
		CZ-A-	9403284	12-07-95
		FI-A-	946104	29-06-95
		HU-A-	70449	30-10-95
		JP-A-	7206709	08-08-95
		NO-A-	945045	29-06-95
WO-A-8909402	05-10-89	AT-T-	117434	15-02-95
		DE-D-	68920693	02-03-95
		DE-T-	68920693	24-05-95
		EP-A-	0365685	02-05-90
		US-A-	5262296	16-11-93

Form PCT/ISA/210 (patent family annex) (July 1992)

Electronic Patent Application Fee Transmittal

Application Number:	16582486
Filing Date:	25-Sep-2019
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Filer:	Karl Bozicevic/Kimberly Zuehlke
Attorney Docket Number:	REGN-024CON9

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Pages:				
Claims:				
CLAIMS IN EXCESS OF 20	1202	62	100	6200
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Extension-of-Time:				
Miscellaneous:				
SUBMISSION- INFORMATION DISCLOSURE STMT	1806	1	260	260
STATUTORY OR TERMINAL DISCLAIMER	1814	1	170	170
		Total in USD ($)		**6630**

Electronic Acknowledgement Receipt

EFS ID:	42068227
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Kimberly Zuehlke
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	02-MAR-2021
Filing Date:	25-SEP-2019
Time Stamp:	17:28:39
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$6630
RAM confirmation Number	E202132H29064259
Deposit Account	
Authorized User	

The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		REGN-024CON9_Response_OA_2021-03-02.pdf	100221 984650fdc26758d1fb353c74a3349f6d7214408f	yes	18
	Multipart Description/PDF files in .zip description				
	Document Description		**Start**	**End**	
	Amendment/Req. Reconsideration-After Non-Final Reject		1	1	
	Claims		2	13	
	Applicant Arguments/Remarks Made in an Amendment		14	18	
Warnings:					
Information:					
2	Terminal Disclaimer Filed	5050US11_terminal_disclaimer_2021-03-02.pdf	229172 dbc392ba8639c4849043275af1b8bf381a68992	no	2
Warnings:					
Information:					
3	Transmittal Letter	REGN-024CON9_2021-03-02_Supp_IDS_trans.pdf	51004 3b3304e8d0c4b7b2b8d63f735fc0f53ca788a9fd	no	2
Warnings:					
Information:					
4	Information Disclosure Statement (IDS) Form (SB08)	REGN-024CON9_2021-03-02_Supp_IDS.pdf	47914 9fa9c5a3e9dbe6e75c9704c9feef3f2f56495435	no	3
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					

5	Foreign Reference	WO9704801_Genetech.pdf	2367942 d15eab6d53b35848015c750ee25079ae6e3025da	no	49
Warnings:					
Information:					
6	Non Patent Literature	Petition_for_IPR_of_US_10464992_2021-01-07.pdf	1183585 b474931f8b150ce36180e4cbfb55fbb89da55c28	no	59
Warnings:					
Information:					
7	Non Patent Literature	10464992_File_History.pdf	6226773 644dbf9989934865b94826981ea1491b50655bf1	no	124
Warnings:					
Information:					
8	Non Patent Literature	Fraser_2005.pdf	1131384 f84e936cfab3c957213b3459a7028198f26c1768	no	9
Warnings:					
Information:					
9	Non Patent Literature	Wulff_2002.pdf	2232205 cfb6323385f7456a57d89ba67d898ebb30dc0495	no	11
Warnings:					
Information:					
10	Non Patent Literature	COC_US_10464992.pdf	592885 21f0ce26da18c22cdee2d47d98e7db05d762835f	no	1
Warnings:					
Information:					
11	Non Patent Literature	Holash_2002.pdf	883870 1ffe9076b117653d70845276976b3beef987b857	no	6
Warnings:					
Information:					

12	Non Patent Literature	USSN_12_835065_FH_Excerpt_Response.pdf	683681 ea993240d76bb2108d18a837034b59ed7cdc8868	no	4
Warnings:					
Information:					
13	Non Patent Literature	USSN_12_835065_FH_Excerpt_Declaration.pdf	1516353 ecbd8c6eceedcfc7bc1960a9131b7ce38779c175	no	11
Warnings:					
Information:					
14	Non Patent Literature	Gentz_Declaration.pdf	5149940 751d13e50171ef84c741467cd1759ef5b21c11c4	no	76
Warnings:					
Information:					
15	Non Patent Literature	Chi_2003.pdf	729817 56856f1db245d6cd6dd3a5b4817eb9032c75f81a	no	12
Warnings:					
Information:					
16	Non Patent Literature	Bontempo_1997.pdf	1755140 386b4e3b8155e7184a3fc1a5089c4bd022a371f7	no	20
Warnings:					
Information:					
17	Non Patent Literature	CSH_Protocol_Phosphate_Buffer.pdf	598152 772763eabac4a346cf7a3e8e7c794da7421bc18f	no	1
Warnings:					
Information:					
18	Non Patent Literature	Gentz_CV_2.pdf	314553 ba731d7e5efb44094ece1386b1566b5028443fc3	no	3
Warnings:					
Information:					

19	Non Patent Literature	Rudge_2005_2.pdf	179904 299e60e541e58d50a66a7177fddbb6958e7bdbbd	no	8
Warnings:					
Information:					
20	Non Patent Literature	Guidance_for_Industry_Q1A_R2_2.pdf	1578431 9b6dab384bba5a295f10172c297883cc9ec1e8b3	no	25
Warnings:					
Information:					
21	Non Patent Literature	Parkins_and_Lashmar_2000_2.pdf	8867809 3226eb7ab80ec5371ecc814627124c69f756f220	no	9
Warnings:					
Information:					
22	Non Patent Literature	Randolph_and_Jones_2002_2.pdf	1723828 aebc047c40eeb6a93b8210301425a9f9615fcbe9	no	17
Warnings:					
Information:					
23	Non Patent Literature	Lucentis_Label.pdf	874664 132f0a6a6fab337a44d3c74202b75938cee8ce5d	no	14
Warnings:					
Information:					
24	Non Patent Literature	Avastin_Label_2.pdf	1148811 7096393dbfc06ab5549700e55455845ad873ec7e	no	37
Warnings:					
Information:					
25	Non Patent Literature	Remicade_Label_2.pdf	1775865 a676ecf2f4ee40f91a0a0c33dec13003f2e9ce5b	no	58
Warnings:					
Information:					

26	Non Patent Literature	Xolair_Label_2.pdf	230158 fbd51c81db4b9d8b667acb4279af590cc77b4c7e	no	17
Warnings:					
Information:					
27	Non Patent Literature	Raptiva_Label_2.pdf	505838 315dd408f0257a5488e0652205716a01891840bb	no	36
Warnings:					
Information:					
28	Non Patent Literature	Simulect_Label_2.pdf	880378 0057644fd6c42a2d5662836d6d4f0fef79d4c1cd	no	7
Warnings:					
Information:					
29	Non Patent Literature	Herceptin_Label_2.pdf	198314 401ac79d34ce4eef12daec3c2c516207b1b06354	no	2
Warnings:					
Information:					
30	Non Patent Literature	Drug_Vehicle_Code_C927.pdf	705638 168d2c7dcbc08b060292bf9c92cdc6a24c03f14a	no	1
Warnings:					
Information:					
31	Non Patent Literature	Janeway_2001.pdf	751780 aead3e5e6583d1127ff3c7f8b36b9d602df9f330	no	6
Warnings:					
Information:					
32	Non Patent Literature	Controls_in_SCI_experiments.pdf	765283 e944f8fc7593b359297af5b529074ad60b9b4512	no	2
Warnings:					
Information:					

33	Non Patent Literature	Andersen_and_Krummen_2002_2.pdf	518774 3ea29e5082b40abb2ab6f7fd53fd71c8ad10e318	no	7
Warnings:					
Information:					
34	Fee Worksheet (SB06)	fee-info.pdf	33935 da228efcd88748a83409fbe64835b73453c914d2	no	2
Warnings:					
Information:					
			Total Files Size (in bytes):	46534001	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Application Number * 16/582,486 *	Application/Control No. 16/582,486	Applicant(s)/Patent under Reexamination FURFINE et al.	
	Examiner LOCKARD, JON MCCLELLAND	Art Unit 1647	

Document Code - DISQ	Internal Document - DO NOT MAIL

TERMINAL DISCLAIMER	☑ APPROVED	☐ DISAPPROVED
Date Filed: 02 March 2021	This patent is subject to a Terminal Disclaimer	

Approved/Disapproved by:

/PAMELA A YOUNG/

Technology Center: OPLC

Telephone: (571)272-3622

_____



United States Patent and Trademark Office

Office of the Chief Financial Officer

Document Code:WFEE

User :70133

Sale Accounting Date:03/08/2021

Sale Item Reference Number	Effective Date
16582486	03/02/2021

Document Number	Fee Code	Fee Code Description	Amount Paid	Payment Method
I202138G03460139	1202	CLAIMS IN EXCESS OF 20	$2,000.00	Deposit Account

SUPPLEMENTAL REPLY AND AMENDMENT Under 37 CFR § 1.111		
	Attorney Docket No.	REGN-024CON9
	Confirmation No.	3381
	First Named Inventor	Eric Furfine
	Application Number	16/582,486
	Filing Date	September 25, 2019
Address to: Mail Stop Amendment Commissioner for Patents P.O. Box 1450 Alexandria, VA 22313-1450	Group Art Unit	1647
	Examiner Name	Jon McClelland Lockard
	Title: "*VEGF Antagonist Formulations Suitable for Intravitreal Administration*"	

Sir:

In response to the Office Action dated January 6, 2021, for which responsive communication was previously filed on March 2, 2021, Applicant hereby submits the following supplemental amendments and remarks. This amendment does nothing more than cancel claims and change claim dependency in view of claim cancellations. However, all in the event the patent office determines that an extension of time is necessary in order to enter this amendment, applicant's petition for any required extension of time and authorize the Commissioner to charge the cost of that extension to our deposit account.

In view of the remarks put forth below, reconsideration and allowance are respectfully requested.

Amendments to the Claims are reflected in the listing of claims which begins on page 2 of this paper.

Remarks/Arguments begin on page 10 of this paper.

Electronic Acknowledgement Receipt

EFS ID:	42555230
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Kimberly Zuehlke
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	26-APR-2021
Filing Date:	25-SEP-2019
Time Stamp:	16:37:35
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		REGN-024CON9_Supplemental_Amendment_2021-04-26.pdf	55782 8d41b87946c7c1ad32a1c552aa5cca5e0837deda	yes	10

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Applicant Arguments/Remarks Made in an Amendment	10	10
	Claims	2	9
	Supplemental Response or Supplemental Amendment	1	1
Warnings:			
Information:			
	Total Files Size (in bytes):	55782	

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111
If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.
National Stage of an International Application under 35 U.S.C. 371
If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.
New International Application Filed with the USPTO as a Receiving Office
If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

REMARKS

Formal Matters

Claims 36, 41, 72-99, 101-132 and 134-137 are pending after entry of the amendments set forth herein.

Claims 1-35, 38-40, 43-45, 50 and 64 were previously canceled and claims 37, 42, 46-49, 51-63, 65-71, 100, 133 and 138-161 are canceled herein without prejudice. Claims 101 and 134 have been amended to update dependency.

No new matter has been added.

CONCLUSION

Applicants submit that all the claims are in condition for allowance, which action is requested. If the Examiner finds that a telephone conference would expedite the prosecution of this application, please telephone the undersigned at the number provided.

The Commissioner is hereby authorized to charge any underpayment of fees up to a strict limit of $3,000.00 beyond that authorized on the credit card, but not more than $3,000.00 in additional fees due with any communication for the above referenced patent application, including but not limited to any necessary fees for extensions of time, or credit any overpayment of any amount to Deposit Account No. 50-0815, order number REGN-024CON9.

Respectfully submitted,
BOZICEVIC, FIELD & FRANCIS LLP

Date: 26 April 2021

By: /Karl Bozicevic, Reg. No. 28,807/
Karl Bozicevic, Reg. No. 28,807

BOZICEVIC, FIELD & FRANCIS LLP
201 Redwood Shores Parkway, Suite 200
Redwood City, CA 94065
Telephone: (650) 327-3400
Direct: (650) 833-7735
Facsimile: (650) 327-3231

AMENDMENTS TO THE CLAIMS

1. – 35. (Cancelled)

36. (Previously presented) A glass vial comprising an ophthalmic formulation suitable for intravitreal administration comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor that is human Flt1 and Ig domain 3 of a second VEGF receptor selected from the group consisting of human Flk1 and human Flt4, and a multimerizing component; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

37. – 40. (Cancelled)

41. (Previously presented) A pre-filled syringe comprising an ophthalmic formulation suitable for intravitreal administration comprising:

a vascular endothelial growth factor (VEGF) antagonist fusion protein,

an organic co-solvent,

a buffer, and

a stabilizing agent;

wherein said VEGF antagonist fusion protein is glycosylated and comprises an immunoglobulin-like (Ig) domain 2 of a first VEGF receptor that is human Flt1 and Ig domain 3 of a second VEGF receptor selected from the group consisting of human Flk1 and human Flt4, and a multimerizing component; and

wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for two months as measured by size exclusion chromatography.

42. – 71. (Cancelled)

72. (Previously presented) The glass vial of claim 36, wherein the concentration of said VEGF antagonist fusion protein is 40 mg/ml, and wherein said organic co-solvent comprises polysorbate.

73. (Previously presented) The glass vial of claim 72, wherein said organic co-solvent comprises 0.01% to 3% polysorbate.

74. (Previously presented) The glass vial of claim 72, wherein said organic co-solvent comprises 0.01% to 3% polysorbate 20.

75. (Previously presented) The glass vial of claim 72, wherein said organic co-solvent comprises about 0.03% to about 0.1% polysorbate 20.

76. (Previously presented) The glass vial of claim 74, wherein said buffer comprises a phosphate buffer.

77. (Previously presented) The glass vial of claim 74, wherein said buffer comprises 5-25 mM buffer.

78. (Previously presented) The glass vial of claim 74, wherein said buffer comprises a pH between about 5.8-7.0.

79. (Previously presented) The glass vial of claim 74, wherein said buffer comprises a pH about 6.2-6.3.

80. (Previously presented) The glass vial of claim 74, wherein said stabilizing agent comprises a sugar.

81. (Previously presented) The glass vial of claim 80, wherein said sugar is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.

82. (Previously presented) The glass vial of claim 74, wherein said stabilizing agent comprises 1.0-10% of sucrose.

83. (Previously presented) The glass vial of claim 74, wherein said stabilizing agent comprises 1.0-7.5% of sucrose.

84. (Previously presented) The glass vial of claim 74, wherein said formulation further comprises a tonicity agent.

85. (Previously presented) The glass vial of claim 74, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

86. (Previously presented) The glass vial of claim 74, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

87. (Previously presented) The glass vial of claim 74, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

88. (Previously presented) The glass vial of claim 74, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

89. (Previously presented) The glass vial of claim 74, wherein said formulation does not contain phosphate.

90. (Previously presented) The glass vial of claim 74, wherein said formulation does not contain trehalose.

91. (Previously presented) The glass vial of claim 82, wherein said formulation further comprises a tonicity agent.

92. (Previously presented) The glass vial of claim 82, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

93. (Previously presented) The glass vial of claim 82, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

94. (Previously presented) The glass vial of claim 82, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

95. (Previously presented) The glass vial of claim 82, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

96. (Previously presented) The glass vial of claim 36, wherein said stabilizing agent comprises sucrose.

97. (Previously presented) The glass vial of claim 96, wherein said stabilizing agent comprises 1.0-10% of sucrose.

98. (Previously presented) The glass vial of claim 96, wherein the organic co-solvent is polysorbate 20.

99. (Previously presented) The glass vial of claim 98, wherein said Ig domain 3 of human VEGF receptor 2 comprises amino acids 131-230 of SEQ ID NO:4.

100. (Cancelled)

101. (**Currently amended**) The glass vial of claim ~~100~~**99**, wherein said formulation further comprises a tonicity agent.

102. (Previously presented) The glass vial of claim 101, wherein said tonicity agent comprises sodium chloride.

103. (Previously presented) The glass vial of claim 98, wherein said formulation comprises 10 mg/mL VEGF antagonist fusion protein.

104. (Previously presented) The glass vial of claim 98, wherein said formulation does not contain phosphate.

105. (Previously presented) The pre-filled syringe of claim 41, wherein the concentration of said VEGF antagonist fusion protein is 40 mg/ml, and wherein said organic co-solvent comprises polysorbate.

106. (Previously presented) The pre-filled syringe of claim 105, wherein said organic co-solvent comprises 0.01% to 3% polysorbate.

107. (Previously presented) The pre-filled syringe of claim 105, wherein said organic co-solvent comprises 0.01% to 3% polysorbate 20.

108. (Previously presented) The pre-filled syringe of claim 105, wherein said organic co-solvent comprises about 0.03% to about 0.1% polysorbate 20.

109. (Previously presented) The pre-filled syringe of claim 107, wherein said buffer comprises a phosphate buffer.

110. (Previously presented) The pre-filled syringe of claim 107, wherein said buffer comprises 5-25 mM buffer.

111. (Previously presented) The pre-filled syringe of claim 107, wherein said buffer comprises a pH between about 5.8-7.0.

112. (Previously presented) The pre-filled syringe of claim 107, wherein said buffer comprises a pH about 6.2-6.3.

113. (Previously presented) The pre-filled syringe of claim 107, wherein said stabilizing agent comprises a sugar.

114. (Previously presented) The pre-filled syringe of claim 113, wherein said sugar is selected from the group consisting of sucrose, sorbitol, glycerol, trehalose, and mannitol.

115. (Previously presented) The pre-filled syringe of claim 107, wherein said stabilizing agent comprises 1.0-10% of sucrose.

116. (Previously presented) The pre-filled syringe of claim 107, wherein said stabilizing agent comprises 1.0-7.5% of sucrose.

117. (Previously presented) The pre-filled syringe of claim 107, wherein said formulation further comprises a tonicity agent.

118. (Previously presented) The pre-filled syringe of claim 107, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

119. (Previously presented) The pre-filled syringe of claim 107, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

120. (Previously presented) The pre-filled syringe of claim 107, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

121. (Previously presented) The pre-filled syringe of claim 107, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

122. (Previously presented) The pre-filled syringe of claim 107, wherein said formulation does not contain phosphate.

123. (Previously presented) The pre-filled syringe of claim 107, wherein said formulation does not contain trehalose.

124. (Previously presented) The pre-filled syringe of claim 115, wherein said formulation further comprises a tonicity agent.

125. (Previously presented) The pre-filled syringe of claim 115, wherein said VEGF antagonist fusion protein is glycosylated at asparagine residues corresponding to asparagine residues 62, 94, 149, 222 and 308 of SEQ ID NO: 4.

126. (Previously presented) The pre-filled syringe of claim 115, wherein said formulation is capable of providing a turbidity of 0.01 or lower at OD_{405} after 2 month storage at 5°C.

127. (Previously presented) The pre-filled syringe of claim 115, wherein at least 99% of said VEGF antagonist fusion protein is present in native conformation after 2 month storage at 5°C as measured by size exclusion chromatography.

128. (Previously presented) The pre-filled syringe of claim 115, wherein at least 98% of said VEGF antagonist fusion protein is present in native conformation following storage at 5° C for 24 months as measured by size exclusion chromatography.

129. (Previously presented) The pre-filled syringe of claim 41, wherein said stabilizing agent comprises sucrose.

130. (Previously presented) The pre-filled syringe of claim 129, wherein said stabilizing agent comprises 1.0-10% of sucrose.

131. (Previously presented) The pre-filled syringe of claim 129, wherein the organic co-solvent is polysorbate 20.

132. (Previously presented) The pre-filled syringe of claim 131, wherein said Ig domain 3 of human VEGF receptor 2 comprises amino acids 131-230 of SEQ ID NO:4.

133. (Cancelled)

134. (**Currently amended**) The pre-filled syringe of claim ~~133~~**132**, wherein said formulation further comprises a tonicity agent.

135. (Previously presented) The pre-filled syringe of claim 134, wherein said tonicity agent comprises sodium chloride.

136. (Previously presented) The pre-filled syringe of claim 131, wherein said formulation comprises 10 mg/mL VEGF antagonist fusion protein.

137. (Previously presented) The pre-filled syringe of claim 131, wherein said formulation does not contain phosphate.

138. – 161. (Cancelled)

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

NOTICE OF ALLOWANCE AND FEE(S) DUE

96387 7590 05/12/2021

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

EXAMINER
LOCKARD, JON MCCLELLAND

ART UNIT	PAPER NUMBER
1647	

DATE MAILED: 05/12/2021

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9	3381

TITLE OF INVENTION: VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	08/12/2021

THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.

THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.

HOW TO REPLY TO THIS NOTICE:

I. Review the ENTITY STATUS shown above. If the ENTITY STATUS is shown as SMALL or MICRO, verify whether entitlement to that entity status still applies.

If the ENTITY STATUS is the same as shown above, pay the TOTAL FEE(S) DUE shown above.

If the ENTITY STATUS is changed from that shown above, on PART B - FEE(S) TRANSMITTAL, complete section number 5 titled "Change in Entity Status (from status indicated above)".

For purposes of this notice, small entity fees are 1/2 the amount of undiscounted fees, and micro entity fees are 1/2 the amount of small entity fees.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

IMPORTANT REMINDER: Maintenance fees are due in utility patents issuing on applications filed on or after Dec. 12, 1980. It is patentee's responsibility to ensure timely payment of maintenance fees when due. More information is available at www.uspto.gov/PatentMaintenanceFees.

PART B - FEE(S) TRANSMITTAL

Complete and send this form, together with applicable fee(s), by mail or fax, or via EFS-Web.

By mail, send to: Mail Stop ISSUE FEE
Commissioner for Patents
P.O. Box 1450
Alexandria, Virginia 22313-1450

By fax, send to: (571)-273-2885

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

96387 7590 05/12/2021

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

Certificate of Mailing or Transmission

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being transmitted to the USPTO via EFS-Web or by facsimile to (571) 273-2885, on the date below.

(Typed or printed name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9	3381

TITLE OF INVENTION: VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

APPLN. TYPE	ENTITY STATUS	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	UNDISCOUNTED	$1200	$0.00	$0.00	$1200	08/12/2021

EXAMINER	ART UNIT	CLASS-SUBCLASS
LOCKARD, JON MCCLELLAND	1647	530-351000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

❑ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.

❑ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-09 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list
(1) The names of up to 3 registered patent attorneys or agents OR, alternatively,
(2) The name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed.

1 _____
2 _____
3 _____

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document must have been previously recorded, or filed for recordation, as set forth in 37 CFR 3.11 and 37 CFR 3.81(a). Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ❑ Individual ❑ Corporation or other private group entity ❑ Government

4a. Fees submitted: ❑ Issue Fee ❑ Publication Fee (if required) ❑ Advance Order - # of Copies _____

4b. Method of Payment: *(Please first reapply any previously paid fee shown above)*

❑ Electronic Payment via EFS-Web ❑ Enclosed check ❑ Non-electronic payment by credit card (Attach form PTO-2038)

❑ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment to Deposit Account No. _____

5. **Change in Entity Status** (from status indicated above)

❑ Applicant certifying micro entity status. See 37 CFR 1.29

❑ Applicant asserting small entity status. See 37 CFR 1.27

❑ Applicant changing to regular undiscounted fee status.

NOTE: Absent a valid certification of Micro Entity Status (see forms PTO/SB/15A and 15B), issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment.
NOTE: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.
NOTE: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

NOTE: This form must be signed in accordance with 37 CFR 1.31 and 1.33. See 37 CFR 1.4 for signature requirements and certifications.

Authorized Signature _____ Date _____

Typed or printed name _____ Registration No. _____

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9	3381

96387 7590 05/12/2021

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

EXAMINER	
LOCKARD, JON MCCLELLAND	
ART UNIT	**PAPER NUMBER**
1647	

DATE MAILED: 05/12/2021

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(Applications filed on or after May 29, 2000)

The Office has discontinued providing a Patent Term Adjustment (PTA) calculation with the Notice of Allowance.

Section 1(h)(2) of the AIA Technical Corrections Act amended 35 U.S.C. 154(b)(3)(B)(i) to eliminate the requirement that the Office provide a patent term adjustment determination with the notice of allowance. See Revisions to Patent Term Adjustment, 78 Fed. Reg. 19416, 19417 (Apr. 1, 2013). Therefore, the Office is no longer providing an initial patent term adjustment determination with the notice of allowance. The Office will continue to provide a patent term adjustment determination with the Issue Notification Letter that is mailed to applicant approximately three weeks prior to the issue date of the patent, and will include the patent term adjustment on the patent. Any request for reconsideration of the patent term adjustment determination (or reinstatement of patent term adjustment) should follow the process outlined in 37 CFR 1.705.

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

OMB Clearance and PRA Burden Statement for PTOL-85 Part B

The Paperwork Reduction Act (PRA) of 1995 requires Federal agencies to obtain Office of Management and Budget approval before requesting most types of information from the public. When OMB approves an agency request to collect information from the public, OMB (i) provides a valid OMB Control Number and expiration date for the agency to display on the instrument that will be used to collect the information and (ii) requires the agency to inform the public about the OMB Control Number's legal significance in accordance with 5 CFR 1320.5(b).

The information collected by PTOL-85 Part B is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 30 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450. Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

Privacy Act Statement

The Privacy Act of 1974 (P.L. 93-579) requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (i.e., GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

Notice of Allowability	Application No. 16/582,486	Applicant(s) FURFINE et al.	
	Examiner JON M LOCKARD	Art Unit 1647	AIA (FITF) Status No

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☑ This communication is responsive to the Amendments filed 02 March 2021 and 26 April 2021.
   ☐ A declaration(s)/affidavit(s) under **37 CFR 1.130(b)** was/were filed on _____.

2. ☐ An election was made by the applicant in response to a restriction requirement set forth during the interview on _____; the restriction requirement and election have been incorporated into this action.

3. ☑ The allowed claim(s) is/are See Continuation Sheet . As a result of the allowed claim(s), you may be eligible to benefit from the **Patent Prosecution Highway** program at a participating intellectual property office for the corresponding application. For more information, please see **http://www.uspto.gov/patents/init_events/pph/index.jsp** or send an inquiry to **PPHfeedback@uspto.gov.**

4. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

   Certified copies:

   a) ☐ All b) ☐ Some *c) ☐ None of the:

   1. ☐ Certified copies of the priority documents have been received.
   2. ☐ Certified copies of the priority documents have been received in Application No. _____ .
   3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

   * Certified copies not received: _____ .

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.
THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
   ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____ .

   Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).

6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

1. ☐ Notice of References Cited (PTO-892)
2. ☑ Information Disclosure Statements (PTO/SB/08), Paper No./Mail Date _____.
3. ☐ Examiner's Comment Regarding Requirement for Deposit of Biological Material _____.
4. ☐ Interview Summary (PTO-413), Paper No./Mail Date. _____.
5. ☑ Examiner's Amendment/Comment
6. ☐ Examiner's Statement of Reasons for Allowance
7. ☐ Other _____.

/J.L/ Examiner, Art Unit 1647	/CHRISTINE J SAOUD/ Primary Examiner, Art Unit 1647

Continuation of 3. The allowed claim(s) is/are: 36, 41, 72-99, 101-132 and 134-137 (renumbered as claims 1,34,2-3,5,4,6-11,20,12-19,21-33,35-36,42,37-41,43-45,51-52,54-58,46-50 and 59-66, respectively).

Notice of Pre-AIA or AIA Status

1. The present application is being examined under the pre-AIA first to invent provisions.

DETAILED ACTION

Status of Application, Amendments, and/or Claims

2. The Amendment filed 02 March 2021 has been received and entered in full. Claims 36-37 and 41-42 have been amended, claims 38-40, 43-45, 50 and 64 have been cancelled, and claims 72-161 have been added. Newly presented claims 72-161 will be examined as they fit under the rubric of the elected invention.

3. The Amendment filed 26 April 2021 has been received and entered in full. Claims 101 and 134 have been amended, and claims 37, 42, 46-49, 51-63, 65-71, 100, 133 and 138-161 have been cancelled. Therefore, claims 36, 41, 72-99, 101-132 and 134-137 are pending and the subject of this Office Action.

Information Disclosure Statement

4. The information disclosure statement (IDS) submitted on 02 March 2021 has been considered by the examiner.

Terminal Disclaimer

5. The terminal disclaimer filed on 02 March 2021 disclaiming the terminal portion of any patent granted on this application which would extend beyond the expiration date of **U.S. Patent**

No. 8,092,803 and **U.S. Patent No. 10,464,992** has been reviewed and is accepted. The terminal disclaimer has been recorded.

Withdrawn Objections and/or Rejections

6. The rejection of claims 36-71 on the ground of nonstatutory obviousness-type double patenting as set forth at pp. 3-5 of the previous Office action (mailed 06 January 2021) is withdrawn in view of Applicant's amendment of claims 36 and 41, cancellation of claims 37 and 42-71, and the submission of a terminal disclaimer (filed 02 March 2021 and 26 April 2021).

Summary

7. Claims 36, 41, 72-99, 101-132 and 134-137.

Advisory Information

Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Jon M. Lockard** whose telephone number is **(571) 272-2717**. The examiner can normally be reached on Monday through Friday, 8:00 AM to 4:30 PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, **Joanne Hama**, can be reached on **(571) 272-2911**. The fax number for the organization where this application or proceeding is assigned is **571-273-8300**.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at **866-217-9197** (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Christine J Saoud/
Primary Examiner, Art Unit 1647

/J.L/
Examiner, Art Unit 1647
April 30, 2021

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/582,486	FURFINE et al.
	Examiner	Art Unit
	JON M LOCKARD	1647

CPC - Searched*		
Symbol	Date	Examiner

CPC Combination Sets - Searched*		
Symbol	Date	Examiner

US Classification - Searched*			
Class	Subclass	Date	Examiner
NONE		12/31/2020	JML

* See search history printout included with this form or the SEARCH NOTES box below to determine the scope of the search.

Search Notes		
Search Notes	Date	Examiner
STIC Search of SEQ ID NO:4. See search results in SCORE.	12/31/2020	JML
EAST (USPAT, US-PGPUB, EPO, DERWENT): See attached search history.	12/31/2020	JML
STN (MEDLINE, SCISEARCH, EMBASE, BIOSIS): See attached search history.	12/31/2020	JML
PALM: Inventor search.	12/31/2020	JML
IPR2021-00402 Reviewed petition for Inter Partes Review of U.S. Patent No. 10,464,992		

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/582,486	FURFINE et al.
	Examiner	Art Unit
	JON M LOCKARD	1647

Interference Search			
US Class/CPC Symbol	US Subclass/CPC Group	Date	Examiner
	STIC Search of SEQ ID NO:4. See search results in SCORE.	04/22/2021	JML
	EAST (USPAT): See attached search history.	04/22/2021	JML
	PALM: Inventor search.	04/22/2021	JML

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/582,486	FURFINE et al.
	Examiner	**Art Unit**
	JON M LOCKARD	1647

CPC						
Symbol					**Type**	**Version**
C07K	/	14	/	71	F	2013-01-01
A61K	/	9	/	0048	I	2013-01-01
A61K	/	9	/	19	I	2013-01-01
A61K	/	38	/	1793	I	2013-01-01
C07K	/	14	/	4705	I	2013-01-01
A61M	/	5	/	178	I	2013-01-01
C07K	/	14	/	47	I	2013-01-01
A61K	/	9	/	0019	I	2013-01-01
A61K	/	38	/	179	I	2013-01-01
A61K	/	47	/	26	I	2013-01-01
A61K	/	47	/	02	I	2013-01-01
A61K	/	47	/	10	I	2013-01-01
C07K	/	2319	/	30	A	2013-01-01
C07K	/	2319	/	00	A	2013-01-01

CPC Combination Sets								
Symbol					**Type**	**Set**	**Ranking**	**Version**
	/		/					

/JON M LOCKARD/ Examiner, Art Unit 1647	22 April 2021	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	66	
/CHRISTINE J SAOUD/ Primary Examiner, Art Unit 1647	03 May 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	NONE

U.S. Patent and Trademark Office

Part of Paper No.: 20210412

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/582,486	FURFINE et al.
	Examiner	Art Unit
	JON M LOCKARD	1647

INTERNATIONAL CLASSIFICATION					
CLAIMED					
A61K	/	38	/	18	
C07K	/	14	/	71	
C07K	/	19	/	00	

NON-CLAIMED				
	/		/	

US ORIGINAL CLASSIFICATION	
CLASS	SUBCLASS

CROSS REFERENCES(S)						
CLASS	SUBCLASS (ONE SUBCLASS PER BLOCK)					

/JON M LOCKARD/ Examiner, Art Unit 1647	22 April 2021	Total Claims Allowed:	
(Assistant Examiner)	(Date)	66	
/CHRISTINE J SAOUD/ Primary Examiner, Art Unit 1647	03 May 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	NONE

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/582,486	FURFINE et al.
	Examiner	**Art Unit**
	JON M LOCKARD	1647

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	36	9	79	17	88	27	97	42	107	51	116	47	125	64	135
34	41	10	80	18	89	28	98	37	108	52	117	48	126	65	136
2	72	11	81	19	90	29	99	38	109	53	118	49	127	66	137
3	73	20	82	21	91	30	101	39	110	54	119	50	128		
5	74	12	83	22	92	31	102	40	111	55	120	59	129		
4	75	13	84	23	93	32	103	41	112	56	121	60	130		
6	76	14	85	24	94	33	104	43	113	57	122	61	131		
7	77	15	86	25	95	35	105	44	114	58	123	62	132		
8	78	16	87	26	96	36	106	45	115	46	124	63	134		

/JON M LOCKARD/ Examiner, Art Unit 1647	22 April 2021	**Total Claims Allowed:**	
(Assistant Examiner)	(Date)	66	
/CHRISTINE J SAOUD/ Primary Examiner, Art Unit 1647	03 May 2021	O.G. Print Claim(s)	O.G. Print Figure
(Primary Examiner)	(Date)	1	NONE

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	1647
				Examiner Name	Jon McClelland Lockard
Sheet	1	of	3	Attorney Docket Number	REGN-024CON9

U.S. PATENT DOCUMENTS

Examiner Initial*	Cite No.	Patent Number Number-Kind Code (*if known*)	Issue Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	6,171,586 B1	01/09/2001	Lam *et al.*	
	2	8,110,546 B2	02/07/2012	Dix *et al.*	
	3	10,464,992 B2	11/05/2019	Furfine *et al.*	

U.S. PATENT APPLICATION PUBLICATIONS

Examiner Initial*	Cite No.	Publication Number **Number-Kind Code** (*if known*)	Publication Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
	1	2003/0113316 A1	06/19/2003	Kaisheva *et al.*	
	2	2003/0138417 A1	07/24/2003	Kaisheva *et al.*	
	3	2004/0197324 A1	10/07/2004	Liu *et al.*	
	4				

FOREIGN PATENT DOCUMENTS

Examiner Initial*	Cite No.	Foreign Document Number Country Code-Number-Kind Code (*if known*)	Publication Date YYYY-MM-DD	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T
	1	W0 97/04801	02/13/1997	Genetech, Inc.		
	2					

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	1	Petition for *Inter Partes* Review of U.S. Patent No. 10,464,992, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 59 pgs.	
	2	File History of U.S. Patent No. 10,464,992, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 124 pgs.	
	3	Declaration of Dr. Reiner Gentz, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 76 pgs.	
	4	Fraser *et al.*, "Single Injections of Vascular Endothelial Growth Factor Trap Block Ovulation in the Macaque and Produce a Prolonged, Dose-Related Suppression of Ovarian Function," *J. Clin. Endocrinol. & Metab.*, 90(2):1114-1122 (2004)	
	5	Wulff *et al.*, "Prevention of Thecal Angiogenesis, Antral Follicular Growth, and Ovulation in the Primate by Treatment with Vascular Endothelial Growth Factor Trap R1R2," *Endocrinology*, 143(7):2797-2807 (2002)	
	6	Certificate of Correction dated March 3, 2020, in U.S. Patent No. 10,464,992, 1 pg.	
	7	Holash *et al.*, "VEGF-Trap: A VEGF blocker with potent antitumor effects," *PNAS*, 99(17):11393-11398 (2002)	
	8	Response to Office Action in U.S. Patent Application No. 12/835,065 filed November 22, 2011, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 4 pgs.	
	9	Declaration Pursuant to 37 C.F.R. § 1.131 of Daniel B. Dix, Kelly Frye, and Susan Kautz in Support of Response to Office Action in U.S. Patent Application No. 12/835,065 filed November 22, 2011, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 11 pgs.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	1647
				Examiner Name	Jon McClelland Lockard
Sheet	2	of	3	Attorney Docket Number	REGN-024CON9

NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	10	Resume of Reiner Gentz, Ph.D., as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 3 pgs.	
	11	Rudge *et al.*, "VEGF Trap as a Novel Antiangiogenic Treatment Currently in Clinical Trials for Cancer and Eye Diseases, and VelociGene®-based Discovery of the Next Generation of Angiogenesis Targets," *Cold Spring Harbor Symposia on Quantitative Biology*, 70:411-418 (2004)	
	12	Chi *et al.*, "Physical Stability of Proteins in Aqueous Solution: Mechanism and Driving Forces in Nonnative Protein Aggregation," *Pharmaceutical Research*, 20(9):1325-1336 (2003)	
	13	Bontempo, "Preformulation Development of Parenteral Biopharmaceuticals," *Drugs and the Pharmaceutical Sciences*, 85:91-108 (1997)	
	14	"Guidance for Industry Q1A(R2) Stability Testing of New Drug Substances and Products," U.S. Department of Health and Human Services, Food and Drug Administration, Rockville, MD, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 25 pgs.	
	15	Parkins *et al.*, "The formulation of biopharmaceutical products," *Pharmaceutical Science & Technology Today*, 3(4):129-137 (2000)	
	16	Randolph *et al.*, "Surfactant-Protein Interactions," *Rational Design of Stable Protein Formulations*, pp. 159-175, Springer, Boston, MA (2002)	
	17	"Phosphate buffer," Cold Spring Harbor Protocols, 2006:pdb.rec8543, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 1 pg.	
	18	LUCENTIS® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 14 pgs.	
	19	AVASTIN® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 37 pgs.	
	20	REMICADE® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 58 pgs.	
	21	XOLAIR® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 17 pgs.	
	22	RAPTIVA® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 36 pgs.	
	23	SIMULECT® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 7 pgs.	
	24	HERCEPTIN® label, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 2 pgs.	
	25	Andersen *et al.*, "Recombinant protein expression for therapeutic applications," *Current Opinion in Biotechnology*, 13:117-123 (2002)	
	26	Janeway *et al.*, "The structure of a typical antibody molecule," Immunobiology: The Immune System in Health and Disease, 5th edition, New York: Garland Science, 6 pgs. (2001)	
	27	Drug Vehicle (Code C927), National Cancer Institute (NCI), retrieved January 6, 2021, from <https://ncithesaurus.nci.nih.gov/ncitbrowser/ConceptReport j sp?dictionary=NCI_Thesaurus&ns=ncit&code=C927 >, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 2 pgs.	

Examiner Signature		Date Considered	

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L/

INFORMATION DISCLOSURE STATEMENT BY APPLICANT				Application Number	16/582,486
				Filing Date	2019-09-25
				First Named Inventor	Eric Furfine
				Art Unit	1647
				Examiner Name	Jon McClelland Lockard
Sheet	3	of	3	Attorney Docket Number	REGN-024CON9

NON PATENT LITERATURE DOCUMENTS			
Examiner Initials*	Cite No.	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.), date, page(s), volume-issue number(s), publisher, city and/or country where published.	T
	28	Controls in SCI experiments, RegenBase, retrieved January 6, 2021, from <http://regenbase.org/control-groups.html>, as submitted to the USPTO on January 7, 2021, in *Inter Partes* Review No. IPR2021-00402, 2 pgs.	
	29		

Examiner Signature	/JON M LOCKARD/	Date Considered	04/12/2021

*EXAMINER: Initial if reference considered, whether or not citation is in conformance with MPEP 609. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L/

PTO/SB/429(08-12)
Approved for use through 07/31/2015. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it contains a valid OMB control number.

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

U.S. PATENTS				
Cite No	Patent Number	Kind Code[1]	Issue Date (YYYY-MM-DD)	First Named Inventor
1	9340594		2016-05-17	Eric FURFINE
2	7608261		2009-10-27	Eric Furfine
3	9580489		2017-02-28	Eric FURFINE

U.S. PATENT APPLICATION PUBLICATIONS				
Cite No	Publication Number	Kind Code[1]	Publication Date (YYYY-MM-DD)	First Named Inventor

FOREIGN PATENTS AND PUBLISHED FOREIGN PATENT APPLICATIONS						
Cite No	Foreign Document Number[3]	Country Code[2]	Kind Code[1]	Publication Date (YYYY-MM-DD)	Applicant, Patentee or First Named Inventor	T[5]
1	WO1998045331	WO		1998-10-15	Manuel Baca	☐

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L/

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

2	WO2000075319	WO		2000-12-14	Nicholas J. Papadopoulos	☐

NON-PATENT PUBLICATIONS (e.g., journal article, Office action)

Cite No	Author (if any), title of the publication, page(s) being submitted, publication date, publisher (where available), place of publication (where available).	T[5]	E[6]
1	USPTO Communication on Ex Parte Reexamination of US10464992, pages 1-12, published 04/01/2020, USPTO, PUBLIC PAIR	☐	☒
2	Ex Parte Request for Reexamination of US10464992, pages 1-70, published 02/11/2020, USPTO, PUBLIC PAIR	☐	☒

STATEMENTS

The party making the submission is not an individual who has a duty to disclose information with respect to the above-identified application under 37 CFR 1.56.

This submission complies with the requirements of 35 U.S.C. 122(e) and 37 CFR 1.290.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L/

THIRD-PARTY SUBMISSION UNDER 37 CFR 1.290	Application Number	16582486

☒ The fee set forth in 37 CFR 1.290(f) has been submitted herewith.

☐ The fee set forth in 37 CFR 1.290(f) is not required because this submission lists three or fewer total items and, to the knowledge of the person signing the statement after making reasonable inquiry, this submission is the first and the only submission under 35 U.S.C 122(e) filed in the above-identified application by the party making the submission or by a party in privity with the party.

☐ This resubmission is being made responsive to a notification of non-compliance issued for an earlier filed third-party submission. The corrections in this resubmission are limited to addressing the non-compliance. As such, the party making this resubmission: (1) requests that the Office apply the previously-paid fee set forth in 37 CFR 1.290(f), or (2) states that no fee is required to accompany this resubmission as the undersigned is again making the fee exemption statement set forth in 37 CFR 1.290(g).

Signature	/Ngam Fung David Chan/		
Name/Print	Ngam Fung David Chan	Registration Number (if applicable)	76820

Examiner Signature	/JON M LOCKARD/	Date Considered	12/31/2020

*EXAMINER: Signature indicates all documents listed above have been considered,except for citations through which a line is drawn. Draw line through citation if not considered. Include a copy of this form with next communication to applicant. 1. If known, enter kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16. See MPEP 901.04(a). 2. Enter the country or patent office that issued the document, by two-letter code under WIPO standard ST.3. See MPEP 1851. 3. For Japanese patent documents, the indication of the year of the reign of the Emperor must precede the serial number of the patent document. 4. If known, enter the kind of document by the appropriate symbols as indicated on the document under WIPO Standard ST.16 . See MPEP 901.04(a). 5. Check mark indicates translation attached. 6. Check mark indicates evidence of publication attached.

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /J.L/

EAST Search History

EAST Search History (Interference) /J.L./

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	75	vegfr1r2$ and formulation	USPAT	OR	ON	2021/04/22 22:05
L2	36	l1 and (ophthalmic or intravitreal)	USPAT	OR	ON	2021/04/22 22:05
L3	96	(vegf adj (trap or antagonist)) same ophthalmic	USPAT	OR	ON	2021/04/22 22:05
L4	22	l3 same formulation	USPAT	OR	ON	2021/04/22 22:05
L5	55	l2 or l4	USPAT	OR	ON	2021/04/22 22:06
L6	5	l5 and (ophthalmic adj formulation).clm.	USPAT	OR	ON	2021/04/22 22:06
L7	356	(furfine-e$ dix-d$ graham-k$ frye-k$).in.	USPAT	OR	ON	2021/04/22 22:06
L8	4	l6 and l7	USPAT	OR	ON	2021/04/22 22:06

4/22/2021 10:41:12 PM
C:\Users\jlockard\Documents\EAST\Workspaces\16582486.wsp

Inventor Information for 16/582486

/J.L./

Inventor Name	City	State/Country
FURFINE, ERIC	CONCORD	MASSACHUSETTS
DIX, DANIEL	LAGRANGEVILLE	NEW YORK
GRAHAM, KENNETH	PLEASANT VALLEY	NEW YORK
FRYE, KELLY	MENDHAM	NEW JERSEY

Appln Info | Contents | Petition Info | Atty/Agent Info | Continuity Data | Foreign Data | **Inventors** | Applicants | Address | Fees | Post Info | Pre Gra

Search Another: Application # [ ] Search **or Patent #** [ ] Search **or International Registration #** [ ] Search

PCT / [ ] / [ ] Search **or PG PUBS #** [ ] Search

Attorney Docket # [ ] Search

Bar Code # [ ] Search

To Go BACK Use BACK Button on Your BROWSER Tool Bar
Back to PALM | ASSIGNMENT | CASIS | Home page

Document Description: Issue Fee Payment (PTO-85B)

Issue Fee Transmittal Form

Application Number	Filing Date	First Named Inventor	Atty. Docket No.	Confirmation No.
16582486	25-Sep-2019	Eric FURFINE	REGN-024CON9	3381

TITLE OF INVENTION :

VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

Entity Status	Application Type	Art Unit	Class - Subclass	EXAMINER
Regular Undiscounted	Utility under 35 USC 111(a)	1647	351000	JON LOCKARD

Issue Fee Due	Publication Due	Total Fee(s) Due	Date Due	Prev. Paid Fee
$1200	$0	$1200	12-Aug-2021	$0

1.Change of Correspondence Address and/or Indication Of Fee Address (37 CFR 1.33 & 1.363)

Current Correspondence Address:	Current Indicated Fee Address :
96387 Regeneron - Bozicevic, Field & Francis 201 REDWOOD SHORES PARKWAY SUITE 200 REDWOOD CITY CA 94065 UNITED STATES 650 327 3400 docket@bozpat.com	
☐ Change of correspondence address requested, system generated AIA/122-EFS form attached	☐ Fee Address indication requested, system generated SB/47-EFS form attached

2.Entity Status

Change in Entity Status

○ Applicant certifying micro entity status; system generated Micro Entity certification form attached. See 37 CFR 1.29.
Note: Absent a valid certification of micro entity status, issue fee payment in the micro entity amount will not be accepted at the risk of application abandonment. If this box is checked, you will be prompted to choose a micro entity status on the gross income basis (37 CFR 1.29(a)) or the institution of higher education basis (37 CFR 1.29(d)), and make the applicable certification online.

○ Applicant asserting small entity status. See 37 CFR 1.27.
Note: If the application was previously under micro entity status, checking this box will be taken to be a notification of loss of entitlement to micro entity status.

◉ Applicant changing to regular undiscounted fee status.
Note: Checking this box will be taken to be a notification of loss of entitlement to small or micro entity status, as applicable.

Document Description: Issue Fee Payment (PTO-85B)

3.The Following Fee(s) Are Submitted:

☒ Issue Fee	☐ I authorize USPTO to apply my previously paid issue fee to the current fees due
☐ Publication Fee	☐ The Director is hereby authorized to apply my previously paid issue fee to the current fee due and to charge deficient fees to Deposit Account Number _____
☐ Advance Order - # of copies _____	☒ If **in addition to** the payment of the issue fee amount submitted with this form, there are any discrepancies in any amount(s) due, the Director is authorized to charge any deficiency or credit any overpayment, to Deposit Account Number 500815 . The **issue fee must be submitted** with this form. **If payment of the issue fee does not accompany this form, checking this box and providing a deposit account number will NOT be effective to satisfy full payment of the fee(s) due.**

4.Firm and/or Attorney Names To Be Printed

NOTE: If no name is listed, no name will be printed
For printing on the patent front page, list to be displayed as entered

1. KARL BOZICEVIC
2. BOZICEVIC, FIELD & FRANCIS LLP
3.

5.Assignee Name(s) and Residence Data To Be Printed

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

Name	City	State	Country	Category
REGENERON PHARMACEUTICALS, INC.	Tarrytown	NEW YORK	united states	corporation

6.Signature

I certify, in accordance with 37 CFR 1.4(d)(4) that I am an attorney or agent registered to practice before the Patent and Trademark Office who has filed and has been granted power of attorney in this application. I also certify that this Fee(s) Transmittal form is being transmitted to the USPTO via EFS-WEB on the date indicated below.

Signature	/Karl Bozicevic/	**Date**	06-15-2021
Name	Karl Bozicevic	**Registration Number**	28807

Electronic Patent Application Fee Transmittal

Application Number:	16582486
Filing Date:	25-Sep-2019
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Filer:	Karl Bozicevic/Kimberly Zuehlke
Attorney Docket Number:	REGN-024CON9

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
UTILITY APPL ISSUE FEE	1501	1	1200	1200
PUBL. FEE- EARLY, VOLUNTARY, OR NORMAL	1504	1	0	0
Pages:				
Claims:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
			Total in USD ($)	**1200**

Electronic Acknowledgement Receipt

EFS ID:	42993904
Application Number:	16582486
International Application Number:	
Confirmation Number:	3381
Title of Invention:	VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION
First Named Inventor/Applicant Name:	Eric FURFINE
Customer Number:	96387
Filer:	Karl Bozicevic/Kimberly Zuehlke
Filer Authorized By:	Karl Bozicevic
Attorney Docket Number:	REGN-024CON9
Receipt Date:	15-JUN-2021
Filing Date:	25-SEP-2019
Time Stamp:	17:26:37
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	CARD
Payment was successfully received in RAM	$1200
RAM confirmation Number	E20216EH26324744
Deposit Account	
Authorized User	
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

File Listing:

Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Issue Fee Payment (PTO-85B)	Web85b.pdf	46445 c613ecd0f497a5c1002e93bfaed4631ababebcb8	no	2
Warnings:					
Information:					
2	Fee Worksheet (SB06)	fee-info.pdf	32349 c1992ddacbccabcc893f4ff46c9e92f14faf44f1	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	78794		

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for a filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application.

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

Issue Classification	Application/Control No.	Applicant(s)/Patent Under Reexamination
	16/582,486	FURFINE et al.
	Examiner	Art Unit
	JON M LOCKARD	1647

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☑ T.D. ☐ R.1.47

CLAIMS

Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original	Final	Original
1	36	9	79	17	88	27	97	~~42~~ 38	107	51	116	47	125	64	135
34	41	10	80	18	89	28	98	37	108	52	117	48	126	65	136
2	72	11	81	19	90	29	99	~~36~~ 42	109	53	118	49	127	66	137
3	73	20	82	21	91	30	101	39	110	54	119	50	128		
5	74	12	83	22	92	31	102	40	111	55	120	59	129		
4	75	13	84	23	93	32	103	41	112	56	121	60	130		
6	76	14	85	24	94	33	104	43	113	57	122	61	131		
7	77	15	86	25	95	35	105	44	114	58	123	62	132		
8	78	16	87	26	96	36	106	45	115	46	124	63	134		

Change(s) applied
to document,
/Q.N./
5/13/2021

/JON M LOCKARD/ Examiner, Art Unit 1647	22 April 2021	**Total Claims Allowed:**
(Assistant Examiner)	(Date)	66
/CHRISTINE J SAOUD/ Primary Examiner, Art Unit 1647	03 May 2021	O.G. Print Claim(s): 1 / O.G. Print Figure: NONE
(Primary Examiner)	(Date)	

U.S. Patent and Trademark Office — Part of Paper No.: 20210412

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	ISSUE DATE	PATENT NO.	ATTORNEY DOCKET NO.	CONFIRMATION NO.
16/582,486	07/20/2021	11066458	REGN-024CON9	3381

96387 7590 06/30/2021

Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

ISSUE NOTIFICATION

The projected patent number and issue date are specified above.

Determination of Patent Term Adjustment under 35 U.S.C. 154 (b)
(application filed on or after May 29, 2000)

The Patent Term Adjustment is 42 day(s). Any patent to issue from the above-identified application will include an indication of the adjustment on the front page.

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (http://pair.uspto.gov).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Application Assistance Unit (AAU) of the Office of Data Management (ODM) at (571)-272-4200.

APPLICANT(s) (Please see PAIR WEB site http://pair.uspto.gov for additional applicants):

Eric FURFINE, Concord, MA;
REGENERON PHARMACEUTICALS, INC., Tarrytown, NY
Daniel DIX, LaGrangeville, NY;
Kenneth GRAHAM, Pleasant Valley, NY;
Kelly FRYE, Mendham, NJ;

The United States represents the largest, most dynamic marketplace in the world and is an unparalleled location for business investment, innovation, and commercialization of new technologies. The USA offers tremendous resources and advantages for those who invest and manufacture goods here. Through SelectUSA, our nation works to encourage and facilitate business investment. To learn more about why the USA is the best country in the world to develop technology, manufacture products, and grow your business, visit SelectUSA.gov.

AO 120 (Rev. 08/10)

TO:	REPORT ON THE FILING OR DETERMINATION OF AN ACTION REGARDING A PATENT OR TRADEMARK
Mail Stop 8 Director of the U.S. Patent and Trademark Office P.O. Box 1450 Alexandria, VA 22313-1450	

In Compliance with 35 U.S.C. § 290 and/or 15 U.S.C. § 1116 you are hereby advised that a court action has been filed in the U.S. District Court Northern District of West Virginia on the following

☐ Trademarks or ☑ Patents. (☐ the patent action involves 35 U.S.C. § 292.):

DOCKET NO.	DATE FILED	U.S. DISTRICT COURT
1:22-cv-61	8/2/2022	Northern District of West Virginia

PLAINTIFF	DEFENDANT
REGENERON PHARMACEUTICALS, INC.	MYLAN PHARMACEUTICALS, INC.

	PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1	See attached		
2			
3			
4			
5			

In the above—entitled case, the following patent(s)/ trademark(s) have been included:

DATE INCLUDED	INCLUDED BY ☐ Amendment ☐ Answer ☐ Cross Bill ☐ Other Pleading	
PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
1		
2		
3		
4		
5		

In the above—entitled case, the following decision has been rendered or judgement issued:

DECISION/JUDGEMENT

CLERK	(BY) DEPUTY CLERK	DATE
CHERYL DEAN RILEY	/s/ D. Kinsey	8/3/2022

Copy 1—Upon initiation of action, mail this copy to Director Copy 3—Upon termination of action, mail this copy to Director
Copy 2—Upon filing document adding patent(s), mail this copy to Director Copy 4—Case file copy

PATENT OR TRADEMARK NO.	DATE OF PATENT OR TRADEMARK	HOLDER OF PATENT OR TRADEMARK
7,070,959	July 4, 2006	Regeneron Pharmaceuticals, Inc.
9,222,106	December 29, 2015	Regeneron Pharmaceuticals, Inc.
9,254,338	February 9, 2016	Regeneron Pharmaceuticals, Inc.
9,669,069	June 6, 2017	Regeneron Pharmaceuticals, Inc.
9,816,110	November 14, 2017	Regeneron Pharmaceuticals, Inc.
10,130,681	November 20, 2018	Regeneron Pharmaceuticals, Inc.
10,406,226	September 10, 2019	Regeneron Pharmaceuticals, Inc.
10,415,055	September 17, 2019	Regeneron Pharmaceuticals, Inc.
10,464,992	November 5, 2019	Regeneron Pharmaceuticals, Inc.
10,669,594	June 2, 2020	Regeneron Pharmaceuticals, Inc.
10,857,205	December 8, 2020	Regeneron Pharmaceuticals, Inc.
10,888,601	January 12, 2021	Regeneron Pharmaceuticals, Inc.
10,927,342	February 23, 2021	Regeneron Pharmaceuticals, Inc.
10,973,879	April 13, 2021	Regeneron Pharmaceuticals, Inc.
11,053,280	July 6, 2021	Regeneron Pharmaceuticals, Inc.
11,066,458	July 20, 2021	Regeneron Pharmaceuticals, Inc.
11,084,865	August 10, 2021	Regeneron Pharmaceuticals, Inc.
11,104,715	August 31, 2021	Regeneron Pharmaceuticals, Inc.
11,174,283	November 16, 2021	Regeneron Pharmaceuticals, Inc.
11,186,625	November 30, 2021	Regeneron Pharmaceuticals, Inc.
11,253,572	February 22, 2022	Regeneron Pharmaceuticals, Inc.
11,299,532	April 12, 2022	Regeneron Pharmaceuticals, Inc.
11,306,135	April 19, 2022	Regeneron Pharmaceuticals, Inc.
11,332,771	May 17, 2022	Regeneron Pharmaceuticals, Inc.

PTO/AIA/80 (07-17)
Approved for use through 03/31/2021. OMB 0651-0035
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no person is required to respond to a collection of information unless it displays a valid OMB control number

POWER OF ATTORNEY TO PROSECUTE APPLICATIONS BEFORE THE USPTO

I hereby revoke all previous powers of attorney given in the application identified in the attached statement under 37 CFR 3.73(c).

I hereby appoint:

[X] Practitioners associated with Customer Number: 191459

OR

[ ] Practitioner(s) named below (if more than ten patent practitioners are to be named, then a customer number must be used):

Name	Registration Number	Name	Registration Number

As attorney(s) or agent(s) to represent the undersigned before the United States Patent and Trademark Office (USPTO) in connection with any and all patent applications assigned only to the undersigned according to the USPTO assignment records or assignment documents attached to this form in accordance with 37 CFR 3.73(c).

Please change the correspondence address for the application identified in the attached statement under 37 CFR 3.73(c) to:

[X] The address associated with Customer Number: 191459

OR

[ ]

Firm or individual name		
Address		
City	State	Zip
Country		
Telephone	Email	

Assignee name and address: Regeneron Pharmaceuticals, Inc.
777 Old Saw Mill River Road
Tarrytown, NY 10591-6707

A copy of this form, together with a statement under 37 CFR 3.73(c) (Form PTO/AIA/96 or equivalent) is required to be filed in each application in which this form is used. The statement under 37 CFR 3.73(c) may be completed by one of the practitioners appointed in this form, and must identify the application in which this Power of Attorney is to be filed.

SIGNATURE of Assignee of Record

The individual whose signature and title is supplied below is authorized to act on behalf of the assignee.

Signature /Frank R. Cottingham/	Date 13 January 2023
Name Frank R. Cottingham, Ph.D., J.D.	Telephone
Title Vice President, Associate General Counsel, Intellectual Property	

This collection of information is required by 37 CFR 1.31, 1.32, and 1.33. The information is required to obtain or retain a benefit by the public, which is to update (and by the USPTO to process) the file of a patent or reexamination proceeding. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 18 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES
PATENT AND TRADEMARK OFFICE

P.O. Box 1450
Alexandria, VA 22313 - 1450
www.uspto.gov

ELECTRONIC ACKNOWLEDGEMENT RECEIPT

APPLICATION #	RECEIPT DATE / TIME	ATTORNEY DOCKET #
16/582,486	**02/28/2023 04:31:34 PM ET**	**REGN-024CON9**

Title of Invention

VEGF ANTAGONIST FORMULATIONS SUITABLE FOR INTRAVITREAL ADMINISTRATION

Application Information

APPLICATION TYPE	Utility - Nonprovisional Application under 35 USC 111(a)	PATENT #	11066458
CONFIRMATION #	3381	FILED BY	Kathi Moore
PATENT CENTER #	61664032	FILING DATE	09/25/2019
CUSTOMER #	96387	FIRST NAMED INVENTOR	Eric FURFINE
CORRESPONDENCE ADDRESS	-	AUTHORIZED BY	Michael Lewis

Documents

TOTAL DOCUMENTS: 2

DOCUMENT	PAGES	DESCRIPTION	SIZE (KB)
P35063US11-373c.pdf	3	Assignee showing of ownership per 37 CFR 3.73	110 KB
POA-Regeneron.pdf	2	Power of Attorney	3810 KB

Digest

DOCUMENT	MESSAGE DIGEST(SHA-512)
P35063US11-373c.pdf	8DC88417FFA6846BFA81856E3CA2EB4991DFE0FAAC99CC0D3EAD717179C72DEC69892A443249B148A46E31625561F59C9479E1DDE0501ABE48FFA7020A0824B8

POA-Regeneron.pdf BDECE05D2F51BBCDB37E674E496644E6B6A6D74B020A14B4FE816D8015E1EC9283171078BA0A0E1076CA395ADB4C661BA9E9C16DA415BC049CBFF10B715A0675

This Acknowledgement Receipt evidences receipt on the noted date by the USPTO of the indicated documents, characterized by the applicant, and including page counts, where applicable. It serves as evidence of receipt similar to a Post Card, as described in MPEP 503.

New Applications Under 35 U.S.C. 111

If a new application is being filed and the application includes the necessary components for filing date (see 37 CFR 1.53(b)-(d) and MPEP 506), a Filing Receipt (37 CFR 1.54) will be issued in due course and the date shown on this Acknowledgement Receipt will establish the filing date of the application

National Stage of an International Application under 35 U.S.C. 371

If a timely submission to enter the national stage of an international application is compliant with the conditions of 35 U.S.C. 371 and other applicable requirements a Form PCT/DO/EO/903 indicating acceptance of the application as a national stage submission under 35 U.S.C. 371 will be issued in addition to the Filing Receipt, in due course.

New International Application Filed with the USPTO as a Receiving Office

If a new international application is being filed and the international application includes the necessary components for an international filing date (see PCT Article 11 and MPEP 1810), a Notification of the International Application Number and of the International Filing Date (Form PCT/RO/105) will be issued in due course, subject to prescriptions concerning national security, and the date shown on this Acknowledgement Receipt will establish the international filing date of the application.

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

Applicant/Patent Owner: Regeneron Pharmaceuticals, Inc.

Application No./Patent No.: 11,066,458 Filed/Issue Date: July 20, 2021

Titled: VEGF Antagonist Formulations Suitable for Intravitreal Administration

Regeneron Pharmaceuticals, Inc., a corporation

(Name of Assignee) (Type of Assignee, e.g., corporation, partnership, university, government agency, etc.)

states that, for the patent application/patent identified above, it is (choose **one** of options 1, 2, 3 or 4 below):

1. ☑ The assignee of the entire right, title, and interest.

2. ☐ An assignee of less than the entire right, title, and interest (check applicable box):

   ☐ The extent (by percentage) of its ownership interest is _____%. Additional Statement(s) by the owners holding the balance of the interest must be submitted to account for 100% of the ownership interest.

   ☐ There are unspecified percentages of ownership. The other parties, including inventors, who together own the entire right, title and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

3. ☐ The assignee of an undivided interest in the entirety (a complete assignment from one of the joint inventors was made). The other parties, including inventors, who together own the entire right, title, and interest are:

   Additional Statement(s) by the owner(s) holding the balance of the interest must be submitted to account for the entire right, title, and interest.

4. ☐ The recipient, via a court proceeding or the like (*e.g.*, bankruptcy, probate), of an undivided interest in the entirety (a complete transfer of ownership interest was made). The certified document(s) showing the transfer is attached.

The interest identified in option 1, 2 or 3 above (not option 4) is evidenced by either (choose **one** of options A or B below):

A. ☑ An assignment from the inventor(s) of the patent application/patent identified above. The assignment was recorded in the United States Patent and Trademark Office at Reel 050903, Frame 0067, or for which a copy thereof is attached.

B. ☐ A chain of title from the inventor(s), of the patent application/patent identified above, to the current assignee as follows:

   1. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

   2. From: _____ To: _____

      The document was recorded in the United States Patent and Trademark Office at

      Reel _____, Frame _____, or for which a copy thereof is attached.

This collection of information is required by 37 CFR 3.73(b). The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.11 and 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, VA 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. **SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450**.

If you need assistance in completing the form, call 1-800-PTO-9199 and select option 2.

PTO/AIA/96 (08-12)
Approved for use through 11/30/2020. OMB 0651-0031
U.S. Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE
Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.

STATEMENT UNDER 37 CFR 3.73(c)

3. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

4. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

5. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

6. From: _____ To: _____

The document was recorded in the United States Patent and Trademark Office at

Reel _____, Frame _____, or for which a copy thereof is attached.

☐ Additional documents in the chain of title are listed on a supplemental sheet(s).

☐ As required by 37 CFR 3.73(c)(1)(i), the documentary evidence of the chain of title from the original owner to the assignee was, or concurrently is being, submitted for recordation pursuant to 37 CFR 3.11.

[NOTE: A separate copy (i.e., a true copy of the original assignment document(s)) must be submitted to Assignment Division in accordance with 37 CFR Part 3, to record the assignment in the records of the USPTO. See MPEP 302.08]

The undersigned (whose title is supplied below) is authorized to act on behalf of the assignee.

/Michael W. Lewis/	February 28, 2023
Signature	Date
Michael W. Lewis	76,829
Printed or Typed Name	Title or Registration Number

[Page 2 of 2]

Privacy Act Statement

The **Privacy Act of 1974 (P.L. 93-579)** requires that you be given certain information in connection with your submission of the attached form related to a patent application or patent. Accordingly, pursuant to the requirements of the Act, please be advised that: (1) the general authority for the collection of this information is 35 U.S.C. 2(b)(2); (2) furnishing of the information solicited is voluntary; and (3) the principal purpose for which the information is used by the U.S. Patent and Trademark Office is to process and/or examine your submission related to a patent application or patent. If you do not furnish the requested information, the U.S. Patent and Trademark Office may not be able to process and/or examine your submission, which may result in termination of proceedings or abandonment of the application or expiration of the patent.

The information provided by you in this form will be subject to the following routine uses:

1. The information on this form will be treated confidentially to the extent allowed under the Freedom of Information Act (5 U.S.C. 552) and the Privacy Act (5 U.S.C 552a). Records from this system of records may be disclosed to the Department of Justice to determine whether disclosure of these records is required by the Freedom of Information Act.
2. A record from this system of records may be disclosed, as a routine use, in the course of presenting evidence to a court, magistrate, or administrative tribunal, including disclosures to opposing counsel in the course of settlement negotiations.
3. A record in this system of records may be disclosed, as a routine use, to a Member of Congress submitting a request involving an individual, to whom the record pertains, when the individual has requested assistance from the Member with respect to the subject matter of the record.
4. A record in this system of records may be disclosed, as a routine use, to a contractor of the Agency having need for the information in order to perform a contract. Recipients of information shall be required to comply with the requirements of the Privacy Act of 1974, as amended, pursuant to 5 U.S.C. 552a(m).
5. A record related to an International Application filed under the Patent Cooperation Treaty in this system of records may be disclosed, as a routine use, to the International Bureau of the World Intellectual Property Organization, pursuant to the Patent Cooperation Treaty.
6. A record in this system of records may be disclosed, as a routine use, to another federal agency for purposes of National Security review (35 U.S.C. 181) and for review pursuant to the Atomic Energy Act (42 U.S.C. 218(c)).
7. A record from this system of records may be disclosed, as a routine use, to the Administrator, General Services, or his/her designee, during an inspection of records conducted by GSA as part of that agency's responsibility to recommend improvements in records management practices and programs, under authority of 44 U.S.C. 2904 and 2906. Such disclosure shall be made in accordance with the GSA regulations governing inspection of records for this purpose, and any other relevant (*i.e.*, GSA or Commerce) directive. Such disclosure shall not be used to make determinations about individuals.
8. A record from this system of records may be disclosed, as a routine use, to the public after either publication of the application pursuant to 35 U.S.C. 122(b) or issuance of a patent pursuant to 35 U.S.C. 151. Further, a record may be disclosed, subject to the limitations of 37 CFR 1.14, as a routine use, to the public if the record was filed in an application which became abandoned or in which the proceedings were terminated and which application is referenced by either a published application, an application open to public inspection or an issued patent.
9. A record from this system of records may be disclosed, as a routine use, to a Federal, State, or local law enforcement agency, if the USPTO becomes aware of a violation or potential violation of law or regulation.

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9

CONFIRMATION NO. 3381

191459
A&P - Regeneron (Prosecution)
601 Massachusetts Ave., NW
Washington, DC 20001-3743

POA ACCEPTANCE LETTER

OC00000137527616

Date Mailed: 03/08/2023

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/28/2023.

The Power of Attorney in this application is accepted. Correspondence in this application will be mailed to the above address as provided by 37 CFR 1.33.

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sltorres/

UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
16/582,486	09/25/2019	Eric FURFINE	REGN-024CON9

CONFIRMATION NO. 3381

96387
Regeneron - Bozicevic, Field & Francis
201 REDWOOD SHORES PARKWAY
SUITE 200
REDWOOD CITY, CA 94065

POWER OF ATTORNEY NOTICE

OC00000137527615

Date Mailed: 03/08/2023

NOTICE REGARDING CHANGE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 02/28/2023.

- The Power of Attorney to you in this application has been revoked by the applicant. Future correspondence will be mailed to the new address of record(37 CFR 1.33).

Questions about the contents of this notice and the requirements it sets forth should be directed to the Office of Data Management, Application Assistance Unit, at **(571) 272-4000** or **(571) 272-4200** or **1-888-786-0101**.

/sltorres/