WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US14/11361

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:

Box No. V:
-Continued from Citations and Explanations:

Claims 53 and 54/53 lack an inventive step under PCT Article 33(3) as being obvious over Tombs and Tsubaki and further in view of Zhang.

As per claim 53, Tombs and Tsubaki, in combination, disclose the method of claim 52, but Tombs does not disclose wherein said solution comprises two or more isolated and purified plant proteins. Zhang discloses wherein said solution comprises two or more isolated and purified plant proteins (an aqueous dispersion of complex coacervates in stable form suitable for use in foods (consumable products) is provided and can include whey protein, hydrolyzed protein, lauric arginate, polylysine, casein or any combination thereof; paragraphs [0004], [0006]). It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have combined the extracting a plant protein, as previously disclosed by Tombs, with the use of multiple proteins, as previously disclosed by Zhang, as the previous disclosure by Tombs includes the use of plant proteins in food products, Zhang discloses the use of multiple proteins in the form of a coacervate to add to food products (Zhang; paragraph [0004]), and a combination of these references would have resulted in a superior food product containing plant proteins.

As per claim 54/53, Tombs, Tsubaki and Zhang, in combination, disclose the method of claim 53, but Tombs does not disclose wherein said beverage is clear. Tsubaki discloses wherein said beverage is clear (foods also include beverages, such as alcoholic beverages (alcoholic beverages are clear); paragraph [0044]). It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have combined the method of extracting a plant protein, as previously disclosed by Tombs, with the the protein in a beverage, as previously disclosed by Tsubaki, as the previous disclosure by Tombs includes the use of a plant protein in a food product, Tsubaki discloses the integration of the protein in food, which is uniformly dispersible throughout the food (Tsubaki; paragraph [0001]), and a combination of these references would have resulted in a food product containing additional protein from a plant source.

Claims 1-8, 9/1-9/8, 17-21, 22/20, 22/21, 52, 53, 54/52 and 54/53 have industrial applicability as defined by PCT Article 33(4) because the subject matter can be made or used in industry.

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Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Box No. IV: Lack of Unity of Invention:

This application contains the following inventions or groups of inventions which are not so linked as to form a single general inventive concept under PCT Rule 13.1. In order for all inventions to be examined, the appropriate additional examination fees must be paid.

Group I: Claims 1-9, 17-21 and 52-54 are directed toward a consumable product comprising an isolated and purified plant protein, wherein the isolated and purified plant protein has (i) a solubility in a solution of at least 25 g/L at a temperature between about 2 degrees C and about 32 degress C, wherein the solution has a pH between 3 and 8, and has a sodium chloride content of 0 to 300 mM or (ii) a solubility in a solution of at least 1 mg/ml at a temperature of between 90 degrees C and 110 degrees C, wherein the solution has a pH between 5 and 8 and has a sodium chloride content of 0 to 300 mM, and a method of making said consumable product.

Group II: Claims 17-21, 28-31, 37-40, 68-70 and 81-83 are directed toward a meat replica comprising a muscle replica, a connective tissue replica; an adipose tissue replica, and a coacervate comprising one or more isolated and purified proteins, said adipose tissue replica including one or more isolated plant proteins, one or more plant or algal derived oils, optionally a phospholipid, and a three-dimensional matrix comprising fibers derived from non-animal sources, wherein said lipid and said protein are dispersed in said three-dimensional matrix, and wherein said three-dimensional matrix stabilizes the structure of the adipose tissue replica; and wherein the connective tissue replica comprises proteins assembled into fibrous structures by a solution spinning process.

Group III: Claims 32-36 and 61-65 are directed toward a consumable product comprising a cold set gel comprising one or more isolated and purified proteins from a non-animal source and a salt, and a method of making said consumable product.

Group IV: Claims 47-49 are directed toward a consumable product comprising a heme-containing protein and (i) carbon monoxide and/or (ii) a nitrite, wherein said consumable product does not comprise meat.

Group V: Claim 51 is directed toward a consumable product comprising a gelled emulsion, said gelled emulsion comprising: a) an isolated and purified protein; b) a first lipid that when not in said consumable product is solid at a selected temperature range; and c) a second lipid that when not in said consumable product is liquid at said selected temperature range; wherein the melting temperature of the mixture of said first and second lipids is similar to the melting temperature of lipids found in meat, and wherein said first and second lipids are plant derived lipids or microbial derived lipids.

Groups VI+: Claims 59, 60 and SEQ ID NO: 1 are directed toward a method for extending the shelf-life of a meat-free consumable product, said method comprising adding a heme-containing protein to said consumable product, wherein said heme containing protein oxidizes more slowly than myoglobin under equivalent storage conditions. (SEQ ID NO: 1-27). + type Markush group.

The method for extending the shelf-life of a meat-free consumable product comprising adding a heme-containing protein to said consumable product, wherein said heme containing protein oxidizes more slowly than myoglobin under equivalent storage conditions can be searched to the extent that it encompasses a sequence at least 70% identical to SEQ ID NO: 1 (Vigna radiata amino acid sequence). Additional sequences will searched upon the payment of additional fees. It is believed that Claims 59 and 60 (in-part) encompass this first named invention and thus these claims will be searched without fee to the extent that they encompass SEQ ID NO: 1 (Vigna radiata amino acid sequence). Failure to clearly identify how any paid additional invention fees are to be applied to the "+" group(s) will result in only the first claimed invention to be searched/examined. An exemplary election would be SEQ ID NO: 2 (Methylacidiphilum infernorum amino acid sequence).

Groups VII+: Claims 71-73 and SEQ ID NO: 1 are directed toward a method for imparting a beef like flavor to a consumable product, including a poultry or fish composition, comprising adding to said consumable composition a heme-containing protein, wherein after cooking, a beef-like flavor is imparted to said consumable.

Group VIII: Claims 74-78 are directed toward a method of making a coacervate, said method comprising: a) acidifying a solution of one or more plant proteins to a pH between 3.5 and 5.5, wherein said solution comprises 100 mM or less of sodium chloride; and b) isolating said coacervate from said solution.

Group IX: Claims 91-93 are directed toward methods of minimizing undesirable odors in a composition comprising plant proteins.

Group X: Claim 94 is directed toward a chocolate flavored spread comprising: a) sugar; b) a chocolate flavoring; and c) a cream fraction from a plant based milk.

Group XI: Claims 95-99 are directed toward a method for altering the texture of a consumable during or after cooking comprising incorporating within the consumable one or more plant proteins with a low denaturation temperature.

Group XII: Claims 100-104 are directed toward tissue replicas comprising a freeze-aligned non-animal protein.

-***-Continued Within the Next Supplemental Box-***-

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INTERNATIONAL SEARCHING AUTHORITY

International application No.
PCT/US14/11361

Supplemental Box

In case the space in any of the preceding boxes is not sufficient.
Continuation of:
Box No. IV: Lack of Unity of Invention:

The inventions listed as Groups I-XI do not relate to a single general inventive concept under PCT Rule 13.1 because, under PCT Rule 13.2, they lack the same or corresponding special technical features for the following reasons: the special technical features of Group I include isolated and purified plant protein has (i) a solubility in a solution of at least 25 g/L at a temperature between about 2 degrees C and about 32 degrees C, wherein the solution has a pH between 3 and 8, and has a sodium chloride content of 0 to 300 mM or (ii) a solubility in a solution of at least 1 mg/ml at a temperature of between 90 degrees C and 110 degrees C, wherein the solution has a pH between 5 and 8 and has a sodium chloride content of 0 to 300 mM, not present in any other groups, the special technical features of Group II including a meat replica comprising a muscle replica, a connective tissue replica; an adipose tissue replica, or a coacervate, which are not present in any other group, the special technical features of Group III including a cold set gel comprising one or more isolated and purified proteins from a non-animal source and a salt, which are not present in any other Group, the special technical features of Group IV including a consumable product comprising a heme-containing protein and (i) carbon monoxide and/or (ii) a nitrite, not present in any other group, the special technical features of Group V including a consumable product comprising a gelled emulsion, said gelled emulsion comprising: a) an isolated and purified protein; b) a first lipid that when not in said consumable product is solid at a selected temperature range; and c) a second lipid that when not in said consumable product is liquid at said selected temperature range; wherein the melting temperature of the mixture of said first and second lipids is similar to the melting temperature of lipids found in meat, which are not not present in any other group, the special technical features of Groups VI+ including a method for extending the shelf-life of a meat-free consumable product, which are not present in any other group, the special technical features of Groups VII+ including a method for imparting a beef like flavor to a consumable product, which are not present in any other group, the special technical features of Group VIII including a method of making a coacervate comprising: a) acidifying a solution of one or more plant proteins to a pH between 3.5 and 5.5, which are not present in any other group, the special technical features of Group IX including methods of minimizing undesirable odors in a composition comprising plant proteins, which are present in any other group, the special technical features of Group X including a chocolate flavored spread, which are not present in any other Group, the special technical features of Group XI including a method for altering the texture of a consumable, which not present in any other group, the special technical features of Group XII including a freeze-aligned non-animal protein.

Groups I-XII share the technical features including consumables. Groups I, II, V, VIII, IX, X and XI share the technical features including plants. Groups I, II, VIII, IX and XI share the technical features including plant proteins. Groups I-V, VI+, VII+, VIII, IX, XI and XII share the technical features including proteins. Groups I, III, V, VII+, XI and XII share the technical features including temperature. Groups I and VIII share the technical features including pH. Groups I, III and VIII share the technical features including sodium chloride. Groups I-III, VI+, VII+, VIII and XI share the technical features including a method of making a consumable product. Groups II, III and XII share the technical features including a meat replica. Groups II and VIII share the technical features including a coacervate. Groups II and V share the technical features including plant or algal derived oils or lipids. Groups II and V share the technical features comprising an emulsion. Groups III and V share the technical features including a gel. Groups IV, VI+ and VII+ share the technical features including a heme-containing protein. Groups IV and VI+ share the technical features including meat-free products. Groups VI+ and VII+ share the technical features including a heme-containing protein comprising a sequence at least 70% identical to any of SEQ ID NOs: 1-27.

Groups VI+ share the technical features including a method for extending the shelf-life of a meat-free consumable product, said method comprising adding a heme-containing protein to said consumable product, wherein said heme containing protein oxidizes more slowly than myoglobin under equivalent storage conditions.

Groups VII+ share the technical features including a method for imparting a beef like flavor to a consumable product, including a poultry or fish composition, comprising adding to said consumable composition a heme-containing protein, wherein after cooking, a beef-like flavor is imparted to said consumable.

However, these shared technical features are previously disclosed by WO 2001/015714 A1 (ZLOTKIN) in view of US 2010/0074998 A1 to Espeleta-Vega et al. (hereinafter 'Espeleta-Vega'), US 2011/0083681 A1 to Sengupta, et al. (hereinafter 'Sengupta'), the publication entitled 'Comparative Analysis Of Autoxidation Of Haemoglobin' by Jensen (hereinafter 'Jensen'), US 4,986,998 A to Yoo, et al. (hereinafter 'Yoo') and GenBank Accession AFK42304 by Krishnakumar, et al. (hereinafter 'Krishnakumar').

Zlotkin discloses consumables (compositions including micronutrients (consumables); abstract) including plants (chicory fructooligosaccharide (plants); page 11, lines 15-19); proteins (proteins; page 15, lines 20-28); temperature (temperature; page 17, lines 10-25); a method of making a consumable product (a process for producing a composition comprising micronutrients (a method of making a consumable product); page 8, lines 22-27); plant or algal derived oils or lipids (soybean oil (plant or algal derived oils or lipids); page 15, lines 1-4); meat-free products (cereals; purees of fruit, vegetables, milk, yogurt, cottage cheese (meat-free products); page 18, lines 1-11), and a method for preventing or reducing the discoloration and taste alteration of a food due to the addition of an iron compound thereto (a method for preventing or reducing the discoloration and taste alteration of a food due to the addition of an iron compound thereto; page 14, lines 21-28).

Zlotkin does not disclose plant proteins; pH, sodium chloride; a meat replica; a coacervate; an emulsion; a gel; a heme-containing protein; a heme-containing protein comprising a sequence at least 70% identical to any of SEQ ID NOs: 1-27; a method for extending the shelf-life of a meat-free consumable product, said method comprising adding a heme-containing protein to said consumable product, wherein said heme containing protein oxidizes more slowly than myoglobin under equivalent storage conditions; and a method for imparting a beef like flavor to a consumable product, including a poultry or fish composition, comprising adding to said consumable composition a heme-containing protein, wherein after cooking, a beef-like flavor is imparted to said consumable.

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WRITTEN OPINION OF THE INTERNATIONAL SEARCHING AUTHORITY

International application No.: PCT/US14/11361

Supplemental Box

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Continuation of:

Box No. IV: Lack of Unity of Invention:

Espeleta-Vega discloses plant proteins (vegetable protein (plant proteins); abstract), pH (a pH modifier; paragraph [0010]), sodium chloride (salt (sodium chloride); paragraph [0038]), a meat replica (substitute meat food product (a meat replica); abstract); an emulsion (an emulsion; paragraph [0011]); a gel (a gel; paragraph [0011]).

Sengupta discloses a process for preparing coacervate gel particles comprising plant materials including proteins (a process for preparing coacervate gel particles comprising plant materials including proteins; paragraph [0015]).

Jensen discloses a heme-containing protein (hemoglobin; abstract) wherein the oxidation of hemoglobin and myoglobin is significantly slower than free heme (oxidation of hemoglobin and myoglobin is significantly slower than free heme; page 2029, column 1, paragraph 2), and wherein the oxidation of tetrameric hemoglobin is significantly slower than either monomeric hemoglobin or myoglobin (wherein the oxidation of tetrameric hemoglobin is significantly slower than either monomeric hemoglobin or myoglobin; page 2030, column 1, paragraph 1).

Yoo discloses a method for imparting (flavoring (imparting); abstract) a beef (cow (beef); column 4, lines 26-32) like flavor to a consumable product (flavor to a consumable product; abstract, column 2, lines 49-50), comprising adding to said consumable composition a heme-containing protein (comprising adding to said consumable a powdered blood product (comprising adding to said consumable composition a heme-containing protein); abstract), wherein after cooking, a beef-like flavor is imparted to said consumable (providing a meat-like flavor (beef-like flavor is imparted to said consumable); column 3, lines 1-6).

Krishnakumar discloses a heme-containing protein comprising a sequence at least 70% identical to SEQ ID NO: 1 (a globin (a heme-containing protein comprising a sequence at least 70% identical to SEQ ID NO: 1); page 1).

It would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the disclosure of Zlotkin by combining the consumable disclosed by Zlotkin with a meat replica, such as that disclosed by Espeleta-Vega, for providing the micronutrients in the consumable in a form acceptable to a consumer, such as in a meat replica, for enhancing the nutrient content of a meat replica, particularly the iron content of said replica, providing the previous disclosure of Zlotkin. Also, it would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the disclosure of Zlotkin regarding micronutrient-comprising consumables with the coacervate preparation process of Sengupta, for enabling the preparation of particulates comprising the micronutrients disclosed by Zlotkin using a plant polysaccharide, such as pectin, as disclosed by Sengupta, for providing micronutrients in a consumable and easily digestible form to enable a consumer to absorb the nutrients. Furthermore, it would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the disclosure of Zlotkin, for including the use of hemoglobin in preference to free iron or other forms of iron, in order to provide the iron to the consumer in a biologically useful form and oxidation state. Moreover, it would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have therefore modified the disclosure of Zlotkin, for providing a method for extending the shelf-life of a meat-free consumable product, such as the consumables disclosed by Zlotkin, said method comprising adding a heme-containing protein to said consumable product, wherein said heme containing protein oxidizes more slowly than myoglobin under equivalent storage conditions, such as adding hemoglobin, based on the disclosure of Jensen that tetrameric hemoglobin oxidizes more slowly than other forms of heme-containing proteins. Also, it would have been obvious to a person of ordinary skill in the art to have modified the disclosure of Zlotkin, for including a meat-like flavoring including an iron-containing protein based on the disclosure of Yoo, in order to provide a beef-like flavor to a consumable food, including a poultry or fish composition, to provide a beef-flavored product not containing beef, but with lower fat, such as a consumable comprising a plant protein, fish, or poultry protein. Finally, it would have been obvious to a person of ordinary skill in the art, at the time of the invention, to have modified the disclosure of Zlotkin regarding micronutrient-comprising consumables comprising iron, for including a plant-based iron-comprising proteins, such as the globin disclosed by Krishnakumar, in order to provide iron from non-animal sources having high absorbability and utilization by a consumer.

Since none of the special technical features of the Groups I-XII inventions is found in more than one of the inventions, and since all of the shared technical features are previously disclosed by a combination of the Zlotkin, Espeleta-Vega, Sengupta, Jensen, Yoo and Krishnakumar references, unity of invention is lacking.

PCT Recordation of Search History

Case/PCT Application Number: PCT/US14/11361

CLIN Number/Technical Field of PCT Application: 0007 Biotechnology

Date(s) during which the search was conducted: 08 May to 20 May 2014

Date of Completion of Recordation of Search History Form: 24 May 2014

Research Analyst Initials: KNW

Search Approval Official (SAO) Initials: ECW

Field of Search/Classification Information:

IPC(8) Classification(s): A23L 1/212, 1/10, 1/216; A23K 1/100 (2014.01)

USPC Classification(s): 424/615, 481, 479, 478, 574, 531

Database(s) Searched (Patent and Non-Patent Literature (NPL), Including Sub-Databases and Files Searched) and Search Terms Used:

MicroPatent (US-G, US-A, EP-A, EP-B, WO, JP-bib, DE-C,B, DE-A, DE-T, DE-U, GB-A, FR-A); Google; Google Scholar; Google Patents; Science Direct; ProQuest

Search Terms Used: consumable, plant, 'plant protein,' peptide, coacervate, 'food product,' 'meat substitute,' 'sodium chloride,' soluble, mayo, beverage

Database Search String Recordation, Including Dates of Searches):

Patent Database Search Strategy/Results:

#	results	criteria	last run

25	1 hit	US 20130004617 A1 USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA 1836-2014	2014-05-24
24	1 hit	Patent/Publication No. US 3870801 A Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
23	4 hits	Any Classification A23L0001212 OR A23L000110 OR A23L0001216 OR A23K0001100 OR 424615 OR 424481 OR 424479 OR 424478 OR 424574 OR 424531 Full patent spec. (pur* NEAR10 plant) AND (protein OR peptide) AND meat AND beverage AND mayo* AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
22	4 hits	Any Classification A23L0001212 OR A23L000110 OR A23L0001216 OR A23K0001100 OR 424615 OR 424481 OR 424479 OR 424478 OR 424574 OR 424531 Full patent spec. (pur* NEAR10 plant)AND (protein OR peptide) AND meat AND beverage AND mayo* AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
21	329 hits	Full patent spec. (pur* NEAR10 plant)AND (protein OR peptide) AND meat AND beverage AND mayo* AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
20	389 hits	Full patent spec. (pur* NEAR10 plant) AND meat AND beverage AND mayo* AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA	2014-05-24

		Years 1836-2014	
19	321 hits	Full patent spec. consum* AND (pur* NEAR10 plant) AND meat AND beverage AND mayo* AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
18	20 hits	Full patent spec. consum* AND (pur* NEAR10 plant) AND (meat NEAR15 substitute) AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
17	225 hits	Full patent spec. consum* AND plant AND (meat NEAR15 substitute) AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
16	no hits	Claims, Title or Abstract consum* AND plant AND protein AND (meat NEAR15 substitute) AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
15	8 hits	Any Classification A23L0001212 OR A23L000110 OR A23L0001216 OR A23K0001100 OR 424615 OR 424481 OR 424479 OR 424478 OR 424574 OR 424531 Full patent spec. consum* AND plant AND protein AND (meat NEAR15 substitute) AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
14	204 hits	Full patent spec. consum* AND plant AND protein AND (meat NEAR15 substitute) AND solub* AND ("sodium chloride" OR salt)	2014-05-24

		Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	
13	no hits	Title or Abstract consum* AND plant AND protein AND (meat NEAR15 substitute) AND solub* AND ("sodium chloride" OR salt) Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
12	1 hit	Patent/Publication No. US 7563473 B2 Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
11	2 hits	Full patent spec. (meat NEAR10 substitute) Inventor(s) Vrljic Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
10	2 hits	Full patent spec. consumable AND plant AND protein Inventor(s) Vrljic Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
9	2 hits	Assignee/Applicant Maraxi Full patent spec. consumable AND plant AND protein Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
8	2 hits	Full patent spec. consumable AND plant AND protein Inventor(s) Solomatin Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24

7	2 hits	Full patent spec. consumable AND plant AND protein Inventor(s) Vrljic Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
6	2 hits	Any Classification A23L0001212 OR A23L000110 OR A23L0001216 OR A23K0001100 OR 424615 OR 424481 OR 424479 OR 424478 OR 424574 OR 424531 Claims, Title or Abstract consumable AND plant AND protein Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
5	107 hits	Any Classification A23L0001212 OR A23L000110 OR A23L0001216 OR A23K0001100 OR 424615 OR 424481 OR 424479 OR 424478 OR 424574 OR 424531 Full patent spec. consumable AND plant AND protein Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
4	4476 hits	Full patent spec. consumable AND plant AND protein Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
3	87 hits	Claims, Title or Abstract consumable AND plant AND protein Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
2	no hits	Title or Abstract consumable AND plant AND protein Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	2014-05-24
1	44 hits	Title or Abstract consum* AND plant AND protein	2014-05-24

		Databases USG USA EPA EPB WO JP DEG DEA DET DEU GBA FRA Years 1836-2014	

Non-Patent Literature (NPL) Search Strategy/Results:

Google/Google Scholar/Google Patents:
09 May to 20 May 2014:

- consumable product comprising an isolated and purified plant protein
- consumable plant protein
- consumable isolated and purified plant protein
- edible isolated and purified plant protein
- coacervate in food products
- coacervate in meat substitute

Science Direct:
20 May 2014:

- consumable product comprising an isolated and purified plant protein
- edible isolated and purified plant protein
- coacervate in meat substitute

ProQuest:
20 May 2014:

- consumable product comprising an isolated and purified plant protein
- edible isolated and purified plant protein
- coacervate in meat substitute

(19) Europäisches Patentamt
European Patent Office
Office européen des brevets

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A21D 2/16 (2006.01) *A23L 1/03* (2006.01)
A23L 1/035 (2006.01) *A23L 1/30* (2006.01)
A23L 1/48 (2006.01) *A23L 1/39* (2006.01)
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(54) **PRODUCTS CONTAINING G(b)-GLUCAN**

PRODUKTE ENTHALTEND G(b)-Glucan

PRODUITS CONTENANT DU G(B)-GLUCANE

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(56) References cited:
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JP-A- 6 065 082
JP-A- 10 120 704
JP-B2- 6 083 652
US-A- 4 231 802

- **PATENT ABSTRACTS OF JAPAN vol. 1997, no. 05, 30 May 1997 (1997-05-30) -& JP 09 009890 A (TAKEDA CHEM IND LTD), 14 January 1997 (1997-01-14)**
- **DATABASE WPI Section Ch, Week 200333 Derwent Publications Ltd., London, GB; Class D13, AN 2003-345457 XP002314009 -& JP 2002 253143 A (ORGANO CORP) 10 September 2002 (2002-09-10)**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

EP 1 361 264 B1

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Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Nikki Krahler
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
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Filing Date:	10-JUL-2015
Time Stamp:	12:14:13
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	Non Patent Literature	BocaFlameGrilledBurger.pdf	91297 8d6639dab8070d36f3738a67244219e269157f80	no	1

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2	Non Patent Literature	Boca_ChiknNuggets.pdf	92966 d5d8267afce04977073c0ab4348ebf8be1ac821c	no	1
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9	Non Patent Literature	Connelly_Person_of_the.pdf	3278293 078273387e0009f6eaa29039b4ab7f5c459fa3e3	no	4
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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.

Electronic Acknowledgement Receipt

EFS ID:	23549016
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Nikki Krahler
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	21-SEP-2015
Filing Date:	10-JUL-2015
Time Stamp:	12:29:04
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

File Listing:

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Total Files Size (in bytes):	61786782

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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.

Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	Unknown
Serial No.	:	14/796,970	Examiner	:	Unknown
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

PRELIMINARY AMENDMENT

Prior to examination, please amend the application as indicated on the following pages.

Amendments to the Specification:

Please amend the paragraph on page 1, lines 3-10, as follows:

--This application is a Continuation of, and claims the benefit of priority under 35 U.S.C. § 120 to, PCT/US2014/011361, which is a Continuation of, and claims the benefit of priority under 35 U.S.C. § 120 to, U.S. Application Serial No. 13/941,211, filed July 12, 2013, which claims the benefit of priority under 35 U.S.C. § 119(e) to U.S. Application Serial No. 61/908,634, filed November 25, 2013, and to U.S. Application Serial No. 61/751,816, filed January 11, 2013; and this application is related to the following co-pending patent applications: Application Serial No. PCT/US2012/46560; Application Serial No PCT/US2012/46552; Application Serial No. 61[[,]] / 876,676, filed September 11, 2013; Application Serial No. 61/751,818, filed January 11, 2013, and Application Serial No. 61/611,999, filed March 16, 2012, all of which are incorporated herein by reference.

REMARKS

Applicant submits the foregoing amendments to make clarifications to the priority claim. A Supplemental Application Data Sheet (ADS) is being filed concurrently herewith.

No fees are believe due. If this is incorrect, please apply any charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Respectfully submitted,

/October 5, 2015/

Date:_____

/M. Angela Parsons/

_____

M. Angela Parsons, Ph.D.
Reg. No. 44,282

Customer Number 26191
Fish & Richardson P.C.
Telephone: (612) 335-5070
Facsimile: (877) 769-7945

61212995.doc

Electronic Acknowledgement Receipt

EFS ID:	23685794
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Judith Witzel
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	05-OCT-2015
Filing Date:	10-JUL-2015
Time Stamp:	09:23:57
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	no

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	Preliminary Amendment	1	1
	Specification	2	2
	Applicant Arguments/Remarks Made in an Amendment	3	3

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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.

Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	Unknown
Serial No.	:	14/796,970	Examiner	:	Unknown
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REQUEST FOR CORRECTED OFFICIAL FILING RECEIPT

Applicant submits the enclosed Supplemental Application Data Sheet (ADS) to correct an inadvertent error made on the original ADS with respect to the priority claim. Please supply a corrected Filing Receipt to the undersigned with respect to this application.

No fee is believed to be due. If this is incorrect, please apply any charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Respectfully submitted,

/October 5, 2015/

Date:_____

/M. Angela Parsons/

_____
M. Angela Parsons, Ph.D.
Reg. No. 44,282

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61212973.doc

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	38767-0010001
	Application Number	14/796,970
Title of Invention	METHODS AND COMPOSITIONS FOR CONSUMABLES	

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.

Domestic Benefit/National Stage Information:

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this 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.

Prior Application Status	Pending		
Application Number	Continuity Type	Prior Application Number	Filing Date (**MM/DD/YYYY**)
	Continuation of	PCT/US2014/011361	1/13/2014

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this 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.

Prior Application Status	Pending		
Application Number	Continuity Type	Prior Application Number	Filing Date (**MM/DD/YYYY**)
PCT/US2014/011361	~~Claims the benefit of~~ Continuation of	13/941,211	7/12/2013

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this 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.

Prior Application Status	Expired		
Application Number	Continuity Type	Prior Application Number	Filing Date (**MM/DD/YYYY**)
PCT/US2014/011361	Claims priority to	61/908,634	11/25/2013

Application Data Sheet 37 CFR 1.76	Attorney Docket Number	38767-0010001
	Application Number	14/796,970
Title of Invention	METHODS AND COMPOSITIONS FOR CONSUMABLES	

This section allows for the applicant to either claim benefit under 35 U.S.C. 119(e), 120, 121, or 365(c) or indicate National Stage entry from a PCT application. Providing this 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.			
Prior Application Status	Expired		
Application Number	Continuity Type	Prior Application Number	Filing Date (**MM/DD/YYYY**)
PCT/US2014/011361	Claims priority to	61/751,816	1/11/2013

Signature:

A signature of the applicant or representative is required in accordance with 37 CFR 1.33 and 10.18. Please see 37 CFR 1.4(d) for the form of the signature.					
Signature	/M. Angela Parsons/			Date (**MM/DD/YYYY**)	10/5/2015
First Name	M. Angela	Last Name	Parsons Ph.D.	Registration Number	44,282

61212985.doc

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
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/796,970	Filing Date 07/10/2015	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ 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

AMENDMENT	10/05/2015	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 4	Minus	***4	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ 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.
** 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 number found in the appropriate box in column 1.

LIE
/JULIET MCMILLAN/

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.**
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APPLICATION NUMBER	FILING or 371(c) DATE	GRP ART UNIT	FIL FEE REC'D	ATTY.DOCKET.NO	TOT CLAIMS	IND CLAIMS
14/796,970	07/10/2015	1791	3360	38767-0010001	30	4

CONFIRMATION NO. 8501

CORRECTED FILING RECEIPT

26191
FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS, MN 55440-1022



Date Mailed: 10/09/2015

Receipt is acknowledged of this non-provisional 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 APPLICANT, 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 Filing Receipt Correction. Please provide a copy of this Filing Receipt with the changes noted thereon. If you received a "Notice to File Missing Parts" for this application, please submit any corrections 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**

Inventor(s)

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Applicant(s)

Impossible Foods Inc., Redwood City, CA

Power of Attorney: None

Domestic Priority data as claimed by applicant

This application is a CON of PCT/US2014/011361 01/13/2014
which is a CON of 13/941,211 07/12/2013
and claims benefit of 61/908,634 11/25/2013
and claims benefit of 61/751,816 01/11/2013

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.

If Required, Foreign Filing License Granted: 07/21/2015

The country code and number of your priority application, to be used for filing abroad under the Paris Convention, is **US 14/796,970**

Projected Publication Date: 10/29/2015

Non-Publication Request: No

Early Publication Request: No
Title

METHODS AND COMPOSITIONS FOR CONSUMABLES

Preliminary Class

426

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.

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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.

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Title 35, United States Code, Section 184

Title 37, Code of Federal Regulations, 5.11 & 5.15

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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/796,970	07/10/2015	Marija Vrljic	38767-0010001

CONFIRMATION NO. 8501

26191
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PUBLICATION NOTICE

OC000000078350428

Title:METHODS AND COMPOSITIONS FOR CONSUMABLES

Publication No.US-2015-0305390-A1
Publication Date:10/29/2015

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 Office of Public Records. The Office of Public Records can be reached by telephone at (703) 308-9726 or (800) 972-6382, by facsimile at (703) 305-8759, by mail addressed to the United States Patent and Trademark Office, Office of Public Records, 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 http://pair.uspto.gov/. 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

Attorney Docket No.: 38767-0010001 / Client Ref: M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	8501
Serial No.	:	14/796,970	Examiner	:	Elizabeth A. Gwartney
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION MAILED SEPTEMBER 17, 2015

In response to the Office Action mailed September 17, 2015, please consider the following reply.

Amendments to the Specification:

Please amend the sentence on page 35, lines 4-7, as follows:

The sequences and structure of numerous heme-containing proteins are known. See for example, Reedy, *et al.*, *Nucleic Acids Research*, 2008, Vol. 36, Database issue D307–D313 and the Heme Protein Database available on the world wide web at [[http://]] hemeprotein.info/heme.php.

Please amend the paragraph at page 36, lines 6-24, as follows:

The percent identity between two amino acid sequences can be determined as follows. First, the amino acid sequences are aligned using the BLAST 2 Sequences (Bl2seq) program from the stand-alone version of BLASTZ containing BLASTP version 2.0.14. This stand-alone version of BLASTZ can be obtained from Fish & Richardson's web site (e.g., at fr.com/blast on the World Wide Web ~~www.fr.com/blast/~~) or the U.S. government's National Center for Biotechnology Information web site (at ncbi.nlm.nih.gov on the World Wide Web ~~www.ncbi.nlm.nih.gov~~). Instructions explaining how to use the Bl2seq program can be found in the readme file accompanying BLASTZ. Bl2seq performs a comparison between two amino acid sequences using the BLASTP algorithm. To compare two amino acid sequences, the options of Bl2seq are set as follows: -i is set to a file containing the first amino acid sequence to be compared (e.g., C:\seq1.txt); -j is set to a file containing the second amino acid sequence to be compared (e.g., C:\seq2.txt); -p is set to blastp; -o is set to any desired file name (e.g., C:\output.txt); and all other options are left at their default setting. For example, the following command can be used to generate an output file containing a comparison between two amino acid sequences: C:\Bl2seq –i c:\seq1.txt –j c:\seq2.txt –p blastp –o c:\output.txt. If the two compared sequences share homology, then the designated output file will present those regions of homology as aligned sequences. If the two compared sequences do not share homology, then the designated output file will not present aligned sequences. Similar procedures can be following for nucleic acid sequences except that blastn is used.

Amendments to the Claims:

Please amend claims 1, 5, 7 and 12 as follows and please add new claims 31-46 as follows. Please also cancel claims 6, 10 and 13-30 without prejudice to continued prosecution. The claims and their status are shown below.

1. (Currently Amended) A method for imparting a beef-like flavor to a consumable product, wherein the consumable product is a meat replica that comprises one or more plant proteins, comprising adding, to the consumable, a ~~an heterologous~~ heme-containing protein from a non-animal source, wherein, after cooking, a beef-like flavor is imparted to the consumable.

2. (Original) The method of claim 1, wherein the heme-containing protein has an amino acid sequence with at least 70% homology to the amino acid sequence set forth in SEQ ID NO: 1.

3. (Original) The method of claim 1, wherein the heme-containing protein has a UV-VIS spectrum that is substantially similar to that of myoglobin from an animal.

4. (Original) The method of claim 1, wherein the heme-containing protein is selected from the group consisting of an androglobin, a cytoglobin, a globin E, a globin X, a globin Y, a hemoglobin, a leghemoglobin, a flavohemoglobin, Hell's gate globin I, a myoglobin, an erythrocruorin, a beta hemoglobin, an alpha hemoglobin, a protoglobin, a cyanoglobin, a cytoglobin, a histoglobin, a neuroglobins, a chlorocruorin, a truncated hemoglobin, a truncated 2/2 globin, a hemoglobin 3, a cytochrome, and a peroxidase.

5. (Currently Amended) The method of claim 1, wherein the meat replica ~~consumable~~ comprises about 0.01% to about 5% of the ~~heterologous~~ heme-containing protein by weight.

6. (Canceled)

7. (Currently Amended) A method for making a ~~white~~ meat replica composition having a ~~taste like~~ beef flavor and aroma, wherein the meat replica composition comprises one or more plant proteins, the method comprising adding a heme-containing protein from a non-animal source to the ~~white~~ meat replica composition~~, respectively~~.

8. (Original) The method of claim 7, wherein the heme-containing protein has an amino acid sequence with at least 70% homology to the amino acid sequence set forth in SEQ ID NO: 1.

9. (Original) The method of claim 7, wherein the heme-containing protein has a UV-VIS spectrum that is substantially similar to that of myoglobin from an animal.

10. (Canceled)

11. (Original) The method of claim 7, wherein the heme-containing protein is selected from the group consisting of an androglobin, a cytoglobin, a globin E, a globin X, a globin Y, a hemoglobin, a leghemoglobin, a flavohemoglobin, Hell's gate globin I, a myoglobin, an erythrocruorin, a beta hemoglobin, an alpha hemoglobin, a protoglobin, a cyanoglobin, a cytoglobin, a histoglobin, a neuroglobins, a chlorocruorin, a truncated hemoglobin, a truncated 2/2 globin, a hemoglobin 3, a cytochrome, and a peroxidase.

12. (Currently Amended) The method of claim 7, wherein about 0.01% to about 5% by weight of the heme-containing protein is added to the ~~white~~ meat replica composition.

13. (Canceled)

14. (Canceled)

15. (Canceled)

16. (Canceled)

17. (Canceled)

18. (Canceled)

19. (Canceled)

20. (Canceled)

21. (Canceled)

22. (Canceled)

23. (Canceled)

24. (Canceled)

25. (Canceled)

26. (Canceled)

27. (Canceled)

28. (Canceled)

29. (Canceled)

30. (Canceled)

31. (New) The method of claim 1, wherein the heme-containing protein is isolated.

32. (New) The method of claim 1, wherein the heme-containing protein is isolated and purified.

33. (New) The method of claim 1, wherein at least one of the one or more plant proteins is isolated.

34. (New) The method of claim 1, wherein at least one of the one or more plant proteins is isolated and purified.

35. (New) The method of claim 1, wherein the one or more plant proteins are selected from the group consisting of rubisco, pea proteins, lentil proteins, or other legume proteins.

36. (New) The method of claim 33, wherein the pea proteins comprise pea albumin proteins.

37. (New) The method of claim 1, wherein the one or more plant proteins are present in the consumable product in an amount of between about 1% and about 30% by weight.

38. (New) The method of claim 1, wherein the one or more plant proteins has a solubility in an aqueous solution of at least 25 g/L at a temperature of between about 2°C and about 32°C, wherein the aqueous solution has a pH between 3 and 8 and a sodium chloride content of 0 to 300 mM.

39. (New) The method of claim 7, wherein at least one of the one or more plant proteins is isolated.

40. (New) The method of claim 7, wherein at least one of the one or more plant proteins is isolated and purified.

41. (New) The method of claim 7, wherein the one or more plant proteins are selected from the group consisting of rubisco, pea proteins, lentil proteins, or other legume proteins.

42. (New) The method of claim 37, wherein the pea proteins comprise pea albumin proteins.

43. (New) The method of claim 7, wherein the one or more plant proteins are present in the meat replica composition in an amount of between about 1% and about 30% by weight.

44. (New) The method of claim 7, wherein the heme-containing protein is isolated.

45. (New) The method of claim 7, wherein the heme-containing protein is isolated and purified.

46. (New) The method of claim 7, wherein the one or more plant proteins has a solubility in an aqueous solution of at least 25 g/L at a temperature of between about 2°C and about 32°C, wherein the aqueous solution has a pH between 3 and 8 and a sodium chloride content of 0 to 300 mM.

REMARKS

Applicants respectfully request entry of the amendments and remarks submitted herein. Claims 1, 5, 7 and 12 have been amended herein; support for these amendments is discussed below. Claims 6, 10, 13 and 14 have been canceled herein without prejudice to continued prosecution, and non-elected claims 15-30 also have been canceled without prejudice to continued prosecution. In addition, new claims 31-46 have been added. Support for new claims 31-40 can be found, for example, in the originally filed claims, and at page 4, lines 7-11.

Claims 1-5, 7-9, 11, 12 and 31-46 are currently pending. Reconsideration of the pending application is respectfully requested.

Restriction Requirement and Response to Restriction Requirement

As indicated in the current Office Action (OA) at pages 2-4, pending claims 1-30 were restricted into three groups as follows: Group I, claims 1-14; Group II, claims 15-22; and Group III, claims 23-30.

On August 27, 2015, the undersigned provisionally elected Group I, claims 1-14, via telephone. Applicants hereby confirm the election of Group I, claims 1-14. This requirement for restriction is not traversed.

Objections to the Specification

The disclosure is objected to because the Examiner indicated that it contains an embedded hyperlink and/or other form of browser-executable code. The Examiner is requiring deletion of any embedded hyperlink or other form of browser-executable code.

Applicants have removed any reference to embedded hyperlinks or other forms of browser-executable code from the instant specification. In view of these amendments, Applicants respectfully request that the objections to the specification be withdrawn.

Claim Rejections - 35 U.S.C. § 102

Claim 7-9, 11 and 13 are rejected under pre-AIA 35 U.S.C. § 102(b) as being anticipated by Jamieson ("Iroquois Stew With Beef, Chicken and Pork" — Bon Appétit, November 1995). According to the Examiner

> Jamieson discloses a method for making a Iroquois stew with beef comprising adding beef to a composition of pork, chicken, flour, oil, onion, chicken broth, carrots, bay leaves, all spice and potatoes. Given Jamieson discloses beef, inherently the beef comprises a heme-containing protein including myoglobin. Moreover, given the composition would comprise myoglobin from beef, inherently the myoglobin would exhibit a VIS spectrum that would be identical to that of myoglobin from an animal and an amino acid sequence at least 70% homologous to that set forth in SEQ ID NO:1.

OA at page 5 (citations omitted).

Without acquiescing to the Examiner's rejection, and solely to expedite prosecution of the pending claims, independent claim 7 has been amended to be directed toward a method of making a meat replica composition having a beef flavor and aroma by adding a heme-containing protein from a non-animal source, where the meat replica composition comprises one or more plant proteins. Support for these amendments can be found, for example, at page 12, lines 22-24; page 15, line 17; page 16, lines 11-14; page 28, lines 9-10; page 29, lines 23-30; page 31, lines 2-4; page 69, lines 25-26; page 82, lines 9-11; and page 114, lines 28-29.

Jamieson does not disclose a meat replica composition that contains one or more plant proteins, and Jamieson does not disclose adding a heme-containing protein from a non-animal source to a meat replica composition that contains one or more plant proteins. Thus, Jamieson does not anticipate independent claim 7 as amended, and Applicants respectfully request that the rejection of the pending claims under 35 U.S.C. § 102 over Jamieson be withdrawn.

Claims 7-9, 11 and 14 are rejected under pre-AIA 35 U.S.C. § 102(b) as being anticipated by Foo ("Beef and Scallop Stir Fry" — Food & Wine, July 2001). According to the Examiner,

> Foo discloses a method for making Beef and Scallop Stir-Fry comprising adding beef to a composition of scallops (i.e., fish), chicken stock, soy sauce, rice vinegar, cornstarch, sugar, crushed red pepper, vegetable oil, cloves, red bell pepper, corn, scallions and fresh basil. Given Foo discloses beef, inherently the beef comprises a heme-containing protein including myoglobin. Moreover,

> given the composition would comprise myoglobin from beef, inherently the myoglobin would exhibit a VIS spectrum that would be identical to that of myoglobin from an animal and an amino acid sequence at least 70% homologous to that set forth in SEQ ID NO:1.

OA at page 6 (citations omitted).

Without acquiescing to the Examiner's rejection, and solely to expedite prosecution of the pending claims, independent claim 7 has been amended to be directed toward a method of making a meat replica composition having a beef flavor and aroma by adding a heme-containing protein from a non-animal source, where the meat replica composition comprises one or more plant proteins. Support for these amendments is indicated herein.

Foo does not disclose a meat replica composition that contains one or more plant proteins, and Foo does not disclose adding a heme-containing protein from a non-animal source to a meat replica composition that contains one or more plant proteins. Thus, Foo does not anticipate independent claim 7 as amended, and Applicants respectfully request that the rejection of the pending claims under 35 U.S.C. § 102 over Foo be withdrawn.

Claim Rejections - 35 U.S.C. § 102 / 35 U.S.C. § 103

Claims 1-6, 10 and 12 are rejected under pre-AIA 35 U.S.C. § 102(b) as anticipated by or, in the alternative, under pre-AIA 35 U.S.C. § 103(a) as obvious over, Jamieson as evidenced by Merriam-Webster (Definition of "heterologous" - www.meriam-webster.com/dictionary/heterologous, downloaded September 10, 2015). According to the Examiner:

> While Jamieson discloses the addition of a heme-containing protein (in the form of beef), the reference is silent with respect to a heterologous heme-containing protein. Given broadly, the term heterologous means "derived from another species" (see Merriam-Webster), since Jamieson discloses the combination of meat species (i.e., pork, chicken and been), it is clear the limitation requiring a heterologous (e.g., different from beef) heme-containing protein has been satisfied.
>
> In the alternative, absent evidence to the contrary, it would have been obvious to one of ordinary skill in the art to have added a heme-protein from any source, including a heterologous heme-protein and have arrives at the present invention. Although the meme-protein is obtained from a different source (i.e., beef), the

> burden shifts to establish an unobvious difference between the claimed product and the prior art product.

OA at page 8.

Without acquiescing to the Examiner's rejection, and solely to expedite prosecution of the pending claims, independent claim 1 has been amended to require that the consumable product be a meat replica that comprises one or more plant proteins. In addition, Applicants have removed the reference to "heterologous" from claim 1 and further amended claim 1 to require that the heme-containing protein is from a non-animal source. Support for these amendments can be found, for example, at page 12, lines 22-24; page 15, line 17; page 16, lines 11-14; page 28, lines 9-10; page 29, lines 23-30; page 31, lines 2-4; the paragraph bridging pages 37-38; page 69, lines 25-26; and page 82, lines 9-11.

Jamieson does not disclose a consumable product that is a meat replica and that contains one or more plant proteins, and Jamieson does not disclose adding a heme-containing protein from a non-animal source to such a consumable product. Therefore, Jamieson does not anticipate independent claim 1 as amended. In addition, Jamieson does not contain disclosure that would suggest to a skilled artisan that a heme-containing protein from a non-animal source can impart a beef-like flavor to a meat replica. Thus, Jamieson, alone or in combination with the definition cited by the Examiner, do not make obvious independent claim 1 as amended.

The pending claims are neither anticipated nor obvious over the cited references, in any combination. Accordingly, in view of the amendments and remarks herein, Applicants respectfully request that the rejection of the pending claims under 35 U.S.C. § 102 or, in the alternative, under 35 U.S.C. § 103, be withdrawn.

CONCLUSION

Applicants respectfully request that claims 1-5, 7-9, 11, 12 and 31-46 be allowed. If a telephone call to the undersigned would expedite prosecution, the Examiner is encouraged to do so.

This Response to Office Action is being filed within the three-month Shortened Statutory Period for reply. Therefore, no fees are believed due. If this is incorrect, please apply any

charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Respectfully submitted,

/December 17, 2015/

Date:

/M. Angela Parsons/

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Electronic Acknowledgement Receipt

EFS ID:	24394789
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Judith Witzel
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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1		Response.pdf	116549 3687e3d4d1993fc7de68fbdc4954b25a227310ca	yes	11

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Amendment/Req. Reconsideration-After Non-Final Reject	1	1
	Specification	2	2
	Claims	3	6
	Applicant Arguments/Remarks Made in an Amendment	7	11
Warnings:			
Information:			
	Total Files Size (in bytes):	116549	

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.

Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	Unknown
Serial No.	:	14/796,970	Examiner	:	Unknown
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the references listed on the enclosed PTO-1449 Form. Foreign patent documents are enclosed; U.S. patents and patent application publications will be provided upon request.

This statement is being filed after a first Office Action on the merits, but before receipt of a Final Office Action or a Notice of Allowance. A submission fee in the amount of $180 as required under 37 CFR §1.17(p) is being paid with this statement. Please apply any other charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Please contact the undersigned if there are any questions regarding this Statement.

Respectfully submitted,

Date: /December 17, 2015/

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Sheet 1 of 1

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
(37 CFR §1.98(b))		Filing Date July 10, 2015	Group Art Unit

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	1.	2006/0035006	2/16/2006	McMindes et al.			

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation	
							Yes	No
	2.	CN1466903	1/14/2004	CHINA			English Abstract	
	3.	CN1557188	12/29/2004	CHINA			English Abstract	

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document

Examiner Signature	Date Considered
EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

Substitute Disclosure Form

Espacenet

Bibliographic data: CN1466903 (A) — 2004-01-14

Peanut jellied bean curd

Inventor(s): YU GUOMIN [CN] ± (GUOMIN YU)

Applicant(s): YU GUOMIN [CN] ± (YU GUOMIN)

Classification: **- international:*A23L1/32; A23L1/36;*** (IPC1-7): A23L1/32; A23L1/36
- cooperative:

Application number: CN2002123983 20020711

Priority number(s): CN2002123983 20020711

Abstract of CN1466903 (A)

A crystal peanut curd is prepared through immersing peanut in water for 6 hr, peeling, washing, grinding the mixture of peanut and water twice, filtering by 120-mesh gauze, mixing less peanut milk with starch to obtain coagulant, boiling the filtered peanut milk, slowly adding said coagulant while stirring, laying aside for 3 min, moulding and cooling for 2 hr. Its advantages are complete nutrients, good smell, and delicious taste.

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权利要求书 1 页 说明书 2 页

[54] 发明名称 花生水晶豆腐

[57] 摘要

本发明公开一种花生水晶豆腐，其特征是它是按下述步骤制成的：步骤 1：浸泡去皮，将花生米用水浸泡 6 小时，去掉表皮，淘洗干净；步骤 2：磨浆，按花生与水为 1∶8 的比例，将花生与水磨浆两次；步骤 3：过滤，用 120 目纱布过滤，取花生浆适量将淀粉调匀作为固化剂待用；步骤 4：烧浆冷却成型，将过滤后的花生浆倒入锅内加热至沸腾时，再将火力减小，将固化剂边搅拌边缓慢加入，3 分钟后，将熟浆倒入成型模具中，冷却约 2 小时即可成型。本发明既可保持花生的原汁原味，又迎合了现代人美食保健的要求，且其营养成份全面优于大豆豆腐，口感又极其鲜美，清香宜人，本发明也可根据需要调制成芝麻、番茄、鸡蛋和蒜味等多种口味。

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1、一种花生水晶豆腐，其特征是它是按下述步骤制成的：

步骤 1：浸泡去皮，将花生米用水浸泡 6 小时，去掉表皮，淘洗干净；

步骤 2：磨浆，按花生与水为 1：8 的比例，将花生与水磨浆两次；

步骤 3：过滤，用 120 目纱布过滤，取花生浆适量将淀粉调匀作为固化剂待用；

步骤 4：烧浆冷却成型，将过滤后的花生浆倒入锅内加热至沸腾时，再将火力减小，将固化剂边搅拌边缓慢加入，3 分钟后，将熟浆倒入成型模具中，冷却约 2 小时即可成型。

2、根据权利要求 1 所述的花生水晶豆腐，其特征是在步骤 4 中按花生原料与芝麻 5：1 的比例添加芝麻，制成芝麻口味的花生水晶豆腐。

3、根据权利要求 1 所述的花生水晶豆腐，其特征是在步骤 4 中按花生与番茄 2：1 的比例加入番茄酱，制成番茄味的花生水晶豆腐。

4、根据权利要求 1 所述的花生水晶豆腐，其特征是在步骤 4 中按花生与鸡蛋 4：1 的比例，加入鸡蛋浆，制成鸡蛋花生水晶豆腐。

5、根据权利要求 1 所述的花生水晶豆腐，其特征是在步骤 4 中按花生原料与蒜泥 8：1 的比例加入蒜泥，制成蒜味花生水晶豆腐。

花生水晶豆腐

技术领域

本发明涉及食品，尤指一种以花生为主要原料制成的食品，特别涉及一种由花生制成豆腐。

背景技术

花生，早在隋代就已被我们的祖先所认识，其营养极其丰富，含有多种氨基酸及其它微量元素，素有“长生果”、“人参果”之称，将其制成食品极具抗癌、保健和美容的功效，对心脑血管疾病具有良好的防治功能。但自古以来，花生的吃法不外乎有：水煮、油炸、包浆等，难免感觉单调，需要多些口味与外观形式上的变化，方能提高人们对花生的食欲。

发明内容

本发明即是提供一种以花生为主要原料制成的花生水晶豆腐及其制作方法，它既可保持花生的原汁原味，又迎合了现代人美食保健的要求，且其营养成份全面优于大豆豆腐，口感又极其鲜美，清香宜人。

本发明的花生水晶豆腐，是按下述步骤制成的：

步骤 1：浸泡去皮，将花生米用水浸泡 6 小时，去掉表皮，淘洗干净；

步骤 2：磨浆，按花生与水为 1：8 的比例，将花生与水磨浆两次；

步骤 3：过滤，用 120 目纱布过滤，取花生浆适量将淀粉调匀作为固化剂待用；

步骤 4：烧浆冷却成型，将过滤后的花生浆倒入锅内加热至沸腾时，再将火力减小，将固化剂边搅拌边缓慢加入，3 分钟后，将熟浆倒入成型模具中，冷却约 2 小时即可成型。

具体实施方式

A：主要原料及设备

原料：花生米、淀粉（玉米淀粉，马铃薯淀粉，豌豆淀粉）

设备工具：磨浆机（过滤），台秤，大口径铁锅，成型模具，搅拌勺

B：具体操作工艺

步骤 1：将花生米用水浸泡 6 小时后，去掉表皮，淘洗干净；

步骤 2：按一斤花生米兑 8 斤水（如需浓香型，加熟花生适量）将花生磨浆两次；两次磨浆可减少出渣量，提高成品产量；

步骤 3：用 120 目纱布过滤，按 1：0.7~1 (花生：淀粉)称取定量淀粉，取 1/3 花生浆将淀粉调匀，要经常搅拌，防止沉淀，影响豆腐的固化，作为固化剂待用；所选用的淀粉最好选用豌豆淀粉，其次是玉米淀、小麦淀粉；

步骤 4：将过滤后的花生浆倒入锅内加热至沸腾时，先用大火，防止浆液溢出，并用勺不断搅拌，再将火力减小，将花生淀粉浆（即固化剂）边搅拌边缓慢加入，3 分钟后当混合液成糊状时，搅拌起来能朝一个方向流动，并且光亮细腻无结块现象，方可出锅，此时还可根据需要可加入芝麻、番茄酱、鸡蛋浆，将熟浆倒入成型模具（模具应先备好，洗净抹干）中，冷却约 2 小时即可成型，供食用或出售。每完成一次工序，应清洗磨浆机和所有器具，以免影响下次使用。

当欲制作含芝麻的花生水晶豆腐时，在步骤 4 中可按花生原料与芝麻 5：1 的比例添加芝麻。欲制作番茄花生水晶豆腐时，在步骤 4 中按花生与番茄 2：1 的比例加入番茄酱。欲制作鸡蛋花生水晶豆腐时，在步骤 4 中按花生与鸡蛋 4：1 的比例，加入鸡蛋浆。欲制作蒜泥花生水晶豆腐时，在步骤 4 中按花生与蒜泥 8：1 的比例加入蒜泥。

Espacenet

Bibliographic data: CN1557188 (A) — 2004-12-29

Bean curd production method with no waste water discharge

Inventor(s):	WU JIAMO [CN]; ZHU DANHUA [CN] ± (JIAMO WU, ; DANHUA ZHU, ; JIAMO,ZHU WU)
Applicant(s):	ZHEJIANG ACAD AGRICULTURAL SCI [CN] ± (ZHEJIANG ACADEMY OF AGRICULTURAL SCIENCE)
Classification:	**- international:** ***A23L1/20;*** (IPC1-7): A23L1/20 **- cooperative:**
Application number:	CN2004101753 20040120
Priority number (s):	CN2004101753 20040120
Also published as:	CN1250109 (C)

Abstract of CN1557188 (A)

The bean curd producing process adopts soybean and peanut as protein material and has no waste water drainage, less loss of nutritive matter, low water consumption, low power consumption, high output, no pollution, low production cost and high product quality. The production process includes dry sorting of soybean and peanut, cold oil squeezing, crushing bean residue, regulating milling water amount to control soybean milk concentration and adding coagulant, and may produce bean curd, bean milk and other products. The present invention can reach the effects of raised economic utility, rich nutrients in product and no environmental pollution.

[19] 中华人民共和国国家知识产权局

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代理人 沈伯伟

权利要求书 2 页 说明书 6 页

[54] 发明名称 无废水豆腐制品生产方法

[57] 摘要

本发明公开了一种无废水豆腐制品生产方法。以大豆、花生为蛋白原料，实施无废水排放，减少营养物质流失新工艺，达到节水、节能、增产、省时、无污染、降低生产成本和提高产品营养质量的目的。通过原料大豆、花生的干法清理精选，冷法榨油，豆粕粉碎，根据对制品蛋白质含量多少的要求，调节研磨加水量以控制豆浆浓度，添加凝固剂后可生产传统豆腐和新型盒装、袋装豆腐及豆奶等其它制品。达到企业增效，制品营养丰富，环境无污染的效益。

ISSN1008-4274

1、 无废水豆腐制品生产方法，其特征是以豆类蛋白为原料，经过如下加工工艺过程制备而成：

（1）原料的干法清理：采用精选机，螺旋分选机，摩擦除杂抛光机及圆筒筛机械和吸尘设备，干法清除原料中各类杂物，达到清洁要求；

（2）清洁原料的冷榨油处理：采用冷压机或螺旋榨油机榨取油脂；

（3）脱脂豆粕的粉碎：采用粉碎机将豆粕粉碎；

（4）脱脂原料粉的水浸泡、磨浆及除渣：原料粉与水按 1：2~3 比例浸泡 1 小时后，开始加水磨浆，在磨浆中根据豆腐老与嫩不同要求调节添水量，使豆浆含水量在 80~95%之间，过滤并除去豆渣；

（5）煮浆：将豆浆煮沸 3~5 分钟后停煮；

（6）豆浆固化成型：有两种处理方法，一种为豆浆冷却至 70~95℃时，倒入配有适量凝固剂的容器中，搅匀后倒入不锈钢浅型方盒中，冷却后即成传统板框式豆腐；另一种为待豆浆冷却至 35℃以下，加入适量凝固剂均合后，灌入小型包装盒或袋内，经密封，再加温至 80~100℃灭菌固化，即成豆腐产品。

2、 根据权利要求 1 所述的方法，其特征在于，步骤（4）磨浆时使含水量达到 90~95%，步骤（5）煮浆后倒入均质机内均质，即成豆奶产品。

3、 根据权利要求 1 所述的方法，其特征在于，将步骤（6）固化的含水量为 80~85%的老豆腐，从中压出 5~20%的水份后，即成豆腐干系列制品；压出水可再作磨浆添加水用。

4、 根据权利要求 1 所述的方法，其特征在于，将步骤（4）磨成的豆浆和豆渣投入超细磨浆机研磨，细度达 300 目以上时，再通过（5）与（6）步骤，即成无渣豆腐制品。

5、 根据权利要求 1 所述的方法，其特征在于，步骤（5）煮浆后，在步骤（6）加入凝固剂的同时，再加入蔬菜粉和/或维生素就可生产彩色豆腐制品。

6、 根据权利要求 1 所述的方法，其特征在于，原料也可直接经剥皮机清理处理，用 3 倍水量浸泡后，再经步骤（4）、（5）、（6），即生产出豆腐制品；该法浸泡富余水可用于磨浆添加水。

7、 根据权利要求 1 至 6 的任一方法，其特征是所述豆类蛋白为大豆、花生所含蛋白。

8、 根据权利要求 1，3，4，5 或 6 所述豆腐制品生产方法，其特征是所述凝固剂为盐卤（氯化镁、氯化钙），石膏（硫酸钙），内脂（葡萄糖内脂）或新型凝固剂琥珀酸，谷胺酰氨转氨酶中的一种或几种的混合物。

无废水豆腐制品生产方法

技术领域

本发明涉及豆制食品加工技术领域，尤其是涉及无废水豆类蛋白食品制造方法。

背景技术

豆腐是我国传统豆制食品，深受消费者喜爱。但在以往的传统加工技术中，首先在洗豆、浸豆、磨浆及用水运送豆源工序中均要消耗大量水资源，一般每生产 1 公斤豆腐需消耗 10~15 公斤水；其次在整个生产过程中，需不断排放富营养化的废水，对环境造成大量污染，企业对此需支付大量排污费，并要消耗巨资修建治废设备；再次在原法生产中，把豆料中的大量活性营养物质随同废水排出，降低了豆制品的营养保健价值，一般大豆中所含低聚糖、异黄酮、皂甙及其它水溶性维生素、乳清蛋白等活性营养物质大量损失,据国家大豆工程技术研究中心测定平均损失达 70%左右。

发明内容

本发明的目的是针对以上存在的不足，提出一套节水、省本、节能、无废水，富营养的豆类蛋白豆腐系列产品的制备方法。

本发明的目的是通过以下技术方案得以实现。

一种无废水豆腐制品生产方法，是以豆类蛋白为原料经过如下加工工艺过程制备而成：

（1）原料的干法清理：采用精选机，螺旋分选机，摩擦除杂抛光机及园筒筛机械和吸尘设备，干法清除原料中各类杂物，使杂质含量小于 0.3%，达到食

品卫生清洁要求；

（2）清洁原料的冷榨油处理：采用冷压机或螺旋榨油机榨取原料所含油脂；

（3）脱脂块壮豆粕的粉碎：采用粉碎机将豆粕粉碎至 20~40 目；

（4） 脱脂原料粉的水浸泡、磨浆及除渣：原料粉与水按 1：2~3 重量比例浸泡 1 小时后，开始添水磨浆，在磨浆中根据对豆腐老与嫩不同要求调节添水量，豆浆含水量达 80~95%之间，再除去豆渣；

（5） 煮浆：将豆浆煮沸 3~5 分钟后停煮；

（6） 豆浆固化成型：有两种处理方法，一种为豆浆冷却至 70~95℃时，倒入配有 0.3%凝固剂的容器中，自然均合后倒入不锈钢方盒中，冷却后即成传统板框式豆腐；另一种为待豆浆冷却至 35℃以下，加入 0.3%凝固剂均合后，灌入小型包装盒或袋内，经密封，再加温至 80~100℃灭菌并固化，即成豆腐产品。

将上述方法过程中改变其中部分工艺或添加一些辅料即能生产下述系列豆制产品：

在步骤（4）磨浆时使豆浆含水量达到 90~95%，步骤（5）煮浆后倒入均质机内均质，即成豆奶产品；

将步骤（6）固化的含水量 80~85%的老豆腐，从中压出 5~20%的水份，即成豆腐干系列制品；压出水可作磨浆添加水用；

将步骤（4）磨成的豆浆连同豆渣投入 JTM50 超细磨浆机研磨，细度达 300 目以上时，再通过步骤（5）、（6），即成无渣豆腐制品；

将步骤（5）煮浆后的豆浆，在步骤（6）加入凝固剂的同时，再加入蔬菜粉和/或维生素即成绿色、淡黄色等彩色豆腐制品；

将干原料豆直接经剥皮机清洁处理，用 3 倍水量浸泡后，豆仁经步骤（4）、

（5）、（6）工艺，同样也能生产出豆腐制品，该法浸泡富余水可回收用于磨浆添加水；

以上所述豆类蛋白为大豆或花生所含蛋白；

所述凝固剂为盐卤（氯化镁、氯化钙）、石膏（硫酸钙）、内脂（葡萄糖内脂）或新型凝固剂琥珀酸，谷胺酰氨转氨酶等中的一种或几种的混合物。

本发明的有益效果，一是由于原料豆改原法水洗为干法机械清理，改大量水浸泡豆为少量水浸泡豆粉，磨浆时的添水量也是根据生产老豆腐或嫩豆腐的不同含水量要求而控制在定量用水范围内，少量富余水也均回收利用无废水排放，达到节省传统用水量的 80%左右，使每生产 1 公斤豆腐仅需 1 公斤水；二是整个生产流程中无废水排放，克服了传统豆腐生产行业中由于大量排放富营养废水而造成污染环境的难题；三是原料豆本身所含营养减少了流失，得到了较好的保护，较原工艺营养成分损失减少了 50%左右，其中原法生产中大豆脂肪随豆渣损失的 15%得到了回收。从而提高了豆腐制品的营养价值与保健功能。采用 DU-6000 光谱仪、721 分光光度计、糖度仪等分别测定传统与本法所制豆腐产品：其中本法产品大豆低聚糖增加 78%，大豆皂甙增加 62%，异黄酮增加 21%，可溶性维生素、乳清蛋白各增 50%，豆腐中的营养成分总的可增 50%。四是由于节省了大量用水和以往的排污，免除了废水治理设备建设的费用，并在冷榨油工序中增加了油脂的效益。在浸豆粉工序中也节省了一半以上的时间，在煮浆工序中含水量也减少 40~50%，达到了省时、节能、节水、增产、增收的目的，从而降低了整个生产成本，豆腐制品产量增产 10%以上，总效益增加了 20%以上。

具体实施方式

下面结合实施例对本发明做进一步详细描述。

实施例 1：

取大豆 100 公斤，按如下步骤、工艺进行加工：

（1）大豆的干法清理：采用 XΦ600 园筒筛精选机，CΦ800 螺旋分选机，N70 喷风铁辊摩擦除杂机等设备，利用永磁铁除去铁类杂物，利用铰龙送豆摩擦力除去大豆表面各类杂质，筛网除去比豆大或小的粒状杂物，吸风机吸除灰尘等，经上述机械的综合作用，使大豆达到清洁要求，杂质含量小于 0.3%(以灰份测定法测定)；

（2）清洁大豆用 200T 冷压机或 rzrx95b 螺旋榨油机进行冷榨油（避免蛋白质的迁热变性），出油率达大豆含油量的 80~90%；

（3）块状脱脂大豆粕，用 SF-400 高速粉碎机粉碎；细度为 20~40 目；

（4） 脱脂大豆粉用 3 倍重量的水，浸泡 1 小时后，逐步倒入 FDM-Z 自动浆渣分离磨浆机进行磨浆。并根据不同豆腐制品含水量的要求，适量加水，使豆浆含水率分别达到 80%或 90%左右；

（5）将豆浆倒入煮浆桶内，边搅拌边加温，待煮沸 3 分钟后停煮；

（6）传统板框豆腐的固化制作：将煮好的含水量为 80%的豆浆冷却到 75℃~95℃时冲入事先用少量水溶解有 0.3%石膏和内脂混合凝固剂的容器中，自然均合后迅速倒入成型的不锈钢框合中，冷却后即成板框豆腐，100 公斤大豆可出板框豆腐约 500~600 公斤；

（7） 小型盒装或袋装豆腐的固化制作：将煮好的含水量为 90%的豆浆冷却到 35℃以下后加入 0.3%内脂凝固剂混合均匀后，用自动灌浆机灌入塑料盒或袋内，封口，再加温到 98℃保温 30 分钟，豆浆遇热灭菌并固化，即成产品，100 公斤大豆可出盒装或袋装豆腐 700 公斤左右；

在实施上述方法过程中改变其中部分工艺或添加一些辅料即能生产下述系列豆制产品：

豆奶：在磨浆时通过加水使含水量达95~98%的豆浆倒入GRB30-6D高压均质机，均质后即成乳状豆奶产品，100公斤大豆可出1000公斤以上豆奶；

豆腐干：将含水量80~85%的老豆腐，通过专用豆干压榨机从中压出5~20%的水份后，即成豆腐干系列制品；压出之水返回作磨浆添加水用；

无渣豆腐：经上述步骤（4）磨成的豆浆和豆渣投入DJM130L超细磨浆机研磨，细度达300目以上时，再通过步骤（5）、（6）或(7)，即成无渣豆腐；

彩色豆腐：煮浆后，在步骤（6）加入凝固剂的同时，再加入蔬菜粉和/或维生素就可生产绿色或淡黄色的彩色豆腐。

实施例2、

取100公斤花生，按如下步骤、工艺进行加工：

（1）花生用XΦ600园筒筛精选机除杂、经过吸尘机吸尘、吸铁石除铁等工序、去花生仁上所有杂质,达到杂质含量小于0.3%的食品清洁卫生要求；

（2）用花生仁专用去衣机去除花生衣；

（3） 用200T冷压榨机或rzrx95b螺旋榨油机榨取花生仁所含的80~90%的油脂；

（4）用SF-400高速粉碎机把榨油后花生仁块粕粉碎成20~40目粉料；

（5）用3倍水量浸泡花生粉料1小时；

（6） 用FDM-Z自动浆渣分离磨浆机进行加水磨浆，根据豆腐品种要求不同确定加水量，使豆浆含水量分别达到老豆腐为80~85%，嫩豆腐为85~90%；豆奶为90~95%；

（7）磨成的浆迅速煮浆，煮沸3分钟，停煮；

（8） 在上述熟热花生浆内迅速加入 50%相同含水量的熟热大豆豆浆混合；或把冷花生浆与相同含水量的冷豆浆各 50%混合后煮浆，以提高花生浆的凝固性；

（9）花生浆制备豆腐系列产品时，方法同实施例 1。

实施例 3：

取 100 公斤大豆，按如下步骤，工艺加工：

（1） 把大豆用 ED-1500 热风烘干机烘干，水份到 10%左右时，用 ZQ 型大豆去皮机清除大豆表皮；

（2） 把清洁豆仁用 3 倍重量水浸泡，气温高于 25℃浸 3 小时，气温低于 25℃时浸泡 6 小时；

（3） 把吸透水的豆仁从浸泡容器中取出，投进 FDM-2 自动浆渣分离磨浆机中进行磨浆，多余浸泡水可作磨浆添加用水；

（4） 按实施例 1 步骤(5)、(6)、(7) 就可生产出同样豆腐制品。

Electronic Patent Application Fee Transmittal

Application Number:	14796970
Filing Date:	10-Jul-2015
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Filer:	M. Angela Parsons/Anastasia Renard
Attorney Docket Number:	38767-0010001

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:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

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Application Number:	14796970
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Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Anastasia Renard
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Attorney Docket Number:	38767-0010001
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RAM confirmation Number	2714
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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	Information Disclosure Statement (IDS) Form (SB08)	IDS_Transmittal.pdf	61896 0d734ff0bc175f16040f7ab0bb64f5754cbee099	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	PTO1449.pdf	103618 4b23c5eda16f5477c078109f2549c99943a630e1	no	1
Warnings:					
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3	Foreign Reference	CN1466903Ax.pdf	522277 e84a73010771d030510e67ec840d49af0246aaa6	no	5
Warnings:					
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4	Foreign Reference	CN1557188Ax.pdf	9206835 d3c63c43a773655a61126e374b08c6b6b6ace4de	no	10
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	30663 457ff1e2ea544153d481ff248acbb62f028365b0	no	2
Warnings:					
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		Total Files Size (in bytes):	9925289		

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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
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/796,970	Filing Date 07/10/2015	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ 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

AMENDMENT	12/17/2015	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 26	Minus	** 30	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 2	Minus	***4	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
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Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	Unknown
Serial No.	:	14/796,970	Examiner	:	Unknown
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the references listed on the enclosed PTO-1449 Form. A non-patent literature document is enclosed.

This statement is being filed after a first Office Action on the merits, but before receipt of a Final Office Action or a Notice of Allowance. A fee in the amount of $180 as required under 37 CFR § 1.17(p) is being paid with this statement via the Electronic Filing System (EFS). Please apply any other charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Please contact the undersigned if there are any questions regarding this Statement.

Respectfully submitted,

/January 21, 2016/

Date:_____

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61270294.doc

Sheet 1 of 1

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
		Filing Date July 10, 2015	Group Art Unit

U.S. Patent Documents							
Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate

Foreign Patent Documents or Published Foreign Patent Applications								
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Other Documents (include Author, Title, Date, and Place of Publication)		
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	1.	Heller, "Barbecued Soybeans," Vegetarian Soybean Recipes, Mother Earth News, January/February 1985, http://motherearthnews.com/real-food/vegetarian-soybean-recipes-zmaz85asie.aspx

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Electronic Patent Application Fee Transmittal

Application Number:	14796970
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Sheet 1 of 1

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0010001	14/796,970
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U.S. Patent Documents

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	1.	WO 2007/060288	5/31/2007	WIPO				

Other Documents (include Author, Title, Date, and Place of Publication)

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	2.	"Rethink Meat," Presented at the 6th Annual Sustainable Innovation Forum at the 2015 United Nations Climate Change Conference (aka COP21), Paris, France, December 7-8, 2015, retrieved on 2/1/2016, https://amp.twimg.com/v/7c7f7084-b173-42cb-bc12-723f35994dff, 1 page (Video Submission)

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(54) Title: METHOD OF MODIFYING THE TEXTURE OF A PREPARATION

(57) Abstract: The invention relates to a method of manufacturing soured fresh dairy products by the use of a transglutaminase enzyme, an enzyme-activating compound and an acidifying agent and by the addition thereof to a protein source under such circumstances that the enzyme is active during acidifying.

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METHOD OF MODIFYING THE TEXTURE OF A PREPARATION

[0001] The invention relates to a method of manufacturing sour milk preparations, such as soured fresh dairy products by the use of a transglutaminase enzyme and an enzyme-activating compound. The invention further relates to a sour milk preparation manufactured by the method according to the invention. The invention further relates to a method of modifying the texture of sour milk preparations by means of a transglutaminase enzyme and an enzyme-activating compound.

BACKGROUND OF THE INVENTION

[0002] Conventionally, sour milk preparations have been manufactured by acidifying milk with an acidifying agent specific to each product at a suitable temperature. *Lactobacillus bulgaricus* and *Streptococcus thermophilus* strains are conventionally used in the preparation of yoghurt, for example. Before acidifying, all necessary raw materials (sweetener, flavouring agents and texturizers) are added to the milk, and the milk is then typically pasteurized and homogenized. The milk is acidified to a pH specific to each product. Then, the texture is broken for all products other than products of the viili (ropy sour milk, a typical Finnish milk product) type and set-type yoghurts, necessary flavouring agents (e.g. jam addition) are added, and the product is packaged. In the manufacture of products of the viili type, viili mould is used in addition to lactic acid bacterium starters. In contrast to other sour milk preparations, for products of the viili type and set-type yoghurts, acidifying occurs in the package.

[0003] Conventionally, the dry substance content of milk is increased or decreased for adjusting the texture of sour milk preparations. The dry substance content can be increased by evaporating the milk or by the use of powders. The protein content of the raw material milk affects the texture of the end product in a manner allowing the texture of the sour milk preparation, such as a soured fresh dairy product to be modified thicker or runnier by increasing or decreasing the protein content. The protein content of the raw material milk can be increased by evaporation or by the use of protein powder addition. The protein powder may originate from milk, such as milk powder, whey protein powder or casein protein powder, but proteins not originating from milk are also usable. For some products, for example fermented milk, thinning-down of the texture may be feasible. This may be influenced by the addition of milk permeate, cheese whey, sour whey (quark whey, cottage

cheese whey) or lactose fraction to the raw material milk. Liquids not originating from milk, such as water, may also be used to liquidify the texture.

[0004] The use of a texture-modifying transglutaminase enzyme in the manufacture of milk preparations, particularly sour milk preparations, is known. In sour milk preparations, such as soured fresh dairy products (yoghurt, set-type yoghurt, viili, fermented milk), the use of a transglutaminase enzyme serves to harden the texture, modify the texture to be finer, and to reduce syneresis. The enzyme also serves to modify the texture thicker.

[0005] The transglutaminase enzyme catalyzes the generation of covalent linkages between the glutamine and lysine amino acid residues present in the protein molecules. When linkages are formed, ammonia is released. The enzyme was first used in Japan in the manufacture of surimi (seafish paste) products (Kuraishi, *et. al.*, Food Rev. Int. 17(2), 2001, pp. 221 to 246).

[0006] Patent publication EP 610 649 (Ajinomoto) describes a method of pre-processing yoghurt milk with transglutaminase enzyme and inactivating the enzyme before acidifying in connection with the pasteurization of yoghurt milk. Patent publication EP 689 383 (Novo Nordisk A/S) discloses a method of processing milk with transglutaminase enzyme, followed by acidifying the milk to the desired pH and heat-treating the gel obtained. The thus-formed gel may be used in the manufacture of yoghurt or cheese. Patent publication EP 1 206 912 (Friesland Brands B.V.) describes a method of adding transglutaminase enzyme after the heat-treatment of milk, during the acidifying step, and adding enzyme also after the acidifying. The method is characterized by adding enzyme always also after the acidifying. Patent publication JP 2001252011 (Koiwai Nyugo KK) discloses a method for the manufacture of yoghurt, wherein i.a. transglutaminase enzyme is added in an acidifying step when pH has dropped close to the value 5, and at this pH, acidifying is stopped by transferring the yoghurts into cold storage.

[0007] A common feature in the above-described methods is the use of transglutaminase enzyme only in the cross-linking. Patent publication EP 1 197 152 (Ajinomoto) discloses a cross-linking method, wherein milk is pre-processed by means of a processing aid affecting the operation of transglutaminase and the enzyme, by means of glutathione, for example. After the processing, transglutaminase is inactivated by heat-treatment, and the milk is used in the manufacture of various milk products. This method enables the

cross-linking to be accomplished more effectively than processing with transglutaminase alone. The method is particularly a pre-processing method of raw material milk prior to conventional manufacture of milk products.

[0008] In the above-described methods, the enzyme, any processing aid affecting the activity of the enzyme, and the acidifying agent used in any particular case, are added to the reaction mixture in different processing steps, and the enzyme, any processing aid affecting the activity of the enzyme or the acidifying agent are not allowed to react simultaneously in the mixture.

[0009] It has now been surprisingly discovered that the addition of transglutaminase enzyme, an enzyme-activating compound and an acidifying agent to a protein source under such circumstances that the enzyme is active upon the addition of the acidifying agent and/or during the acidifying, results in a simpler method that requires fewer processing steps, which enables a reduction in the protein content of sour milk preparations, especially soured fresh dairy products without any damage to or adverse effect on the texture of the preparation.

BRIEF DESCRIPTION OF THE INVENTION

[0010] The invention relates to a method of manufacturing sour milk preparations, such as soured fresh dairy products with the use of a transglutaminase enzyme, an enzyme-activating compound, and an acidifying agent by the addition thereof to a protein source under such circumstances that the enzyme is active upon the addition of the acidifying agent and/or during the acidifying. The method enables the modification of the texture of soured fresh dairy products more advantageously and easily than known methods. In addition, the method enables a significant reduction in the protein content of soured fresh dairy products without any damage to or adverse effect on the texture of the preparation.

[0011] The method also relates to a soured fresh dairy product manufactured by the method.

DETAILED DESCRIPTION OF THE INVENTION

[0012] It has now been surprisingly discovered that the addition of transglutaminase enzyme, an enzyme-activating compound, and an acidifying agent to a protein source under such circumstances that the enzyme is active upon the addition of the acidifying agent and/or during the acidifying, enables the modification of the texture of a sour milk preparation, such as a soured

fresh dairy product significantly more efficiently than by the use of the above described pre-processing method of raw material milk. The method according to the invention, wherein the cross-linking occurs during the acidifying, is about 20% more effective compared with a method wherein transglutaminase enzyme alone is used during acidifying. The method according to the invention enables the manufacture of sour milk preparations, especially soured or fermented fresh dairy products, with a significantly lower protein content while the texture remains the same as in sour milk preparations manufactured in the conventional manner. This enables the manufacture of sour milk preparations, especially soured or fermented fresh dairy products, at a lower raw material cost level than in the manufacture of sour milk preparations at a conventional protein level. Fermented or more generally soured fresh dairy products include yoghurts, viili, fermented milks, quarks (a kind of low-fat curd cheese), fresh cheeses, cream cheeses and soured cream products, such as crème fraîche and smetana, for example.

[0013] Transglutaminase enzyme (EC 2.3.2.13) catalyzes the generation of covalent linkages between the glutamine and lysine amino acid residues present in the protein molecules. Microbial transglutaminase preparations acceptable for use in foodstuffs are commercially available. The manufacturers recommend an enzyme dosage of 1 to 3 U/g of protein, depending on the use.

[0014] As the enzyme-activating compound, any compound possessing the necessary property may be used. For example, compounds whose chemical activity is based on either reduction or oxidation are usable. As examples of reducing compounds may be mentioned glutathione, cysteine, γ-glutamyl cysteine, thiosulphuric acid, thioglycolic acid, sulphurous acid, ascorbic acid, erythorbic acid, dithiotreitol and salts thereof, accepted for use in foodstuffs, $NaBH_4$, tocopherol, fatty acid ester of glycerine or lecithin. As an example of oxidizers, formic acid may be mentioned.

[0015] The enzyme-activating compound is preferably glutathione. Glutathione reduces whey proteins and its effect, when used together with transglutaminase enzyme, is thought to be based on this property. Glutathione may be used as such, as a commercially available purified compound, for example. Alternatively, a glutathione-containing mixture may be used. As an example of a glutathione-containing mixture accepted for use in the foodstuffs industry, yeast extract may be mentioned.

[0016] The term 'acidifying agent' refers to a microbiological starter

or culture, a chemical acidifying agent or mixtures thereof.

[0017] Acidifying may be performed by fermenting with at least one product specific culture and/or by using chemical acidifying agents, such as organic or inorganic acids, for example.

[0018] In accordance with the method of the invention, transglutaminase enzyme, the enzyme-activating compound, and the acidifying agent are added to the protein source under such circumstances that the enzyme is active upon the addition of the acidifying agent and/or during the acidifying. This allows the enzyme and the enzyme-activating compound to be added to the protein source before the addition of the acidifying agent, in connection with the addition of the acidifying agent or after the addition of the acidifying agent. It is essential to the method according to the invention that the circumstances after the addition of the enzyme and the enzyme-activating compound, before the addition of the acidifying agent, or in a reverse order, after the addition of the acidifying agent, before the addition of the enzyme and the enzyme-activating compound, do not change and/or are not changed in a manner causing the enzyme to become inactive. Thus, in accordance with the invention, provided the enzyme is active upon the addition of the acidifying agent and/or during the acidifying, the enzyme and the enzyme-activating compound may be added to the protein source several hours, e.g. 2 to 10 hours, prior to the addition of the acidifying agent. The circumstances where the additions are performed in the method according to the invention depend on the properties of the enzyme used in the method. The properties of the enzymes, such as activity and substrate-specificity, depend typically on the temperature and the pH, for example. The transglutaminase enzymes commercially available at present are active in a temperature range of from 0 to 80°C, the enzyme becoming inactive at temperatures of over 80°C, and reaching its maximum activity at a temperature of about 50°C. In milk-based applications, the enzyme can be used preferably at a temperature range of from 3 to 60°C. When transglutaminase enzyme is used in connection with an oxidation reaction, the temperature range is preferably from 20 to 50°C. The transglutaminase enzymes commercially available at present are active in a pH range of from 3 to 10, reaching their maximum activity at a pH range of from 5 to 8. In milk-based applications, pH is preferably between 3.5 and 7.5 or it is adjusted to said pH value range.

[0019] In the method according to the invention, raw material milk

as such or pre-processed in the desired manner usually constitutes the protein source. Decreasing the protein content of raw material milk may be mentioned as an example of pre-processing. The protein level may be lowered also simultaneously with the addition of the acidifying agent. Milk permeate, whey, lactose fraction, concentrates thereof or a mixture constituted by milk permeate, whey, lactose fraction and/or concentrates thereof, for example, may be used for decreasing the protein level. In addition, water, corn steep liquid, juice or any other liquid suitable for foodstuffs use may be used for decreasing the protein level. The above-mentioned liquids or mixtures thereof, suitable for decreasing the protein level, may be added up to 20 volume percent to the protein source used in the method.

[0020] In this context, raw material milk refers to milk obtained from an animal, e.g. a cow or a goat, as such or processed in various manners. Milk may be processed for instance by removing fat or lactose from it, resulting in fat-free, low-fat, lactose-free or low-lactose milk. In this context, raw material milk also refers to pre-processed or unprocessed milks used in the manufacture of yoghurt, viili and fermented milk, for example, which persons skilled in the art refer to as raw material milk for yoghurt, viili and fermented milk.

[0021] The milk may be fractionated for instance by means of chromatographic separation and/or micro, nano or ultra-filtering into fractions containing different amounts of different components, and the fractions may, in turn, be used for adjusting the protein content of the milk as such or as different mixtures thereof.

[0022] A milk permeate refers to a permeate that is obtained in the ultra-filtering of milk and contains mainly lactose, ash and protein. The protein content of the milk permeate depends on the filtering conditions, but is most generally between about 0.2 to 0.4 percent by weight, typically about 0.3 percent by weight of protein.

[0023] Whey refers to the liquid, non-precipitated part of milk that is separated from the curd in making cheese or curd cheese. The protein content of whey is usually between about 0.5 and 0.7 percent by weight, typically about 0.6 percent by weight.

[0024] A lactose fraction refers to a fraction that is obtained as the result of chromatographic separation and that contains mainly lactose, but also proteins, for example. The protein content of the lactose fraction depends on the separation conditions, but is most generally between about 0.2 and 0.4

percent by weight, typically about 0.3 percent by weight of protein.

[0025] Furthermore, not only animal milk, but also liquids originating from plants, such as oat, soy, rice or coconut milk that are commercially available, may be used as the protein source. Oat, soy and rice milk may be industrially manufactured in a process wherein grains or beans are crushed and the desired nutrients extracted into a suitable liquid, such as water, which may also contain oil, such as rapeseed oil, for example.

[0026] Fermented or more generally soured fresh dairy products refer to soured fresh products based on milk(s) originating from animal(s) and/or plant(s).

[0027] With the exception of the addition of transglutaminase enzyme and an enzyme-activating compound and the optional adjustment of the protein content of the protein source, acidifying takes place in the same way as for corresponding soured fresh dairy products manufactured conventionally by the use of an acidifying agent suitable for each particular case and/or each particular product, and suitable reaction conditions, however, in such a manner that the enzyme remains active.

[0028] The method of the invention is suitable for the manufacture of flavoured and non-flavoured fatty and fat-free, and homogenized and non-homogenized fresh products. It is further suitable for the manufacture of lactose-free and low-lactose (such as HYLA®) products.

[0029] In an embodiment of the invention, the method comprises the following steps:

addition of transglutaminase enzyme, an enzyme-activating compound and an acidifying agent to a protein source,

acidifying,

recovering the product obtained.

[0030] In another embodiment of the invention, the method further comprises a step of decreasing the protein content of the protein source by the addition of liquid suitable for the purpose to the protein source. In this case, the method comprises the following steps:

addition of a liquid suitable for decreasing the protein content, such as milk permeate, whey, lactose fraction, a concentrate thereof or a mixture constituted by milk permeate, whey, lactose fraction and/or concentrates thereof, to a protein source,

addition of transglutaminase enzyme, an enzyme-activating com-

pound and an acidifying agent to the protein source,

acidifying,

recovering the product obtained.

[0031] In addition to these steps, the method of the invention preferably comprises any other necessary manufacturing steps for accomplishing the end product, such as the addition of jam and/or sugar and/or heat-treatment (post-pasteurization).

[0032] An advantage of the method according to the invention is that it enables the utilization of raw material milk having a lower protein content than in the use of the above-described, known methods. The protein content of the raw material milk used in the method of the invention may be as low as about 0.5 percent by weight, whereas the lower limit of the protein content is within the range 2 to 3 weight percent when known manufacturing methods are used, depending on the sour milk product. When known manufacturing methods are used, the protein content of yoghurt is typically within the range 3 to 5 percent by weight, of viili within the range 3 to 5 percent by weight, of fermented milk within the range 3 to 5 percent by weight, and of drinkable yoghurt within the range 2 to 4 percent by weight. There is no actual upper limit for the protein content, but in practice, a 10% protein content in raw material milk is seldom exceeded in industrial manufacture of yoghurt, viili and/or fermented milk.

[0033] An advantage of the method of the invention is that the amount of enzyme required in the method is smaller than the amount required when known methods are used. In the method of the invention, enzyme may be used in an amount of 0.1 to 300 ppm, preferably 1 to 200 ppm. A smaller amount of enzyme required results in clear cost saving in the production. In addition, another advantage of the method according to the invention is a simplified manufacturing process, since extra method steps binding energy and time can be omitted.

[0034] The invention also relates to a method of modifying the texture of sour milk preparations, especially soured or fermented fresh dairy products, by means of transglutaminase enzyme and an enzyme-activating compound. This method is characterized by adding the transglutaminase enzyme, the enzyme-activating compound and the acidifying agent to a protein source under conditions when the enzyme is active during the acidifying.

[0035] The following examples illustrate the present invention. They

are in no way intended to restrict the claims.

Example 1. Preparation of yoghurt

[0036] In the example, it was studied how pre-processing of milk with transglutaminase enzyme and glutathione in accordance with prior art and processing with transglutaminase enzyme and glutathione together with an acidifying agent in accordance with the present invention affected the manufacturing process and the properties of the end product.

[0037] Reference yoghurt was manufactured from raw material milk having a protein content of 4.2% and fat content of 2.5%. 0.252 g of Activa® YG powder (Ajinomoto, contains i.a. transglutaminase and yeast extract)/1,000 g milk were added to the milk. The enzyme was allowed to act at a temperature of 6°C for 16 hours. The milk was then pasteurized at 92°C for 5 minutes and cooled to a temperature of 42°C. Yoghurt starter culture was added and maturing occurred at a temperature of 42°C until pH had fallen to 4.5.

[0038] The test yoghurt according to the invention was manufactured from raw material milk having a protein content of 3.8% and fat content of 2.5%. The milk was pasteurized at 92°C for 5 minutes and cooled to a temperature of 42°C. 0.171g/1,000 g milk of Activa® YG powder were added to the milk together with a yoghurt starter and was brought to maturity at a temperature of 42°C until pH had fallen to 4.5. In the manufacture of the test yoghurt, smaller amounts of transglutaminase enzyme and yeast extract were used than in the manufacture of the reference yoghurt. In addition, the manufacture of the test yoghurt according to the invention differed from the manufacture of the reference yoghurt in that the Activa® YG powder was added together with the culture.

[0039] The organoleptic quality and the viscosity of the yoghurts were observed during 20 days. The method according to the invention enabled the use of milk having a protein level lowered from 4.2% to 3.8% as raw material milk without any weakening of the quality of the yoghurt. In contrast, the texture of the test yoghurt was slightly thicker than the reference yoghurt (see Table 1) and the amount of enzyme preparation was smaller than in the manufacture of the reference yoghurt.

Table 1. Viscosity of reference yoghurt and test yoghurt during the shelf-life.

Shelf-life [days]	Reference, viscosity [Pas]	Test yoghurt, viscosity [Pas]
2	1.9	2.3
20	2.1	2.5

Example 2. Preparation of yoghurt

[0040] In the example, it was studied how processing milk with transglutaminase during acidifying in accordance with prior art and the use of a yeast extract containing transglutaminase and glutathione during acidifying in accordance with the present invention affected the manufacturing process and the properties of the end product.

[0041] Reference yoghurt was manufactured from raw material milk having a protein content of 4.2% and fat content of 2.5%. The milk was pasteurized at 92°C for 5 minutes and cooled to a temperature of 42°C. 0.252 g of Activa® MP powder (Ajinomoto, contains transglutaminase)/1,000 g milk were added to the milk, the yoghurt culture was added, and maturing occurred at a temperature of 42°C until pH had fallen to 4.5.

[0042] The test yoghurt according to the invention was manufactured in the same way as the reference yoghurt except that in connection with the culture addition 0.168g/1,000 g milk of Activa® YG powder containing yeast extract was added instead of Activa® MP powder.

[0043] The method of the invention enabled the manufacture of yoghurt of the same quality by using a 33% smaller enzyme preparation dosage when Activa® YG powder that contains yeast extract was used as compared with ordinary Activa® MP powder. Consequently, significant savings in enzyme costs are obtained.

Table 2. Viscosity of reference yoghurt and test yoghurt

Shelf-life [days]	Reference, viscosity [Pas]	Test yoghurt, viscosity [Pas]
3	2.2	2.2
21	2.7	2.6

Example 3. Preparation of yoghurt

[0044] In the example, it was studied how processing milk with transglutaminase enzyme and glutathione together with an acidifying agent in accordance with the present invention in the manufacture of yoghurt and the manufacture of yoghurt without processing with an enzyme in accordance with prior art affected the manufacturing process and the properties of the end product.

[0045] Reference yoghurt was manufactured from raw material milk having a protein content of 4.2% and fat content of 2.5%. The milk was pasteurized at 92°C for 5 minutes and cooled to a temperature of 42°C. Yoghurt acidifier was added to the milk, and maturing occurred at a temperature of 42°C until pH had fallen to 4.5.

[0046] The test yoghurt according to the invention was manufactured from raw material milk having a protein content of 3.65% and fat content of 2.5%. The milk was pasteurized at 92°C for 5 minutes and cooled to a temperature of 42°C. 0.15g/1,000 g milk of Activa® YG powder were added to the milk together with the yoghurt culture, and maturing occurred at a temperature of 42°C until pH had fallen to 4.5. In the manufacture of the test yoghurt according to the invention, transglutaminase enzyme and yeast extract were used in addition to the culture.

[0047] The method according to the invention enabled the use of milk having a protein level lowered from 4.2% to 3.65% as raw material milk without any weakening of the quality of the yoghurt. The viscosities of both yoghurts were at the same level and the yoghurts could not be distinguished from one another organoleptically.

Example 4. Preparation of set-type yoghurt

[0048] In the example, it was studied how processing milk with transglutaminase enzyme and glutathione together with an acidifying agent in accordance with the present invention in the manufacture of set-type yoghurt and the manufacture of set-type yoghurt without processing with an enzyme in accordance with prior art affected the manufacturing process and the properties of the end product.

[0049] Reference yoghurt was manufactured from raw material milk having a protein content of 4.2% and fat content of 2.5%. The milk was pasteurized at 92°C for 5 minutes and cooled to a temperature of 42°C. Yoghurt

culture was added to the milk, and maturing occurred at a temperature of 42°C until pH had fallen to 4.5.

[0050] The test yoghurt was manufactured from raw material milk having a protein content of 3.65% and fat content of 2.5%. The milk was pasteurized at 92°C for 5 minutes and cooled to a temperature of 42°C. 0.15g/1,000 g milk of Activa® YG powder were added to the milk together with the yoghurt acidifier and brought to maturity at a temperature of 42°C until pH had fallen to 4.5.

[0051] The method according to the invention enabled the use of milk having a protein level lowered from 4.2% to 3.65% as raw material milk without any weakening of the quality of the yoghurt. The consistencies of both yoghurts were at the same level and the yoghurts could not be distinguished from one another organoleptically.

Example 5. Preparation of viili

[0052] The test viili according to the invention was manufactured by adding 94 g of milk permeate to 906 g of raw material milk for viili having a fat content of 2.5%. The mixture was pasteurized at 93°C for 5 minutes and cooled to a temperature of 65°C. The raw material was then homogenized at 65°C at a pressure of 200 bar. The raw material was then cooled to an acidifying temperature of 24°C and viili culture and 88 mg of Activa® YG enzyme preparation were added.

[0053] Reference viili was manufactured in the same way as the test viili except that 1,000 g of raw material milk for viili (fat content 2.5%) were used and no milk permeate or Activa® YG enzyme preparation was added to the milk. Both viilis were packaged in 200 g beakers and the viilis matured at a temperature of 24°C until pH fell to 4.5. The viilis were then transferred to cold storage. During a three-week storage time, the syneresis, the decomposition of the viili on a dish, the taste and the texture were followed organoleptically. In addition, consistency was measured at one week's intervals.

[0054] The method according to the invention enabled the use of milk having a lower protein level than the protein content of the milk used in the manufacture of the reference viili in the manufacture of viili without any weakening of the quality of the viili. Although the protein content of the viili manufactured with the method of the invention was smaller (2.9%) compared with the protein content (3.2%) of the reference viili, the organoleptic properties of both

viilis were the same and their consistencies were almost equal.

Example 6. Preparation of fermented milk

[0055] The test fermented milk according to the invention was manufactured by adding 180 g of milk permeate to 820 g of fat-free milk. The mixture was high-pasteurized at 90°C for 10 minutes and tempered to an acidifying temperature of 24°C. Fermented milk cultures and 100 mg of Activa® YG enzyme preparation were added. The milk was allowed to become acidified for 24 hours until pH was 4.5.

[0056] Reference fermented milk was manufactured in the same way as the test fermented milk except that 1,000 g of fat-free milk were used and no milk permeate or Activa® YG enzyme preparation was added to the milk. Both fermented milks were then mixed and packaged into one-litre packages. The fermented milks were then transferred to cold storage. During a three-week storage time, the syneresis, the taste and the texture were followed organoleptically. In addition, viscosity was measured at one week's intervals.

[0057] The method according to the invention enabled the use of milk having a protein level lowered from 3.3% to 2.7% as raw material milk without any weakening of the quality of the fermented milk. The organoleptic properties of both fermented milks were the same and their viscosities almost equal.

CLAIMS

1. A method of manufacturing a soured fresh dairy product, **characterized** by adding a transglutaminase enzyme, an enzyme-activating compound, and an acidifying agent to a protein source under such circumstances that the enzyme is active during acidifying, allowing to get acidified, and recovering the preparation obtained.

2. A method as claimed in claim 1, **characterized** in that the enzyme-activating compound is yeast extract.

3. A method as claimed in claim 1 or 2, **characterized** in that the enzyme-activating compound is glutathione.

4. A method as claimed in any one of claims 1 to 3, **characterized** by adding the enzyme and enzyme-activating compound to the protein source before addition of acidifying agent.

5. A method as claimed in any one of claims 1 to 3, **characterized** by adding the enzyme and enzyme-activating compound to the protein source during addition of acidifying agent.

6. A method as claimed in any one of claims 1 to 4, **characterized** by adding the enzyme and enzyme-activating compound to the protein source after addition of acidifying agent.

7. A method as claimed in any one of claims 1 to 6, **characterized** by decreasing the protein content of the protein source used in the method.

8. A method as claimed in claim 7, **characterized** by decreasing the protein content by adding milk permeate, whey, lactose fraction, a concentrate thereof or a mixture constituted by milk permeate, whey, lactose fraction and/or concentrates thereof.

9. A method as claimed in any one of claims 1 to 8, **characterized** in that the protein content of the protein source used in the method is at least 0.5 percent by weight.

10. A method as claimed in any one of claims 1 to 9, **characterized** in that the protein content of the protein source used in the method is between about 0.5 and about 10 percent by weight.

11. A method as claimed in any one of claims 1 to 10, **characterized** in that the protein source used in the method is raw material milk.

12. A method as claimed in any one of claims 1 to 11, **charac-**

terized in that the soured fresh dairy product is yoghurt, set-type yoghurt, viili, or fermented milk.

13. A soured fresh dairy product, **characterized** in that it has been manufactured according to the method as claimed in any one of claims 1 to 11.

14. A soured fresh dairy product as claimed in claim 13, **characterized** in that the product is yoghurt, set-type yoghurt, viili or fermented milk.

15. A method of modifying the texture of a soured fresh dairy product, **characterized** by adding a transglutaminase enzyme, an enzyme-activating compound, and an acidifying agent to a protein source under such circumstances that the enzyme is active during acidifying.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2006/050506

A. CLASSIFICATION OF SUBJECT MATTER

See extra sheet

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)

IPC8: A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

FI, SE, NO, DK

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-internal, WPI, BIOSIS, CAPLUS, FROSTI, FSTA

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	EP 1197152 A2 (AJINOMOTO KK) 17 April 2002 (17.04.2002)	
X		13, 14
Y	paragraphs [0052], [0074], [0098]	1-12, 15
	Faergemand, M. et al., Transglutaminase: effect on instrumental and sensory texture of set style yoghurt, Milchwissenschaft, Vol. 54, No. 10, 1999, p. 563-566, ISSN: 0026-3788	
X		13, 14
Y	pages 563 and 566, Fig. 1	1-12, 15

☒ Further documents are listed in the continuation of Box C. ☒ See patent family 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 application or patent 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
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"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

Date of the actual completion of the international search	Date of mailing of the international search report
31 January 2007 (31.01.2007)	07 March 2007 (07.03.2007)

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Form PCT/ISA/210 (second sheet) (April 2005)

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2006/050506

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
	Lorenzen, P. Chr. et al., Effect of enzymatic cross-linking of milk proteins on functional properties of set-style yoghurt, International Journal of Dairy Technology, Vol. 55, No. 3, 2002, p. 152-157, ISSN: 1364-727X	
X		13, 14
Y	pages 153 and 156	1-12, 15
	Lorenzen P.Chr., Enzymatische Quervernetzung von Milcheiweiss, Deutsche Milchwirtschaft, Vol. 53, No. 17, August 21 2002, p. 726-728, ISSN: 0012-0480	
X		13, 14
Y		1-6 11, 12, 15
	JP 2001252011 A (KOIWAI NYUGYO KK) 18 September 2001 (18.09.2001)	
	& World Patent Index/Thomson (abstract). [online][retrieved on 2007-01-23]. Retrieved from: EPOQUE WPI DATABASE, Accession No. 2001-651351[75]	
	& Machine translation of JP2001252011 A into English [online], [retrieved on 2007-01-23]. Retrieved from the Internet: http://www4.ipdl.ncipi.go.jp/pajdetail.ipdl?N0000=73&N0120=01&N2001=2&N3001=2001-252011	
X		13, 14
Y	example 1, claims	1-6, 11, 12, 15
	US 6416797 B1 (HAN XIAO-QING et al.) 09 July 2002 (09.07.2002)	
X		13
Y		1-6, 11, 15

INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/FI2006/050506

Patent document cited in search report	Publication date	Patent family members(s)	Publication date
EP 1197152 A2	17/04/2002	BR 0104466 A	04/06/2002
		US 2002061358 A1	23/05/2002
		DE 60107791T T2	01/09/2005
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US 6416797 B1	09/07/2002	EP 1232692 A1	21/08/2002
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INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI2006/050506

CLASSIFICATION OF SUBJECT MATTER

Int.Cl.
A23C 9/12 (2006.01)
A23C 21/02 (2006.01)
A23C 17/02 (2006.01)

Electronic Patent Application Fee Transmittal

Application Number:	14796970
Filing Date:	10-Jul-2015
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Filer:	M. Angela Parsons/Nikki Krahler
Attorney Docket Number:	38767-0010001

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:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt

EFS ID:	24888715
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Nikki Krahler
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	11-FEB-2016
Filing Date:	10-JUL-2015
Time Stamp:	13:17:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$180
RAM confirmation Number	12907
Deposit Account	061050
Authorized User	FISH & RICHARDSON P C
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	Information Disclosure Statement (IDS) Form (SB08)	IDS_TRANSMITTAL.pdf	61749 62b0cd07bdd3a8a0dab98dab5ad368fe9e929169	no	1
Warnings:					
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Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	30809 8d6a911111b71d02648ee2a3a46585f960c6ab4b	no	2
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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.

Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	Unknown
Serial No.	:	14/796,970	Examiner	:	Unknown
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the references listed on the enclosed PTO-1449 Form. A foreign patent document is enclosed. A copy of the video reference is being sent via Express Mail.

This statement is being filed after a first Office Action on the merits, but before receipt of a Final Office Action or a Notice of Allowance. A submission fee in the amount of $180 as required under 37 CFR § 1.17(p) is being paid with this statement. Please apply any other charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Please contact the undersigned if there are any questions regarding this Statement.

Respectfully submitted,

/February 11, 2016/ — Date: _____

/M. Angela Parsons/

M. Angela Parsons, Ph.D.
Reg. No. 44,282

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61279833.doc



Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	Unknown
Serial No.	:	14/796,970	Examiner	:	Unknown
Filed	:	July 10, 2015	Conf. No.	:	8501
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/February 11, 2016/ /M. Angela Parsons/

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61279833.doc

Sheet 1 of 1

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0010001	14/796,970
		Applicant: Impossible Foods Inc.	
		Filing Date: July 10, 2015	Group Art Unit

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No
	1.	WO 2007/060288	5/31/2007	WIPO				

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document
	2.	"Rethink Meat," Presented at the 6th Annual Sustainable Innovation Forum at the 2015 United Nations Climate Change Conference (aka COP21), Paris, France, December 7-8, 2015, retrieved on 2/1/2016, https://amp.twimg.com/v/7c7f7084-b173-42cb-bc12-723f35994dff, 1 page (Video Submission)

Examiner Signature	Date Considered

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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14796970ZA

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Doc Code: Artifact Artifact Type Code X

1 Other, description: **DVD**
Doc Code: Artifact Artifact Type Code: Z

March 8, 2004

2-12-16

IFW



PATENT
Attorney Docket No.: 38767-0010001

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor:	Marija Vrljic
Serial No.:	14/796,970
Filed:	July 10, 2015
Title	METHODS AND COMPOSITIONS FOR CONSUMABLES

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

DECLARATION OF MAILING BY "EXPRESS MAIL"

Zakk Young declares as follows:

1. I reside at:

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2. On February 11, 2016, I deposited in the mail, "Express Mail Post Office to Addressee" service of the United States Postal Service, the contents of the envelope for which "Express Mail" receipt No. 726792632 was issued addressed to the Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.

3. Attached hereto is a true copy of the "Express Mail" receipt No. EM726792632US.

I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the above-identified application or any patents issued thereon.

Date: February 11, 2016 /Zakk Young/

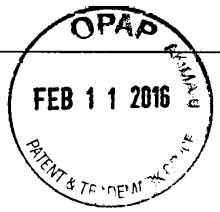
OPAP
FEB 11 2016
PATENT & TRADEMARK OFFICE

Electronic Acknowledgement Receipt

EFS ID:	24888715
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Nikki Krahler
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	11-FEB-2016
Filing Date:	10-JUL-2015
Time Stamp:	13:17:30
Application Type:	Utility under 35 USC 111(a)

Payment information:

Submitted with Payment	yes
Payment Type	Deposit Account
Payment was successfully received in RAM	$180
RAM confirmation Number	12907
Deposit Account	061050
Authorized User	FISH & RICHARDSON P C
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	Information Disclosure Statement (IDS) Form (SB08)	IDS_TRANSMITTAL.pdf	61749 62b0cd07bdd3aaaudabvsdab3ad368fe9e929169	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	IDS-1449.pdf	105519 41d2004e134c19dca5b0f0dbe863706bec48d358	no	1
Warnings:					
Information:					
This is not an USPTO supplied IDS fillable form					
3	Non Patent Literature	Rethink_Meat_Video.pdf	175520 9558649917ef30f1ad4cf628d6eb05a123a45e8f	no	1
Warnings:					
Information:					
4	Foreign Reference	WO2007060288A1.pdf	1941880 260f816dbd32bd8c24ca5554c20170571c96d7c5	no	20
Warnings:					
Information:					
5	Fee Worksheet (SB06)	fee-info.pdf	30809 8d6a911111b71d02648ee2a3a46585f960c6ab4b	no	2
Warnings:					
Information:					
		Total Files Size (in bytes):	2315477		

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.

Electronic Patent Application Fee Transmittal

Application Number:	14796970
Filing Date:	10-Jul-2015
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Filer:	M. Angela Parsons/Nikki Krahler
Attorney Docket Number:	38767-0010001

OPAP AKIMA 9 FEB 11 2016 PATENT & TRADEMARK OFFICE

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:				
Miscellaneous-Filing:				
Petition:				
Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**



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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/796,970	07/10/2015	Marija Vrljic	38767-0010001	8501

26191 7590 02/25/2016
FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER	
GWARTNEY, ELIZABETH A	

ART UNIT	PAPER NUMBER
1791	

NOTIFICATION DATE	DELIVERY MODE
02/25/2016	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):

PATDOCTC@fr.com

Applicant-Initiated Interview Summary	**Application No.** 14/796,970	**Applicant(s)** VRLJIC ET AL.	
	Examiner ELIZABETH GWARTNEY	**Art Unit** 1791	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ELIZABETH GWARTNEY*.

(2) *Angela Parsons, Teresa Lavoie and Ian Lodovice*.

(3) *Patrick Brown, Myra Pasek, Alison Davis*.

(4) *Michele Jacobson, Erik Kashnikow, Assaf Zilbering*.

Date of Interview: *2/1/2016*.

Type: ☐ Telephonic ☐ Video Conference
☒ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☒ Yes ☐ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1*.

Identification of prior art discussed: *None*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

February 1, 2015, representatives from Impossible Foods and Attorneys/Agents for Applicants met in person at the USPTO with USPTO Examiners and SPEs to discuss US Application No. 14/796,970 and related cases. In the interview Mr. Patrick Brown discussed the background, mission and technology of Impossible Foods. Ms. Alison Davis demonstrated preparation of raw product of the invention and prepared samples for tasting. Angela Parsons and Ian Lodovice discussed the pending claims and how they differ from the prior art. While no agreements were made, the Examiner and SPE Michele Jacobson agreed to a follow-up telephone interview on February 8, 2016.

On February 8, 2015, Attorneys/Agents for Applicants, Angela Parsons and Ian Lodovice discussed possible claim amendments to distinguish the heme-containing proteins obtained from animal sources and the claimed heme-containing proteins obtained from plant sources. No agreement was reached .

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☒ Attachment

/ELIZABETH GWARTNEY/ Primary Examiner, Art Unit 1791	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Office Action Summary	Application No. 14/796,970	Applicant(s) VRLJIC ET AL.	
	Examiner ELIZABETH GWARTNEY	Art Unit 1791	AIA (First Inventor to File) 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 *12/17/2015*.

☐ 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) *1-5,7-9,11,12 and 31-46* 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) *1-5,7-9,11,12 and 31-46* 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. *2/1/2016* .

4) ☐ Other: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

2. The Amendment filed December 17, 2015 has been entered. Claims 6, 10, 13 and 14 have been cancelled, non-elected claims 15-30 have been cancelled and new claims 31-46 have been added.

3. The previous rejections under 35 U.S.C. 102 and 35 U.S.C. 103 have been withdrawn in light of Applicants' amendment and remarks filed December 17, 2015. However, upon further consideration, a new grounds of rejection is made as set forth below.

Election/Restrictions

4. Applicants' election without traverse of Invention I, claims 1-14 in the reply filed on December 17, 2015 is acknowledged.

Claim Rejections - 35 USC § 112

5. The following is a quotation of 35 U.S.C. 112(b):

> (b) CONCLUSION.—The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the inventor or a joint inventor regards as the invention.

The following is a quotation of 35 U.S.C. 112 (pre-AIA), second paragraph:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

6. **Claims 36 and 42 are rejected under 35 U.S.C. 112(b) or 35 U.S.C. 112 (pre-AIA), second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which the inventor or a joint inventor, or for pre-AIA the applicant regards as the invention.**

7. **Claims 36 and 42** recite the limitation "wherein the pea proteins" in line 1. There is insufficient antecedent basis for this limitation in the claim. Claim 36 depends from claim 33,

and claim 42 depends from claim 37, which only require that the one or more plant proteins be isolated.

Claim Rejections - 35 USC § 103

8. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

9. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

10. This application currently names joint inventors. In considering patentability of the claims under pre-AIA 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of pre-

AIA 35 U.S.C. 103(c) and potential pre-AIA 35 U.S.C. 102(e), (f) or (g) prior art under pre-AIA 35 U.S.C. 103(a).

11. **Claims 1-5, 7-9, 11, 12 and 31-35, 37-41 and 43-46 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Espeleta Vega et al. (US 2010/0074998).**

Regarding **claims 1-4, 7-9, 11, 31, 32, 44 and 45**, Espeleta Vega et al. disclose a method of preparing a meat substitute food product comprising the steps of: (a) hydrating at least one vegetable protein mixed with water and at least one colorant; (b) mixing at least one meat product (e.g. beef) with the hydrated vegetable protein (e.g. soy or pea); (c) mixing units of texturized material and flavoring units (e.g. beef flavor) to the mixture of meat product and hydrated vegetable protein to obtain a prepared food paste; (d) cooking the prepared paste; and (e) forming the cooked paste to give a presentation similar to a meat product (Abstract, [0015]-[0023], [0038], [0040]).

Further, Espeleta Vega et al. disclose wherein flavoring units are added in a dosed manner and can be units with a flavor of meat, i.e. beef ([0040])

Given Espeleta Vega et al. disclose a meat substitute food product comprising beef, intrinsically the product would include a heme-containing protein (e.g. a hemoglobin or a myoglobin). Moreover, given the composition would comprise myoglobin from beef, intrinsically the myoglobin would exhibit a VIS spectrum that would be identical to that of myoglobin from an animal and an amino acid sequence at least 70% homologous to that set forth in SEQ ID NO: 1.

Regarding the source and process of obtaining (i.e. isolated and purified) the heme-containing product, it is noted that these limitations do not differentiate the meat substitute food

product of Espeleta Vega et al. and the product resulting from the claimed method. Even though the heme-containing protein of Espeleta Vega et al. is obtained from a different source and method, i.e. animal, the burden shifts to applicant to come forward with evidence establish an unobvious difference between using the claimed heme-containing protein and one obtained from an animal source.

Regarding **claims 5 and 12**, Espeleta Vega et al. disclose all of the claim limitations as set forth above.

While Espeleta Vega et al. disclose a meat substitute food product comprising heme-containing protein from meat, i.e. an animal source, the reference is silent with respect to the amount.

Given Espeleta Vega et al. generally disclose the addition of at least one meat product to hydrated vegetable protein and in one example disclose a meat substitute food product comprising approximately 2.5% beef (*see* Example 1/[0075]-[0082]), it would have been obvious to one of ordinary skill in the art to have adjusted, in routine processing, the amount of beef (and resulting heme-containing protein) in the meat substitute food product of Espeleta Vega et al. to obtain the desired balance between texture and flavor.

Regarding **claims 33, 34, 38, 39, 40 and 46**, Espeleta Vega et al. disclose all of the claim limitations as set for above.

Given Espeleta Vega et al. disclose vegetable protein in the form of a concentrated protein, isolate, flour, pellets or combinations thereof, it is clear Espeleta Vega et al. disclose isolated and purified forms of vegetable protein. Moreover, given Espeleta Vega et al. disclose

vegetable proteins similar to those presently claimed, intrinsically the proteins would exhibit the claimed solubility properties.

Regarding **claims 35 and 41**, Espeleta Vega et al. disclose all of the claim limitations as set forth above. Given Espeleta Vega et al. disclose vegetable protein generally, it would have been obvious to one of ordinary skill in the art at the time of the invention to have used any vegetable protein including pea, lentil and other legume proteins, and arrive at the claimed invention.

Regarding **claims 37 and 43**, Espeleta Vega et al. disclose all of the claim limitations as set forth above. Further, Espeleta Vega et al. disclose a meat substitute food product comprising about 12% by weight vegetable protein (*see* Example 1-[0075]-[0082]).

12. Claims 1-5, 7-9, 11, 12, 31-35, 37-41 and 43-46 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hseih et al. (US 2012/0093994) in view of Proulx et al. ("Iron Bioavailability of Hemoglobin from Soy Root Nodules Using a Caco-2 Cell Culture Model" - J. Agric. Food Chem.“ 2006, p. 1518-1522).

Regarding **claims 1, 4, 7, 11, 37 and 43**, Hseih et al. disclose a process of for making a structured plant protein product (i.e. meat analog), the process comprising extruding a mixture under conditions of elevated temperature and pressure to form the structured plant protein product, wherein the structured plant protein product comprises protein fibers that are substantially aligned, and wherein the structured plant protein product has a moisture content that is at least about 50% by weight of the structured plant protein product, and wherein the mixture comprises: (a) dry ingredients that comprise: (i) a protein component that comprises a plant-

derived protein material, wherein the protein component is at an amount that is no more than about 90% by weight of the dry ingredients; (ii) a carbohydrate component at an amount that is in the range of about 2 to about 50% by weight of the dry ingredients; and (iii) a lipid component at an amount that is in the range of about 0.1 to about 5% by weight of the dry ingredients; and (b) wet ingredients that comprise water ([0013]).

Hseih et al. disclose wherein the structured plant protein product may comprises colorants wherein the concentration of colorants is adjusted to match the color of the animal meat to be simulated and a flavoring agent such as an animal meat flavor ([[0090]).

Hseih et al. is silent with respect to a heme-containing protein from a non-animal source.

Proulx et al. teach that iron deficiency is a major nutritional problem and fortification of foods with iron has been a successful strategy for improving iron content of foods (p. 1518/Introduction). Proulx et al. teach that iron bioavailability is higher from heme iron sources because of lack of inhibition from chelating compounds (p. 1518/Introduction). Proulx et al. teach that heme iron in the human diet is almost exclusively from animal sources and its intake has been shown to have a positive correlation with iron status (p. 1520/Results and Discussion). Proulx et al. teach that the incorporation of animal sourced heme iron is often unfeasible because of economic costs and because cultural and religious barrier forbid the consumption of meat (p. 1520-1521/Results and Discussion).

Proulx et al. teach that heme iron in the human diet is generally present in animal sources as part of hemoglobin and myoglobin but is also found in many invertebrates, bacteria, fungi and in the plant kingdom (p. 1518/Introduction). Proulx et al. teach leghemoglobin is a heme protein identified in soybean root nodules (p.1518/Introduction). Proulx et al. teach that the

bioavailability of hemoglobin from soy root nodules is similar to that of heme iron from animal sources (p. 1521/Results and Discussion). Proulx et al. teach using plant hemoglobin, i.e. leghemoglobin, as a heme iron source in diets that are consumed by humans (p. 1518/Introduction).

Given Proulx et al. teach that iron deficiency is a major nutritional problem and that fortification of foods with iron has been a successful strategy from improving iron content, since Proulx et al. teach that bioavailability is higher from heme iron sources including, leghemoglobin from soy root nodules, it would have been obvious to one of ordinary skill in the art to have fortified the structured plant protein product of Hseih et al. comprising no animal protein, with leghemoglobin from soy root nodules, to obtain a product with improved nutritional status, i.e. bioavailable source of iron.

Regarding **claims 2, 3, 8 and 9**, modified Hseih et al. disclose all of the claim limitations as set forth above. Given Proulx et al. teach a heme-containing protein (leghemoglobin) from soy root nodules, intrinsically the heme-containing protein would exhibit a VIS spectrum that would be identical to that of myoglobin from an animal and an amino acid sequence at least 70% homologous to that set forth in SEQ ID NO: 1.

Regarding **claims 5 and 12**, modified Hseih et al. disclose all of the claim limitations as set forth above. While Proulx et al. teach the use of leghemoglobin to fortify foods with iron, the reference is silent with respect to amount.

However, the skilled artisan would know how to adjust, in routine processing, the amount of leghemoglobin added to the structured plant protein product of Hseih et al. to obtain the desired iron fortification.

Regarding **claims 31, 32, 44 and 45**, modified Hseih et al. disclose all of the claim limitations as set forth above.

Proulx et al. teach leghemoglobin isolated and purified from soy root nodules (p. 1519/LHb Preparation).

Regarding **claims 33-35, 37, 39-41 and 46**, modified Hseih et al. disclose all of the claim limitations as set forth above.

Given Hseih et al. disclose soy protein in the form of soy protein isolate, soy protein concentrate, soy flour and mixtures thereof, it is clear Hseih et al. disclose isolated and purified forms of plant protein. Moreover, given Hseih et al. disclose plant proteins similar to those presently claimed, intrinsically the proteins would exhibit the claimed solubility properties.

Response to Arguments

13. Applicants' arguments with respect to claims 1-12, have been considered but are moot because the arguments do not apply to any of the references being used in the current rejection.

Conclusion

14. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELIZABETH GWARTNEY whose telephone number is (571)270-3874. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571) 272-1515. The fax phone 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.

/ELIZABETH GWARTNEY/
Primary Examiner, Art Unit 1791

Applicant-Initiated Interview Summary	**Application No.** 14/796,970	**Applicant(s)** VRLJIC ET AL.	
	Examiner ELIZABETH GWARTNEY	**Art Unit** 1791	

All participants (applicant, applicant's representative, PTO personnel):

(1) *ELIZABETH GWARTNEY*.

(2) *Angela Parsons, Teresa Lavoie and Ian Lodovice*.

(3) *Patrick Brown, Myra Pasek, Alison Davis*.

(4) *Michele Jacobson, Erik Kashnikow, Assaf Zilbering*.

Date of Interview: *2/1/2016*.

Type: ☐ Telephonic ☐ Video Conference
☒ Personal [copy given to: ☐ applicant ☐ applicant's representative]

Exhibit shown or demonstration conducted: ☒ Yes ☐ No.
If Yes, brief description: _____.

Issues Discussed ☐101 ☐112 ☐102 ☒103 ☐Others
(For each of the checked box(es) above, please describe below the issue and detailed description of the discussion)

Claim(s) discussed: *1*.

Identification of prior art discussed: *None*.

Substance of Interview
(For each issue discussed, provide a detailed description and indicate if agreement was reached. Some topics may include: identification or clarification of a reference or a portion thereof, claim interpretation, proposed amendments, arguments of any applied references etc...)

February 1, 2015, representatives from Impossible Foods and Attorneys/Agents for Applicants met in person at the USPTO with USPTO Examiners and SPEs to discuss US Application No. 14/796,970 and related cases. In the interview Mr. Patrick Brown discussed the background, mission and technology of Impossible Foods. Ms. Alison Davis demonstrated preparation of raw product of the invention and prepared samples for tasting. Angela Parsons and Ian Lodovice discussed the pending claims and how they differ from the prior art. While no agreements were made, the Examiner and SPE Michele Jacobson agreed to a follow-up telephone interview on February 8, 2016.

On February 8, 2015, Attorneys/Agents for Applicants, Angela Parsons and Ian Lodovice discussed possible claim amendments to distinguish the heme-containing proteins obtained from animal sources and the claimed heme-containing proteins obtained from plant sources. No agreement was reached .

Applicant recordation instructions: The formal written reply to the last Office action must include the substance of the interview. (See MPEP section 713.04). If a reply to the last Office action has already been filed, applicant is given a non-extendable period of the longer of one month or thirty days from this interview date, or the mailing date of this interview summary form, whichever is later, to file a statement of the substance of the interview

Examiner recordation instructions: Examiners must summarize the substance of any interview of record. A complete and proper recordation of the substance of an interview should include the items listed in MPEP 713.04 for complete and proper recordation including the identification of the general thrust of each argument or issue discussed, a general indication of any other pertinent matters discussed regarding patentability and the general results or outcome of the interview, to include an indication as to whether or not agreement was reached on the issues raised.

☒ Attachment

/ELIZABETH GWARTNEY/ Primary Examiner, Art Unit 1791	

Summary of Record of Interview Requirements

Manual of Patent Examining Procedure (MPEP), Section 713.04, Substance of Interview Must be Made of Record
A complete written statement as to the substance of any face-to-face, video conference, or telephone interview with regard to an application must be made of record in the application whether or not an agreement with the examiner was reached at the interview.

Title 37 Code of Federal Regulations (CFR) § 1.133 Interviews
Paragraph (b)

In every instance where reconsideration is requested in view of an interview with an examiner, a complete written statement of the reasons presented at the interview as warranting favorable action must be filed by the applicant. An interview does not remove the necessity for reply to Office action as specified in §§ 1.111, 1.135. (35 U.S.C. 132)

37 CFR §1.2 Business to be transacted in writing.
All business with the Patent or Trademark Office should be transacted in writing. The personal attendance of applicants or their attorneys or agents at the Patent and Trademark Office is unnecessary. The action of the Patent and Trademark Office will be based exclusively on the written record in the Office. No attention will be paid to any alleged oral promise, stipulation, or understanding in relation to which there is disagreement or doubt.

The action of the Patent and Trademark Office cannot be based exclusively on the written record in the Office if that record is itself incomplete through the failure to record the substance of interviews.

It is the responsibility of the applicant or the attorney or agent to make the substance of an interview of record in the application file, unless the examiner indicates he or she will do so. It is the examiner's responsibility to see that such a record is made and to correct material inaccuracies which bear directly on the question of patentability.

Examiners must complete an Interview Summary Form for each interview held where a matter of substance has been discussed during the interview by checking the appropriate boxes and filling in the blanks. Discussions regarding only procedural matters, directed solely to restriction requirements for which interview recordation is otherwise provided for in Section 812.01 of the Manual of Patent Examining Procedure, or pointing out typographical errors or unreadable script in Office actions or the like, are excluded from the interview recordation procedures below. Where the substance of an interview is completely recorded in an Examiners Amendment, no separate Interview Summary Record is required.

The Interview Summary Form shall be given an appropriate Paper No., placed in the right hand portion of the file, and listed on the "Contents" section of the file wrapper. In a personal interview, a duplicate of the Form is given to the applicant (or attorney or agent) at the conclusion of the interview. In the case of a telephone or video-conference interview, the copy is mailed to the applicant's correspondence address either with or prior to the next official communication. If additional correspondence from the examiner is not likely before an allowance or if other circumstances dictate, the Form should be mailed promptly after the interview rather than with the next official communication.

The Form provides for recordation of the following information:
- Application Number (Series Code and Serial Number)
- Name of applicant
- Name of examiner
- Date of interview
- Type of interview (telephonic, video-conference, or personal)
- Name of participant(s) (applicant, attorney or agent, examiner, other PTO personnel, etc.)
- An indication whether or not an exhibit was shown or a demonstration conducted
- An identification of the specific prior art discussed
- An indication whether an agreement was reached and if so, a description of the general nature of the agreement (may be by attachment of a copy of amendments or claims agreed as being allowable). Note: Agreement as to allowability is tentative and does not restrict further action by the examiner to the contrary.
- The signature of the examiner who conducted the interview (if Form is not an attachment to a signed Office action)

It is desirable that the examiner orally remind the applicant of his or her obligation to record the substance of the interview of each case. It should be noted, however, that the Interview Summary Form will not normally be considered a complete and proper recordation of the interview unless it includes, or is supplemented by the applicant or the examiner to include, all of the applicable items required below concerning the substance of the interview.

A complete and proper recordation of the substance of any interview should include at least the following applicable items:
1) A brief description of the nature of any exhibit shown or any demonstration conducted,
2) an identification of the claims discussed,
3) an identification of the specific prior art discussed,
4) an identification of the principal proposed amendments of a substantive nature discussed, unless these are already described on the Interview Summary Form completed by the Examiner,
5) a brief identification of the general thrust of the principal arguments presented to the examiner,
   (The identification of arguments need not be lengthy or elaborate. A verbatim or highly detailed description of the arguments is not required. The identification of the arguments is sufficient if the general nature or thrust of the principal arguments made to the examiner can be understood in the context of the application file. Of course, the applicant may desire to emphasize and fully describe those arguments which he or she feels were or might be persuasive to the examiner.)
6) a general indication of any other pertinent matters discussed, and
7) if appropriate, the general results or outcome of the interview unless already described in the Interview Summary Form completed by the examiner.

Examiners are expected to carefully review the applicant's record of the substance of an interview. If the record is not complete and accurate, the examiner will give the applicant an extendable one month time period to correct the record.

Examiner to Check for Accuracy

If the claims are allowable for other reasons of record, the examiner should send a letter setting forth the examiner's version of the statement attributed to him or her. If the record is complete and accurate, the examiner should place the indication, "Interview Record OK" on the paper recording the substance of the interview along with the date and the examiner's initials.

Receipt date: 12/17/2015

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0010001	14/796,970
		Applicant: Impossible Foods Inc.	
		Filing Date: July 10, 2015	Group Art Unit

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
/E.G./	1.	2006/0035006	2/16/2006	McMindes et al.			

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No
/E.G./	2.	CN1466903	1/14/2004	CHINA			English Abstract	
/E.G./	3.	CN1557188	12/29/2004	CHINA			English Abstract	

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document

Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	02/18/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Receipt date: 01/21/2016

Sheet 1 of 1

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary) (37 CFR §1.98(b))		38767-0010001	14/796,970
		Applicant: Impossible Foods Inc.	
		Filing Date: July 10, 2015	Group Art Unit

U.S. Patent Documents							
Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate

Foreign Patent Documents or Published Foreign Patent Applications								
Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
/E.G./	1.	Heller, "Barbecued Soybeans," Vegetarian Soybean Recipes, Mother Earth News, January/February 1985, http://motherearthnews.com/real-food/vegetarian-soybean-recipes-zmaz85asie.aspx

Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	02/18/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Receipt date: 02/11/2016

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0010001	14/796,970
		Applicant: Impossible Foods Inc.	
		Filing Date: July 10, 2015	Group Art Unit

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No
/E.G./	1.	WO 2007/060288	5/31/2007	WIPO				

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document
/E.G./	2.	"Rethink Meat," Presented at the 6th Annual Sustainable Innovation Forum at the 2015 United Nations Climate Change Conference (aka COP21), Paris, France, December 7-8, 2015, retrieved on 2/1/2016, https://amp.twimg.com/v/7c7f7084-b173-42cb-bc12-723f35994dff, 1 page (Video Submission)

Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	02/18/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Proposed Agenda for Feb 1, 2016 Demo at USPTO

1) Introductions
    a. Applicants = Impossible Foods (Patrick Brown, Myra Pasek, Alison Davis)
    b. Attorneys / Agents for Applicants = Teresa Lavoie, Ian Lodovice, Angela Parsons
    c. Examiners = Assaf Zilbering & Eric Kashnikow (SPE); Liz Gwartney & Michael Jacobson (SPE)

2) Introduction to Impossible Foods – Pat Brown

3) Demo and Tasting

4) Questions from Examiners

5) Pending claims (if time permits)
    a. Examiner Zilbering (14/152,499 (Meat 1), 14/752,540 (Meat 1 – CON), 13/941,211 (Meat 1 – CIP))
    b. Examiner Gwartney (14/796,970 (Meat 2) and 14/797,006 (Meat 3))

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14796970	VRLJIC ET AL.
	Examiner	**Art Unit**
	ELIZABETH GWARTNEY	1791

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/10/2015	02/21/2016							
	1	✓	✓							
	2	✓	✓							
	3	✓	✓							
	4	✓	✓							
	5	✓	✓							
	6	✓	-							
	7	✓	✓							
	8	✓	✓							
	9	✓	✓							
	10	✓	-							
	11	✓	✓							
	12	✓	✓							
	13	✓	-							
	14	✓	-							
	15	N	-							
	16	N	-							
	17	N	-							
	18	N	-							
	19	N	-							
	20	N	-							
	21	N	-							
	22	N	-							
	23	N	-							
	24	N	-							
	25	N	-							
	26	N	-							
	27	N	-							
	28	N	-							
	29	N	-							
	30	N	-							
	31		✓							
	32		✓							
	33		✓							
	34		✓							
	35		✓							
	36		✓							

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14796970	VRLJIC ET AL.
	Examiner	**Art Unit**
	ELIZABETH GWARTNEY	1791

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/10/2015	02/21/2016							
	37		✓							
	38		✓							
	39		✓							
	40		✓							
	41		✓							
	42		✓							
	43		✓							
	44		✓							
	45		✓							
	46		✓							

Receipt date: 09/21/2015

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
(37 CFR §1.98(b))		Filing Date July 10, 2015	Group Art Unit

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	1.	2001/0024677	9/27/2001	Bringe			
	2.	2001/0049132	12/6/2001	Kringelum et al.			
	3.	2003/0198700	10/23/2003	Gruber			
	4.	2003/0224476	12/4/2003	Chou			
	5.	2004/0151778	8/5/2004	Richard et al.			
	6.	2004/0161513	8/19/2004	Akashe et al.			
	7.	2005/0037111	2/17/2005	Berry			
	8.	2006/0035003	2/16/2006	McMindes et al.			
	9.	2006/0233721	10/19/2006	Tamarkin et al.			
	10.	2007/0269567	11/22/2007	McMindes et al.			
	11.	2007/0269571	11/22/2007	Akita et al.			
	12.	2007/0269583	11/22/2007	McMindes et al.			
	13.	2008/0226810	9/18/2008	Passe et al.			
	14.	2008/0254168	10/16/2008	Mueller et al.			
	15.	2008/0268112	10/30/2008	Rolan et al.			
	16.	2008/0292749	11/27/2008	Goodwins et al.			
	17.	2008/0299254	12/4/2008	Kim et al.			
	18.	2009/0264520	10/22/2009	Bhagat et al.			
	19.	2009/0274817	11/5/2009	Yamaguchi et al.			
	20.	2010/0074998	3/25/2010	Vega et al.			
	21.	2010/0136201	6/3/2010	Bigeard et al.			
	22.	2010/0233347	9/16/2010	Uhrhan			
	23.	2010/0249560	9/30/2010	Levinson et al.			
	24.	2010/0281765	11/11/2010	Schwartz			
	25.	2010/0311950	12/9/2010	Kugitani			
	26.	2011/0008502	1/13/2011	Hosomi et al.			
	27.	2011/0064862	3/17/2011	McCready et al			

Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	02/18/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.G./

Receipt date: 09/21/2015

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
(37 CFR §1.98(b))		Filing Date July 10, 2015	Group Art Unit

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	28.	2011/0065847	3/17/2011	Miwa et al.			
	29.	2011/0081386	4/7/2011	Guth et al.			
	30.	2011/0081435	4/7/2011	Guth et al.			
	31.	2011/0117180	5/19/2011	Yan et al.			
	32.	2011/0286992	11/24/2012	Gruber et al.			
	33.	2011/0288389	11/24/2011	Levinson et al.			
	34.	2012/0059150	3/8/2012	Moloney et al.			
	35.	2012/0093994	4/19/2012	Hsieh et al.			
	36.	2013/0004617	1/3/2013	Zhang et al.			
	37.	3,658,550	4/25/1972	Hawley			
	38.	3,693,533	9/26/1972	Liepa			
	39.	3,829,582	8/13/1974	Guadagni et al.			
	40.	3,870,801	3/11/1975	Tombs			
	41.	3,973,043	8/3/1976	Lynn			
	42.	3,966,985	6/29/1976	Jonas			
	43.	4,045,587	8/30/1977	Katz et al.			
	44.	4,094,997	6/13/1978	Aishima et al.			
	45.	4,218,487	8/19/1980	Jaeggi			
	46.	4,435,438	3/6/1984	Lehnhardt et al.			
	47.	4,604,290	8/5/1986	Lee et al.			
	48.	4,678,676	7/7/1987	Ishizuka et al.			
	49.	4,994,285	2/19/1991	Hisano et al.			
	50.	5,055,310	10/18/1991	Nonaka et al.			
	51.	5,264,239	11/23/1993	Cornet et al.			
	52.	5,443,852	8/22/1995	Shahidi et al.			
	53.	5,650,554	7/22/1997	Moloney et al.			
	54.	5,753,295	5/19/1998	Goldman			
	55.	5,807,601	9/15/1998	Carpenter et al			

Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	02/18/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.G./

Receipt date: 09/21/2015

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
(37 CFR §1.98(b))		Filing Date July 10, 2015	Group Art Unit

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	56.	5,856,452	1/5/1999	Moloney et al.			
	57.	5,922,392	7/13/1999	Kelly et al.			
	58.	6,093,424	7/25/2000	Han et al.			
	59.	6,146,645	11/14/2000	Deckers et al.			
	60.	6,183,762	2/6/2001	Deckers et al.			
	61.	6,210,742	4/3/2001	Deckers et al.			
	62.	6,228,418	5/8/2001	Gluck			
	63.	6,242,036	6/5/2001	Han et al.			
	64.	6,287,620	9/11/2001	Van Den Ouweland et al.			
	65.	6,372,234	4/16/2002	Deckers et al.			
	66.	6,372,961	4/16/2002	Tarczynski			
	67.	6,379,738	4/30/2002	Dingman et al.			
	68.	6,383,531	5/7/2002	Gottemoller			
	69.	6,399,135	6/4/2002	Gottemoller			
	70.	6,413,569	7/2/2002	Borders et al.			
	71.	6,416,797	7/9/2002	Han et al.			
	72.	6,420,148	7/16/2002	Yamaguchi			
	73.	6,495,184	12/17/2002	Zheng et al.			
	74.	6,495,187	12/17/2002	Borders et al.			
	75.	6,509,453	1/21/2003	Moloney			
	76.	6,582,710	6/24/2003	Deckers et al.			
	77.	6,596,287	7/22/2003	Deckers et al.			
	78.	6,599,513	7/29/2003	Deckers et al.			
	79.	6,692,788	2/17/2004	Mottram et al.			
	80.	6,761,914	7/13/2004	Deckers et al.			
	81.	6,908,634	6/21/2005	Hwang			
	82.	6,936,749	8/30/2005	Guy et al.			

Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	02/18/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

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Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0010001	14/796,970
		Applicant: Impossible Foods Inc.	
		Filing Date: July 10, 2015	Group Art Unit

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Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	02/18/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Receipt date: 09/21/2015

Substitute Disclosure Form U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)	Applicant Impossible Foods Inc.	
(37 CFR §1.98(b))	Filing Date July 10, 2015	Group Art Unit

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document
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Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	02/18/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

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ALL REFERENCES CONSIDERED EXCEPT WHERE LINED THROUGH. /E.G./

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S1	705	((heme ADJ protein) OR myoglobin OR hemoglobin) WITH meat	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 10:54
S2	128	((heme ADJ protein) OR myoglobin OR hemoglobin) WITH heterologous	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 10:54
S3	6	"8927490"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 12:05
S4	1131	A23L1/31427	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 12:18
S5	0	"14796970"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 12:25
S8	4	"20100074998"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/19 09:21
S9	12709	vegetable ADJ protein	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/19 12:50
S10	434	(vegetable ADJ protein) AND legume	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/19 12:50
S11	353	(meat) WITH (substitute OR replica) WITH (soy OR pea)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 09:49
S12	2032	(meat) WITH (substitute OR replica)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 09:50
S13	7	(meat ADJ replica)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 09:50
S14	806	(meat ADJ substitute)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 09:50

S15	34	(meat ADJ substitute) WITH (soy ADJ protein)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 10:25
S16	1079	Hseih	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 10:28
S17	4	"20120093994"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 11:16

2/ 21/ 2016 2:31:37 PM
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Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14796970	VRLJIC ET AL.
	Examiner	Art Unit
	ELIZABETH GWARTNEY	1791

CPC- SEARCHED		
Symbol	Date	Examiner
A23L1/31427	9/10/2015	EG

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
PALM inventor search completed	9/9/2015	EG
EAST text search - see search history	9/9/2015	EG
Google search / Google Scholar search - beef, chicken, pork and fish stew; heme-containing proteins from bacteria/ and in general.	9/10/2015	EG
EAST text search updated - see search history	2/21/2016	EG
Google search updated -	2/21/2016	EG

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

PTO/SB/30 (07-09)
Approved for use through 07/31/2012. OMB 0651-0031
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Request for Continued Examination (RCE) Transmittal

Address to:
Mail Stop RCE
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Application Number	14/796,970
Filing Date	July 10, 2015
First Named Inventor	Marija Vrljic
Art Unit	1791
Examiner Name	Elizabeth A. Gwartney
Attorney Docket Number	38767-0010001

This is a Request for Continued Examination (RCE) under 37 CFR 1 .114 of the above-identified application.
Request for Continued Examination (RCE) practice under 37 CFR 1.114 does not apply to any utility or plant application filed prior to June 8, 1995, or to any design application. See Instruction Sheet for RCEs (not to be submitted to the USPTO) on page 2.

1. Submission required under 37 CFR 1.114 Note: If the RCE is proper, any previously filed unentered amendments and amendments enclosed with the RCE will be entered in the order in which they were filed unless applicant instructs otherwise. If applicant does not wish to have any previously filed unentered amendment(s) entered, applicant must request non-entry of such amendment(s).

   a. ☐ Previously submitted. If a final Office action is outstanding, any amendments filed after the final Office action may be considered as a submission even if this box is not checked.

      i. ☐ Consider the arguments in the Appeal Brief or Reply Brief previously filed on _____

      ii. ☐ Other _____

   b. ☒ Enclosed

      i. ☒ Amendment/Reply

      ii. ☐ Affidavit(s)/ Declaration(s)

      iii. ☒ Information Disclosure Statement (IDS)

      iv. ☒ Other Track 1 Request

2. Miscellaneous

   Suspension of action on the above-identified application is requested under 37 CFR 1.103(c) for a

   a. ☐ period of _____ months. (Period of suspension shall not exceed 3 months; Fee under 37 CFR 1.17(i) required)

   b. ☐ Other _____

3. Fees The RCE fee under 37 CFR 1.17(e) is required by 37 CFR 1.114 when the RCE is filed.
   The Director is hereby authorized to charge the following fees any underpayment of fees or credit any overpayments to

   a. ☒ Deposit Account No. 06-1050 .

      i. ☒ RCE fee required under 37 CFR 1.17(e)

      ii ☐ Extension of time fee (37 CFR 1.136 and 1.17)

      iii ☒ Other any deficiencies

   b. ☐ Check in the amount of $ _____ enclosed

   c. ☐ Payment by credit card (Form PTO-2038 enclosed)

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.

SIGNATURE OF APPLICANT, ATTORNEY, OR AGENT REQUIRED

Signature	/M. Angela Parsons/	Date	/April 20, 2016/
Name (Print/Type)	M. Angela Parsons, Ph.D.	Registration No.	44,282

CERTIFICATE OF MAILING OR TRANSMISSION

I hereby certify that this correspondence is being deposited with the United States Postal Service with sufficient postage as first class mail in an envelope addressed to: Mail Stop RCE, Commissioner for Patents, P. O. Box 1450, Alexandria, VA 22313-1450 or facsimile transmitted to the U.S. Patent and Trademark Office on the date shown below.

Signature			
Name (Print/Type)		Date	

This collection of information is required by 37 CFR 1.114. 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: Mail Stop RCE, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450.**

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Doc Code: TRACK1.REQ
Document Description: TrackOne Request

PTO/AIA/424 (03-14)

CERTIFICATION AND REQUEST FOR PRIORITIZED EXAMINATION UNDER 37 CFR 1.102(e) (Page 1 of 1)

First Named Inventor:	Marija Vrljic	Non provisional Application Number (if known):	14/796,970
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES		

APPLICANT HEREBY CERTIFIES THE FOLLOWING AND REQUESTS PRIORITIZED EXAMINATION FOR THE ABOVE-IDENTIFIED APPLICATION.

1. The processing fee set forth in 37 CFR 1.17(i)(1), the prioritized examination fee set forth in 37 CFR 1.17(c), and if not already paid, the publication fee set forth in 37 CFR 1.18(d) have been filed with the request. The basic filing fee, search fee, and examination fee are filed with the request or have been already been paid. I understand that any required excess claims fees or application size fee must be paid for the application.

2. I understand that the application may not contain, or be amended to contain, more than four independent claims, more than thirty total claims, or any multiple dependent claims.

3. The applicable box is checked below:

I. ☐ Original Application (Track One) - Prioritized Examination under § 1.102(e)(1)

i. (a) The application is an original non provisional utility application filed under 35 U.S.C. 111(a). This certification and request is being filed with the utility application via EFS-Web.

---OR---

(b) The application is an original non provisional plant application filed under 35 U.S.C. 111(a). This certification and request is being filed with the plant application in paper.

ii. An executed inventor's oath or declaration under 37 CFR 1.63 or 37 CFR 1.64 for each inventor, **or** the application data sheet meeting the conditions specified in 37 CFR 1.53(f)(3)(i) is filed with the application.

II. ☒ Request for Continued Examination - Prioritized Examination under § 1.102(e)(2)

i. A request for continued examination has been filed with, or prior to, this form.
ii. If the application is a utility application, this certification and request is being filed via EFS-Web.
iii. The application is an original non provisional utility application filed under 35 U.S.C. 111(a), or is a national stage entry under 35 U.S.C. 371.
iv. This certification and request is being filed prior to the mailing of a first Office action responsive to the request for continued examination.
v. No prior request for continued examination has been granted prioritized examination status under 37 CFR 1.102(e)(2).

Signature /M. Angela Parsons/	Date /April 20, 2016/
Name (Print/Typed) M. Angela Parsons, Ph.D.	Practitioner Registration Number 44,282

Note: *This form must be signed in accordance with 37 CFR 1.33. See 37 CFR 1.4(d) for signature requirements and certifications. Submit multiple forms if more than one signature is required.**

☐ *Total of _____ forms are submitted.

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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.

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Attorney Docket No.: 38767-0010001 / Client Ref: M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	1791
Serial No.	:	14/796,970	Examiner	:	Elizabeth A. Gwartney
Filed	:	July 10, 2015	Conf. No.	:	8501

Title : METHODS AND COMPOSITIONS FOR CONSUMABLES

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

RESPONSE TO OFFICE ACTION MAILED FEBRUARY 25, 2016

In response to the Office Action mailed February 25, 2016, please consider the following reply.

Amendments to the Claims

Please amend claims 1, 5, 7, 12, 32, 34-38, 40-43, 45 and 46, and please add new claims 47-52 as follows. Please cancel claims 31 and 44 without prejudice to continued prosecution. The claims and their status are shown below.

1. (Currently Amended) A method for imparting a beef-like flavor to a consumable product, wherein the consumable product is a meat replica that contains no animal products and comprises one or more plant proteins, comprising obtaining an isolated heme-containing protein; and adding, to the consumable, 0.01%-5% (by weight of the consumable) of the isolated [[a]] heme-containing protein ~~from a non-animal source~~, wherein, after cooking, a beef-like flavor is imparted to the consumable.

2. (Original) The method of claim 1, wherein the heme-containing protein has an amino acid sequence with at least 70% homology to the amino acid sequence set forth in SEQ ID NO: 1.

3. (Original) The method of claim 1, wherein the heme-containing protein has a UV-VIS spectrum that is substantially similar to that of myoglobin from an animal.

4. (Original) The method of claim 1, wherein the heme-containing protein is selected from the group consisting of an androglobin, a cytoglobin, a globin E, a globin X, a globin Y, a hemoglobin, a leghemoglobin, a flavohemoglobin, Hell's gate globin I, a myoglobin, an erythrocruorin, a beta hemoglobin, an alpha hemoglobin, a protoglobin, a cyanoglobin, a cytoglobin, a histoglobin, a neuroglobins, a chlorocruorin, a truncated hemoglobin, a truncated 2/2 globin, a hemoglobin 3, a cytochrome, and a peroxidase.

5. (Currently Amended) The method of claim 1, comprising adding, to the consumable, ~~wherein the meat replica comprises about 0.01% to about 5%~~ 0.4%-1% (by weight of the consumable) of the isolated heme-containing protein ~~by weight~~.

6. (Canceled)

7. (Currently Amended) A method for making a meat replica composition having a beef flavor and aroma, wherein the meat replica composition contains no animal products and comprises one or more plant proteins, the method comprising obtaining an isolated heme-containing protein; and adding 0.01%-5% (by weight of the consumable) of the isolated [[a]] heme-containing protein ~~from a non-animal source~~ to the meat replica composition.

8. (Original) The method of claim 7, wherein the heme-containing protein has an amino acid sequence with at least 70% homology to the amino acid sequence set forth in SEQ ID NO: 1.

9. (Original) The method of claim 7, wherein the heme-containing protein has a UV-VIS spectrum that is substantially similar to that of myoglobin from an animal.

10. (Canceled)

11. (Original) The method of claim 7, wherein the heme-containing protein is selected from the group consisting of an androglobin, a cytoglobin, a globin E, a globin X, a globin Y, a hemoglobin, a leghemoglobin, a flavohemoglobin, Hell's gate globin I, a myoglobin, an erythrocruorin, a beta hemoglobin, an alpha hemoglobin, a protoglobin, a cyanoglobin, a cytoglobin, a histoglobin, a neuroglobins, a chlorocruorin, a truncated hemoglobin, a truncated 2/2 globin, a hemoglobin 3, a cytochrome, and a peroxidase.

12. (Currently Amended) The method of claim 7, comprising adding 0.4-1% ~~wherein about 0.01% to about 5%~~ (by weight of the composition) of the isolated heme-containing protein ~~is added~~ to the meat replica composition.

13-30. (Canceled)

31. (Canceled)

32. (Currently Amended) The method of claim 1, wherein the isolated heme-containing protein is ~~isolated and~~ purified.

33. (Previously Presented) The method of claim 1, wherein at least one of the one or more plant proteins is isolated.

34. (Currently Amended) The method of claim 1, wherein at least one of the one or more isolated plant proteins is ~~isolated and~~ purified.

35. (Currently Amended) The method of claim 1, wherein the one or more plant proteins are selected from the group consisting of rubisco, pea proteins, lentil proteins, and [[or]] other legume proteins.

36. (Currently Amended) The method of claim 35 [[33]], wherein the pea proteins comprise pea albumin proteins.

37. (Currently Amended) The method of claim 1, wherein the one or more plant proteins are present in the consumable product in an amount of between ~~about~~ 1% and ~~about~~ 30% (by weight of the consumable).

38. (Currently Amended) The method of claim 1, wherein the one or more plant proteins has a solubility in an aqueous solution of at least 25 g/L at a temperature of between ~~about~~ 2°C and ~~about~~ 32°C, wherein the aqueous solution has a pH between 3 and 8 and a sodium chloride content of 0 to 300 mM.

39. (Previously Presented) The method of claim 7, wherein at least one of the one or more plant proteins is isolated.

40. (Currently Amended) The method of claim 7, wherein at least one of the one or more isolated plant proteins is ~~isolated and~~ purified.

41. (Currently Amended) The method of claim 7, wherein the one or more plant proteins are selected from the group consisting of rubisco, pea proteins, lentil proteins, and [[or]] other legume proteins.

42. (Currently Amended) The method of claim 41 [[37]], wherein the pea proteins comprise pea albumin proteins.

43. (Currently Amended) The method of claim 7, wherein the one or more plant proteins are present in the meat replica composition in an amount of between ~~about~~ 1% and ~~about~~ 30% (by weight of the composition).

44. (Canceled)

45. (Currently Amended) The method of claim 7, wherein the isolated heme-containing protein is ~~isolated and~~ purified.

46. (Currently Amended) The method of claim 7, wherein the one or more plant proteins has a solubility in an aqueous solution of at least 25 g/L at a temperature of between ~~about~~ 2°C and ~~about~~ 32°C, wherein the aqueous solution has a pH between 3 and 8 and a sodium chloride content of 0 to 300 mM.

47. (New) A method for making a meat replica composition having a beef flavor and aroma, wherein the meat replica composition contains no animal products and comprises one or more plant proteins, the method comprising isolating a heme-containing protein; and adding

0.01%-5% (by weight of the composition) of the isolated heme-containing protein to the meat replica composition.

48. (New) The method of claim 47, wherein the heme-containing protein has an amino acid sequence with at least 70% homology to the amino acid sequence set forth in SEQ ID NO: 1.

49. (New) The method of claim 47, wherein the heme-containing protein has a UV-VIS spectrum that is substantially similar to that of myoglobin from an animal.

50. (New) The method of claim 47, wherein the heme-containing protein is selected from the group consisting of an androglobin, a cytoglobin, a globin E, a globin X, a globin Y, a hemoglobin, a leghemoglobin, a flavohemoglobin, Hell's gate globin I, a myoglobin, an erythrocruorin, a beta hemoglobin, an alpha hemoglobin, a protoglobin, a cyanoglobin, a cytoglobin, a histoglobin, a neuroglobins, a chlorocruorin, a truncated hemoglobin, a truncated 2/2 globin, a hemoglobin 3, a cytochrome, and a peroxidase.

51. (New) The method of claim 47, comprising adding 0.4%-1% (by weight of the composition) of the isolated heme-containing protein to the meat replica composition.

52. (New) The method of claim 47, wherein the one or more plant proteins are selected from the group consisting of rubisco, pea proteins, lentil proteins, and other legume proteins.

REMARKS

Applicants respectfully request entry of the amendments and remarks submitted herein. Claims 1, 5, 7, 12, 32, 34-38, 40-43, 45 and 46 have been amended herein, and new claims 47-52 have been added herein. Support for the amendments to independent claims 1 and 7 and for new claims 47-52 can be found, for example, in the originally filed claims and throughout the specification.

Claims 1-5, 7-9, 11, 12, 32-43 and 45-52 are currently pending. Reconsideration of the pending application is respectfully requested.

Claim Rejections - 35 U.S.C. § 112

Claims 36 and 42 are rejected under 35 U.S.C. § 112 (pre-AIA), second paragraph, as the Examiner asserted that those claims are indefinite. According to the Examiner, the reference to "the pea proteins" in claims 36 and 42 has insufficient antecedent basis.

Applicants have amended claims 36 and 42 to correct their dependency. Claim 36 has been amended to depend from claim 35, and claim 42 has been amended to depend from claim 41.

These amendments remedy the antecedent basis issues identified by the Examiner. As such, Applicants request that the rejection of claims 36 and 42 under 35 U.S.C. § 112 (pre-AIA), second paragraph, be withdrawn.

Claim Rejections - 35 U.S.C. § 103

Claims 1-5, 7-9, 11, 12 and 31-35, 37-41 and 43-46 are rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Espeleta Vega et al. (US 2010/0074998; hereafter "Vega"). According to the Examiner,

> Given Espeleta Vega et al. disclose a meat substitute food product comprising beef, intrinsically the product would include a heme-containing protein (e.g., hemoglobin or a myoglobin). Moreover, given the composition would comprise myoglobin from beef, intrinsically the myoglobin would exhibit a VIS spectrum that would be identical to that of myoglobin from an animal and an amino acid sequence at least 70% homologous to that set forth in SEQ ID NO:1.

OA at page 4. This rejection is respectfully traversed with respect to the pending claims.

As indicated herein, independent claims 1 and 7 have been amended herein to require that the meat replica contains no animal products and to require a step in which the heme-containing protein is isolated.

Vega does not disclose a consumable product or a meat replica that contains no animal products, and Vega does not contain disclosure that would prompt one of skill in the art to make a consumable product or a meat replica that contains no animal products. Vega also does not disclose isolating a heme-containing protein or obtaining an isolated heme-containing protein, and Vega does not contain disclosure that would prompt a skilled artisan to isolate a heme-containing protein or to obtain an isolated heme-containing protein.

In addition, and in order to clarify the record, Applicant notes that SEQ ID NO:1 in the present application, which corresponds to a non-symbiotic hemoglobin from Vigna radiata, does not intrinsically possess at least 70% sequence identity to myoglobin from beef, as the Examiner asserted. Using the BlastP algorithm, available on the ncbi.nlm.nih.gov Website, aligning SEQ ID NO:1 in the present application with NP_776306.1, which is a myoglobin sequence from Bos taurus, results in "no significant similarity." Therefore, Vega contains no disclosure that is relevant to the sequences recited in dependent claims 2 and 8.

As set forth herein, the methods recited in *at least* independent claims 1 and 7 and dependent claims 2 and 8 are not obvious over Vega. Therefore, Applicants request that the rejection of the pending claims under 35 U.S.C. § 103 be withdrawn.

Claims 1-5, 7-9, 11, 12, 31-35, 37-41 and 43-46 are rejected under pre-AIA 35 U.S.C. § 103(a) as being unpatentable over Hseih et al. (US 2012/0093994; hereafter "Hseih") in view of Proulx et al. (2006, "Iron Bioavailability of Hemoglobin from Soy Root Nodules Using a Caco-2 Cell Culture Model," J. Agric. Food Chem., 54:1518-22). According to the Examiner,

> Hseih et al. disclose wherein the structured plant protein product may comprises colorants wherein the concentration of colorants is adjusted to match the color of the animal meat to be simulated and a flavoring agent such as an animal meat flavor.
> Hseih et al. is silent with respect to a heme-containing protein from a non-animal source.

> [ ]
> Proulx et al. teach that heme iron in the human diet is generally present in animal sources as part of hemoglobin and myoglobin but is also found in many invertebrates, bacteria, fungi and in the plant kingdom. Proulx et al. teach leghemoglobin is a heme protein identified in soybean root nodules. Proulx et al. teach that the bioavailability of hemoglobin from soy root nodules is similar to that of heme iron from animal sources. Proulx et al. teach using plant hemoglobin, i.e. leghemoglobin, as a heme iron source in diets that are consumed by humans.
> Given Proulx et al. teach that iron deficiency is a major nutritional problem and that fortification of foods with iron has been a successful strategy from improving iron content, since Proulx et al. teach that bioavailability is higher from heme iron sources including, leghemoglobin from soy root nodules, it would have been obvious to one of ordinary skill in the art to have fortified the structured plant protein product of Hseih et al. comprising no animal protein, with leghemoglobin from soy root nodules, to obtain a product with improved nutritional status, i.e. bioavailable source of iron.

OA at pages 7-8 (citations omitted). Applicants respectfully traverse this rejection with respect to the pending claims.

As indicated herein, independent claims 1 and 7 have been amended herein to clarify the steps that are required to impart a beef-like flavor to a consumable product (independent claim 1) or that are required to make a meat replica composition having a beef flavor and aroma (independent claim 7). Both claims now require a step of obtaining an isolated heme-containing protein and adding 0.1%-5% by weight of the isolated heme-containing protein to the meat replica.

The Supreme Court, in *KSR Int'l Co. v. Teleflex Inc.* (127 S. Ct. 1727, 1741 (2007)), stated that

> a patent composed of several elements is not proved obvious merely by demonstrating that each of its elements was, independently, known in the prior art. Although common sense directs one to look with care at a patent application that claims as innovation the combination of two known devices according to their established functions, it can be important to identify a reason that would have prompted a person of ordinary skill in the relevant field to combine the elements in the way the claimed new invention does.

The Supreme Court went on to state that "rejections on obviousness grounds cannot be sustained by mere conclusory statements; instead, there must be some articulated reasoning with some rational underpinning to support the legal conclusion of obviousness." (*KSR* at 1741, quoting *In*

re Kahn, 441 F.3d 997, 988 (Fed. Cir. 2006)) and urged that "this analysis should be made explicit" (*KSR* at 1742).

Hseih discloses a meat analog that includes a structured plant protein having substantially aligned fibers produced under particular extrusion conditions (see, for example, paragraphs [0011] and [0033]). According to Hseih, the "meat analog compositions may optionally comprise animal meat" (see, for example, paragraphs [0033] and [0079] – [0081]), however, Hseih does not disclose how to impart a meat flavor in meat analogs that lack meat. In fact, Hseih directly correlates the degree of animal flavor in the meat analog with the amount of animal meat present. See, for example, paragraph [0084], which states that

> when a significantly vegetarian composition that has a relatively small degree of animal flavor is desired, the concentration of animal meat in a meat analog composition may be about 45%, about 40%, about 35%, about 30%, about 25%, about 20%, about 15%, about 10%, about 5%, about 2%, or 0% by weight. Alternatively, when a meat analog composition have a relatively high degree of animal meat flavor is desired, the concentration of animal meat may be about 50%, about 55%, about 60%, about 65%, about 70% or about 75%, by weight.

The Examiner acknowledged that Hseih et al. is silent with respect to a heme-containing protein from a non-animal source (OA at page 7). In fact, however, Hsieh is silent with respect to a heme-containing protein from *any* source. For example, Hseih discloses flavoring agents that can be included in a meat analog, but the list of flavoring agents does not include a heme-containing protein (see paragraph [0090]). Hseih also discloses coloring agents that can be included in a meat analog, but the list of coloring agents does not include a heme-containing protein (see paragraphs [0086] – [0087]). Hseih further discloses vitamins and minerals as well as "additional ingredients" that can be included in a meat analog, but neither of those lists include a heme-containing protein (see paragraphs [0059] – [0062] and [0092]).

The Examiner asserted that Proulx's disclosure regarding the importance of dietary iron and the associated iron bioavailability provides the motivation to modify Hsieh. Significantly, however, Hsieh is completely silent with respect to iron or iron bioavailability, despite discussing various nutritional aspects of meat and meat analogs. In addition, Proulx never discloses which foods or types of foods might benefit from iron fortification, and Proulx certainly never discusses fortifying any type of meat analog or meat substitute. "Defining the

problem in terms of its solution reveals improper hindsight in the selection of the prior art relevant to obviousness." Monarch Knitting Machinery Corp. v. Sulzer Morat GmbH, 139 F.3d 877, 881 (Fed.Cir.1998) (emphasis added).

The assertion that it would be obvious to modify the meat analog of Hsieh to include the leghemoglobin of Proulx amounts to an additional component in the meat analog of Hsieh and adds an extra step to the process of Hsieh. Contrary to the Examiner, however, Hsieh provides no reason to modify their formulation—as indicated herein, Hsieh discloses how to make a meat analog taste more or less like meat and also provides numerous flavor agents, coloring agents, and vitamins and minerals for a skilled artisan to choose from. It has been well established that an invention is not obvious merely because the prior art *could be* modified. See, *In re Gordon* (221 USPQ 1125, 1127 (Fed. Cir. 1984); emphasis added). Instead, the prior art, as a whole, must fairly suggest the desirability to make the [ ] invention. *Id.*

Furthermore, at the time the present application was filed, iron supplementation of protein-based non-meat alternatives (variously referred to as meat analogs, meat substitutes, and/or meat replicas) was not considered to be an art recognized problem. In fact, the art is replete with examples of commercially available protein-based non-meat alternatives that naturally contain an amount of iron that is essentially equivalent to ground beef (e.g., ~ 10-15 % Daily Value Iron) and, therefore, are not further supplemented with iron. See Table 1 for a representative list of commercially available products and their iron content in the absence of any supplementation. 80% lean ground beef, which has a Daily Value Iron of 15%, is provided as a reference.

Table 1.

Meat Replica / Meat Substitute Consumable Products (No Supplemental Iron)	% Daily Value* Iron
80% Lean Ground Beef	15%
Amy's California Veggie Burger	8%
Amy's All American Veggie Burger	10%
Beyond Chicken Grilled Strips	15%
BOCA Original Veggie Burgers	10%

BOCA Veggie Patties Original Chik'n	8%
Field Roast Wild Mushroom Deli Sliced	6%
Field Roast Grain Sausages	10%
Gardein Black Bean Burger	8%
Gardein Golden Fishless Filets	6%
Gardein Holiday Roast	8%
Gardein Savory Stuffed Turk'y	30%
Lightlife Smart Patties Original Burger with Quinoa	8%
Lightlife Smart Strips Chick'n	10%
Morning Star Farms Spicy Black Bean Burgers	10%
Quorn Meatless Grounds	4%
Quorn Turk'y Roast	1%
Sophie's Kitchen Vegan Crab Cakes	4%
Sophie's Kitchen Breaded Vegan Shrimp	4%
Sophie's Kitchen Breaded Vegan Scallops	4%
Sweet Earth Benevolent Bacon	2%
Wegmans Don't Have A Cow Meatless Beef Style Crumbles	15%
Wegmans Don't Have A Cow Meatless Beef Style Strips	10%
Wegmans Don't Be Chicken Meatless Breaded Chicken Style Nuggets	10%
Wegmans Don't Be Piggy Meatless Sausage Style Crumbles	8%
Wegmans Don't Be Piggy Meatless Sausage Style Breakfast Patties	6%

*% Daily Values are based on a 2,000 calorie diet

Further still, at the time the present application was filed, iron supplementation of protein-based non-meat alternatives was known and practiced in the art. Table 2 below provides a representative list of commercially available protein-based non-meat alternatives that are supplemented with iron; Table 2 also provides the form in which the iron is supplemented. Again, 80% lean ground beef having a Daily Value Iron of 15% is provided as a reference.

Table 2.

Meat Replica / Meat Substitute Consumable Products (w/ Supplemental Iron)	Form of Supplemented Iron	% Daily Value* Iron
80% Lean Ground Beef		15%
Beyond Beast Burger	Ferric phosphate	20%
Gardein Meatless Meatballs	Ferrous sulfate	not provided
Morning Star Farms Original Sausage Patties	Ferrous sulfate	10%
Morning Star Farms Veggie Breakfast Bacon Strips	Ferrous sulfate	2%
Yves Veggie Cuisine Deli Salami	Ferric orthophosphate iron oxide	20%
Yves Veggie Cuisine Meatless Ham	Ferric orthophosphate iron oxide	20%
Yves Veggie Cuisine Deli Turkey	ferric orthophosphate	20%

*% Daily Values are based on a 2,000 calorie diet

As shown in Table 2, when commercially available protein-based non-meat alternatives are supplemented with iron, the iron is provided as a salt. Thus, even if iron supplementation of protein-based non-meat alternatives was a problem at the time the present application was filed, which Applicants submit it was not, less complex and less expensive methods for supplementing such products with iron than the methods that are required by the pending claims (i.e., adding an isolated heme-containing protein) were widely known and used in the art. This is reinforced by the fact that the U.S. Food and Drug Administration's (FDAs) database of Everything Added to Food in the United States (EAFUS) contains only iron salts and does not contain any heme-containing molecules (based on a search of the EAFUS database at www.accessdata.fda.gov/scripts/fcn/fcnNavigation.cfm?rpt=eafusListing using "iron" or "heme).

As further evidence that iron supplementation of protein-based non-meat alternatives was not an art-recognized problem, Applicants refer the Examiner to Van den Briel et al. (EP 1759593; hereafter "Van den Briel"). Van den Briel describes a minced meat analog that includes fibers made with proteins and cross-linked polysaccharides; some of which are white-colored and others of which are coated with a fat that includes a red coloring substance (see, for example, paragraphs [0008], [0009], [0014] and [0019]). Van den Briel describes the desire for

the red coloring substance to "discolour when subjected to severe heating conditions, such as those employed in shallow frying, deep frying or roasting" (see paragraph [0021]) and, in the same paragraph, describes that a "particularly suitable red colouring substance that exhibits this kind of discolurisation behavior is betanin" in the form of beet extract (see paragraph [0021]).[1] Further, Van den Briel discloses that the "organoleptic quality of the minced meat analogue is exceptionally good" when the interstitial material contains a particular amount of fat, red coloring substances, water and a binding agent (see paragraph [0024]). Significantly, Van den Briel is completely silent with respect to iron or heme; Van den Briel does not disclose iron or heme as a red colouring substance and Van den Briel does not disclose iron or heme as part of the recipe of a minced meat analog having exceptionally good organoleptic properties.

Applicants also refer the Examiner to Asgar et al. (2010, Comprehensive Rev. Food Sci. Food Safety, 9:513-29; hereafter "Asgar"), which provides an extensive review of nonmeat protein sources that can be used in meat extenders and meat analogs. In the entire review, self-described as "comprehensive" (see the "Acknowledgments" section on page 525), Asgar never mentions including iron or a heme-containing protein in a meat analog. In fact, in Table 3, which provides "typical meat analog ingredients and their purpose," (page 522 of Asgar; originally from Egbert and Borders 2006), describes both flavors and coloring agents, and neither list includes iron or a heme-containing protein. Significantly, the need for iron supplementation is not mentioned, not even in the section entitled "Advantages and disadvantages of nonmeat protein" (see page 516[2]).

Interestingly, Asgar provides the following challenge to scientists:

> All the characteristic attributes found in a meat product – texture, flavor, color, and so on, must be added to the analog by the product developer. Acceptable texture and flavor often prove to be the biggest product development challenges.

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[1] Also, in the 2015 article discussed below entitled "The Problem with Fake Meat," the author describes Beyond Meat's attempt to impart color to their Beast Burger: "A young man at a walnut-Formica table uses an eyedropper to squeeze rust–colored liquid, colored with turmeric, onto a Beast patty to see if he can get the liquid to stay in the burger during cooking and create the look of myoglobin, a protein in muscle cells; the paper plates under the cooked patties stubbornly keep getting stained."

[2] Simply for purposes of complete transparency, Applicants note that Asgar does mention "iron-deficiency anemia" in the context of Celiac disease (see the left hand column on page 520), but there is still no suggestion in Asgar to supplement meat extenders or meat analogs with any form of iron. Rather, Asgar suggests nutrition therapy that involves eliminating wheat, rye and barley from the diet to reduce malabsorption problems (e.g., iron-deficiency anemia) associated with Celiac disease.

> It is up to the food scientist and the food industry in general to advance this technology even further toward improved taste and texture.

Third full paragraph in the "Meat analog" section on page 522 (citation omitted). Although Asgar is not used in an obviousness rejection of the pending claims, it is well established that an invitation to try is not one of the standards for obviousness. According to the Supreme Court in *KSR Int'l Co. v. Teleflex Inc.* (127 S. Ct. 1727, 1732 (2007)), "[w]hen there is a design need [ ] to solve a problem and there are a finite number of identified, predictable solutions, a person of ordinary skill in the art has good reason to pursue the known options within his or her technical grasp. If this leads to the anticipated success, it is likely the product not of innovation but of ordinary skill and common sense." The converse also is true. For example, "where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful," an invention may well be patentably non-obvious. *In re Kubin*, 561 F.3d 1351, 1359 (Fed. Cir. 2006), citing *In re O'Farrell* 853 F.2d 894, 903 (Fed. Cir. 1988).

In addition to there simply being no motivation to combine Hsieh and Proulx, the Examiner is respectfully reminded that the pending claims require that the addition of the isolated heme-containing protein to the one or more plant proteins impart a beef-like flavor (independent claim 1) or a beef flavor and aroma (independent claim 7) to a meat replica. As discussed herein, Hsieh teaches imparting a meat flavor to a meat analog using varying amounts of meat (see paragraph [0084]); since Hsieh makes no mention of a heme-containing protein, Hsieh contains no disclosure that would suggest to a skilled artisan that a heme-containing protein would impart a beef flavor or aroma. Proulx, while disclosing the use of leghemoglobin in tortilla chips, is silent regarding any flavor imparted by the leghemoglobin. Therefore, Proulx also contains no disclosure that would suggest to a skilled artisan that a heme-containing protein would impart a beef flavor or aroma. Prior to the present disclosure, the claimed beef flavor or aroma imparted by the heme-containing protein would not have been expected or predicted. In fact, Applicants' discovery that heme-containing proteins impart a beef taste and aroma to a consumable product was completely unexpected, and none of the references of record disclose how to impart a beef flavor and aroma in the *absence* of any animal products.

In closing, Applicants respectfully refer the Examiner to the attached, relatively recent article entitled "The Problem with Fake Meat," which critiques the flavors of several different currently-available meat substitutes or meat replicas. According to the article, "…veggie burgers [ ] all taste like overseasoned, underhydrated corrugated cardboard," and an emeritus professor of food chemistry who spent decades studying meat flavor states that meat "is the hardest problem for flavor-chemical companies to solve. Because of its complex structure, [ ] meat develops flavor at different rates as fat, muscle, and bone successively cook." In discussing how Beyond Meat approaches this flavor problem, the author indicates that the Beyond Meat test kitchen "has an open pantry of wire shelves filled with spices and peppers and starch powders only slightly more abstruse than what you'd find in a supermarket" and indicates that Beyond Meat achieves a flavor, which the author implies is comparable to his grandmother's re-boiled, overly salted chicken, by "tossing pieces of extruded soy protein into a flavored brine under a vacuum, so the liquid and flavor will penetrate better." Specifically with respect to one of Beyond Meat's products, the author writes:

> The Beast is more problematic. It has to be tarted up with a lot of seasoning—more onion and garlic, paprika, mesquite, sugar—to cover the taste of the nutrient powder it contains so that [the founder of Beyond Meat] can claim in TED-talk tones that it has more iron and protein than the same amount of ground beef, more omega-3s than the same amount of salmon. What the Beast doesn't have is enough hydration to keep you from needing a good bit of liquid to get it down. When I saw [the founder of Beyond Meat] eat one, he added the emollients of ketchup, sliced tomato, and iceberg lettuce.

This article highlights the difficulties encountered when trying to impart a beef-like flavor to a food product in the absence of meat, and indicates that, even in 2015, Beyond Meat was struggling with the flavor profiles of meat substitutes or meat replicas. This article demonstrates that, as of 2015, Beyond Meat was using nothing more in the way of flavors than what is disclosed in, for example, Asgar, and nothing more in the way of iron supplementation that what appears to be the industry standard (see, for example, Table 2 above). In addition, given the difficulties discussed in this article for imparting a beef-like flavor to non-meat products, and the less-than-glowing reviews of the Beyond Meat products by the author of this article, Applicants believe that the beef-like flavor and aroma imparted by the heme-containing protein as recited in the claimed methods meets a long-felt need in the art.

For at least the reasons set forth herein, the combination of Hsieh and Proulx fail to make obvious the pending claims. Accordingly, in view of the amendments and remarks herein, Applicants request that the rejection of the pending claims under 35 U.S.C. § 103 be withdrawn.

CONCLUSION

Applicants respectfully request that claims 1-5, 7-9, 11, 12, 32-43 and 45-52 be allowed. In the absence of a Notice of Allowance, Applicants respectfully request that an Advisory Action be issued, particularly since this Response to Final Office Action is being filed within the 2-month period for early reply. If a telephone call to the undersigned would expedite prosecution, the Examiner is encouraged to do so.

This Response to Office Action is being filed before the expiration of the three-month Shortened Statutory Period for reply. Therefore, no fees are believed due. If this is incorrect, please apply any charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Respectfully submitted,

/April 20, 2016/

Date:_____

/M. Angela Parsons/

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Electronic Patent Application Fee Transmittal

Application Number:	14796970
Filing Date:	10-Jul-2015
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Filer:	M. Angela Parsons/Judith Witzel
Attorney Docket Number:	38767-0010001

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
Request for Prioritized Examination	1817	1	4000	4000
Pages:				
Claims:				
Miscellaneous-Filing:				
PROCESSING FEE, EXCEPT PROV. APPLS.	1830	1	140	140
Petition:				
Patent-Appeals-and-Interference:				

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Post-Allowance-and-Post-Issuance:				
Extension-of-Time:				
Miscellaneous:				
Request for Continued Examination	1801	1	1200	1200
		Total in USD ($)		**5340**

Electronic Acknowledgement Receipt

EFS ID:	25546033
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Judith Witzel
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	20-APR-2016
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Payment was successfully received in RAM	$5340
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Deposit Account	061050
Authorized User	FISH & RICHARDSON P C
The Director of the USPTO is hereby authorized to charge indicated fees and credit any overpayment as follows:	

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Document Number	Document Description	File Name	File Size(Bytes)/ Message Digest	Multi Part /.zip	Pages (if appl.)
1	Request for Continued Examination (RCE)	RCE.pdf	141784 3b6ef8b453d8afaa7c92355497aeedb9946867f3	no	1
Warnings:					
This is not a USPTO supplied RCE SB30 form.					
Information:					
2	TrackOne Request	Track1Req.pdf	155332 49dceb81f89d27f253198e8a77bbeaaaa5db324c	no	2
Warnings:					
Information:					
3		RespFOA.pdf	142601 2f362178889b66e5c113c80c991929bfb8ae5707	yes	16

	Multipart Description/PDF files in .zip description		
	Document Description	**Start**	**End**
	Response After Final Action	1	1
	Claims	2	5
	Applicant Arguments/Remarks Made in an Amendment	6	16

Warnings:					
Information:					
4	Fee Worksheet (SB06)	fee-info.pdf	34299 d38724bb354395c4d453a7ef87b233e99521b323	no	2
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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.

Sheet 1 of 1

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
(37 CFR §1.98(b))		Filing Date July 10, 2015	Group Art Unit 1791

Foreign Patent Documents or Published Foreign Patent Applications								
Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No
	1.	EP0815736	1/7/1998	EPO				
	2.	EP1759593	3/7/2007	EPO				

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
	3.	Asgar et al., "Nonmeat Protein Alternatives as Meat Extenders and Meat Analogs," Comprehensive Reviews in Food Science and Food Safety, 2010, 9:513-529
	4.	Clare et al., "Effects of Transglutaminase Catalysis on the Functional and Immunoglobulin Binding Properties of Peanut Flour Dispersions Containing Casein," J. Agric. Food Chem., 2008, 56(22):10913-10921
	5.	Felt, "Raw Vegan Almond Ricotta Cheese," FeedYourSkull, March 12, 2012, https://feedyourskull.com/2012/03/12/raw-vegan-almond-ricotta-cheese/, 15 pages
	6.	Kummer, "The Problem with Fake Meat," MIT Technology Review, March 31, 2015, retrieved April 20, 2016, <https://www.technologyreview.com/s/536296/the-problem-with-fake-meat/>, 11 pages
	7.	Sterling, "Welcome to the Era of Plant -Based Meat," Food & Wine, April 13, 2016, Retrieved April 20, 2016, <http://www.foodandwine.com/blogs/welcome-era-plant-based-meat>, 3 pages

Examiner Signature	Date Considered
EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

Substitute Disclosure Form

(19) Europäisches Patentamt
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(54) Melt-controlled cheese

(57) A method of making melt-controlled cheese and a melt-controlled cheese are described. The method includes mixing a curd produced by adding acid to hot milk and a curd product by rennet coagulation. A cheese with taste and texture similar to natural cheese but with desirable melting properties is produced.

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Description

FIELD OF THE INVENTION

The present invention concerns novel processes for the production of cheeses with a range of controlled melting properties and novel melt-controlled cheese products.

BACKGROUND OF THE INVENTION

In some food manufacturing applications that involve cheese, the control of the melting properties of the cheese components of such food products is desirable. For example, the addition of cheese to a frozen meat product that is designed to be cooked or reheated may be problematic if the cheese melts and runs off the meat before the meat is fully cooked or reheated; deep-fried cheese snacks made from a conventional mozzarella or cheddar cheese can "blow-out" and leak cheese into the oil, causing restaurant operators to incur the time and expense of prematurely changing their cooking oils; melting cheese in a heated pocket sandwich, breaded appetizer or burrito can leak onto consumers' clothing and burn mouths and other skin surfaces, thereby exposing the serving establishments or manufacturers of such products to product liability claims. Or, it may simply be desirable to conserve the appearance and textural identity of cheese particles when the cheese is incorporated into canned soups, bakery products, pasta sauces, pizzas or other processed food products that are subjected to high preparation temperatures.

Food manufacturers also have a considerable interest in being able to develop food products that exhibit statements of content that are devoid of ingredients not normally associated with the food in question and which may have negative connotations for the consumers thereof. Examples of such may include food additives such as stabilizers, vegetable gums, whey proteins and other such food ingredients. There is, therefore, an advantage to be gained by offering food manufacturers the ability to design food products that have so-called "natural" designation and that are free of non-conventional components or ingredients that consumers normally would not associate with such a product. Consequently, many food manufacturers would prefer to utilize a cheese ingredient that minimizes the use of stabilizers, vegetable gums and other ingredients that would be perceived by consumers to be "additives" and not normally associated with the manufacture of that cheese.

There is considerable interest among food manufacturers, therefore, in being able to design cheeses that convey at least some of the sensory properties of those types of cheeses that consumers are already familiar with (such as Cheddar, Mozzarella, Monterey Jack or Blue Cheeses) but for which the melting properties have been customized to meet the specific processing and preparation requirements of the final food product. It is also desirous that such cheeses be perceived as "natural" by consumers by virtue of the absence of non-conventional cheese ingredients or additives in the cheese component of the product.

However, the melting of cheese is often difficult to restrict unless modifications are made in the manufacturing process to either (a) incorporate whey proteins into the cheese or (b) incorporate non-conventional cheese ingredients into the cheese. Methods of incorporating whey proteins result in undesirable alterations to the cheese manufacturing process, resulting in inconsistencies in the flavor and texture of the resultant cheese which negatively affect the consumer appeal of the cheese. The most traditional method of controlling the meltability of cheese is to incorporate gum, stabilizers, cheese whey or other additives into a processed cheese mix. U.S. Patent No. 4,885,183 (Strandholm) describes a method for controlling melting of process cheese by incorporating whey proteins in the process cheese mix and heating under specific conditions to denature the whey proteins.

For natural cheese, U.S. Patent No. 5,445,845 (Farkye et al.) and U.S. Patent Application Serial No. 08/514,559 (Farkye et al.) filed August 14, 1995 (the disclosures of which are hereby incorporated by reference) describe methods for producing an acid-set, non-melting cheese. However, having a melt-controlled cheese may be more desirable to consumers. Also desirable are melt-controlled cheeses having flavors and textures similar to high melting natural cheese for use in prepared food.

We have discovered a method of controlling the melt of a wide range of cheeses by integrating the curds of a direct-acidified cheese into the curds of a renneted cheese without the use of non-conventional additives and without the use of an additional heating or pasteurization step. The cheeses produced by this method can be designed to exhibit a wide range of controlled melting properties as well as the flavor and textural characteristics associated with conventional cheeses that are familiar to consumers.

Other objects and advantages of the present invention will become apparent as the description proceeds.

SUMMARY OF THE INVENTION

In accordance with the present invention, a method of making controlled-melt cheese is provided which comprises forming an acid curd by adding acid directly to hot milk, forming a rennet curd by adding starter culture and rennet to

milk and integrating said acid curd and said rennet curd. Also provided is a melt-controlled cheese product comprising a heat-stable cheese curd and a curd of the following cheese types: Cheddar, Mozzarella, Colby, Monterey Jack, Swiss (Emmental), Gouda, Edan, Feta, Gruyere, Blue, Queso Fresco, Queso Blanco and Ricotta.

In an illustrative embodiment, the melt-controlled cheese product has a moisture content of 38% to 55%, a fat content of 15% to 30%, a protein content of 18% to 30%, a salt content of 1.8% to 2.5%, and a melt value of 0 to 1.

A more detailed explanation of the invention is provided in the following description and claims.

DETAILED DESCRIPTION OF THE ILLUSTRATIVE EMBODIMENT

This detailed description describes the preferred method for controlling the degree of melting of natural cheese by integrating (i.e., mixing, blending, shearing, comminuting or kneading) in various proportions and pressing two curd types (Curd I and Curd II) from different vats to produce a cheese with substantially uniform texture and melting properties. Curd I is produced by acidification of heated milk. Curd II is produced by rennet coagulation of milk which has been inoculated with lactic acid bacteria or other desirable bacteria. The described method can be used to produce a cheese that exhibits sensory qualities like those of the rennet-coagulated cheese.

Curd I is produced by acidification of heated milk. This curd is made from raw or pasteurized non-homogenized, or pasteurized and homogenized milk, preferably pasteurized milk containing about 3.5% fat. Calcium chloride may be added to milk at the rate of 0.02% (wt/wt) before heating the milk. When solid calcium chloride is used, it is dissolved in a small volume of water before being added to the milk. Liquid calcium chloride may be used.

The milk is slowly heated indirectly (by steam injection) in a water-jacketed vat at the rate of about 1.3°C (2.3°F) per minute to from about 160°F (71.7°C) to about 200°F (93.3°C) and held there for about 5 seconds to about 2 hours. The preferred heating in this embodiment is 85°C (185°F) for 30 min. A solution of 0.5 to 10%, preferably 2%, food-grade organic acid, preferably acetic, citric, malic or lactic acid or natural sources thereof, such as fruit juices (malic and citric) and vinegar (acetic), or blends thereof, at a temperature of about 32.2°C (90°F) to 87.8°C (190°F), preferably 79°C (175°F), is slowly and uniformly added (with mild agitation) to reduce the pH of the milk to about 5.0 to 4.2, preferably 4.4. This results in the formation of a curd mass in whey. The volume of acid required to reach the desired pH depends on the type of acid and the initial pH of the milk.

The curd-whey mixture is held at 73-75°C (165-167°F) for about 10 minutes under quiescent conditions (with the vat covered) to allow the curd to form agglomerates and settle to the bottom of the vat. The whey is drained through a strainer while the hot water in the jacket of the vat is simultaneously drained. After most of the whey is removed, the curd is trenched to facilitate complete whey removal. The curd is cooled by circulating cold water through the jacket.

Curd II is produced from rennet-coagulated milk inoculated with lactic acid bacteria. Pasteurized milk is standardized to casein to fat ratio of 0.7 to 1.4, preferably 1.2, by the addition of skim milk or nonfat dry milk. The standardized milk is placed in a vat and heated to about 31.1°C (88°F) to 38.9°C (102°F), preferably 36.7°C (98°F). Dilute lactic acid, citric acid, acetic acid, malic acid or natural sources thereof, such as fruit juices (malic and citric) and vinegar (acetic), or blends thereof are added to reduce the pH of the milk to 6.5. The amount of acid added depends on the initial milk pH and total solids contents. The acid should be added carefully to prevent localized coagulation of the milk. Preferably, cold acid is added.

Lactic starter culture, which may consist of single strains or multiple strains or mixtures of *Lactococcus lactis* subspecies *cremoris, Lactococcus lactis* subspecies *lactis, Lactobaccillus helveticus, Lactobacillus bulgaricus* and *Streptococcus thennophilus,* is added to milk in the vat. The level of starter added is about 0.1 to 10% depending on the medium in which it was grown.

Then, rennet coagulant is stirred into the milk. The rennet coagulant may be a single or double strength rennet. The amount of rennet added is about 15 to 120 milliliters, preferably 90 milliliters per 454 kg (1000 pounds) of milk. The rennet-treated milk is left undisturbed for about 15 to 45 minutes, preferably 30 minutes until a firm cuttable coagulum is formed.

The coagulum is cut into 1/4-, 3/8-, 1/2-, 5/8- or 3/4-inch cubes which are then cooked in the whey to 37.8°C (100°F) to 45°C (113°F), preferably 38.9°C (102°F). The preferred rate of cooking is 0.5 to 1°F per minute. The curds are held in the whey at the cooking temperature for 5 to 50 min, preferably 30 min. Then, the whey is removed from the curd. The curd particles are preferably stirred continuously till the pH is about 5.8 to 5.0, preferably 5.4. Salt is added to the curds at the preferred rate of 2 to 2.5% wt/wt curd.

Different ratios, 5:95 to 95:5, of the Curd I and Curd II are integrated (mixed, blended, sheared, comminuted or kneaded) at temperatures of about 26°C (78°F) to 88°C (190°F), preferably 60°C (140°F) into a uniform mass. The integrating time is from 2 min to 30 minutes, preferably 5 minutes. The resultant curd mass is placed in hoops and pressed at 20 to 40 pounds per square inch for 30 minutes to 16 hours, preferably one hour.

Rather than salting the curds separately, it may be possible to salt the integrated curds. And, it may be possible to integrate the curds while one or more of the curds are still relatively amorphous.

The term "milk" as used herein describes the lacteal secretion obtained by the milking of one or more mammals

of similar species, such as cow, sheep, goat, camel, water buffalo. Also, "milk" as used in this description can include reconstituted milk powder or recombined milk, and milk having fat contents from about 0.01% to 10%, as well as concentrated milks.

The term "natural cheese' generally refers to cheese made from milk by adding a coagulating agent (such as rennet, acid or acidogen). It may or may not contain starter bacteria, adjunct bacteria or exogenous enzymes. Examples of natural cheeses include, but are not limited to, Cheddar, Mozzarella, Colby, Monterey Jack, Swiss (Emmental), Gouda, Edam, Feta, Gruyere, Blue, Queso Fresco, Queso Blanco, Ricotta, etc.

The term "process cheese" generally describes cheese products prepared by mixing and comminuting, with the aid of heat, one or more natural cheeses and emulsifiers to form a homogeneous mass. Optional ingredients allowed include cream, whey, buttermilk, etc. In the United States, Standards of Identity applied to process cheese products are established by the Food and Drug Administration. In foreign countries, different standards may exist and/or other ingredients not approved for use in the United States may be used.

The term "melt" describes the process whereby cheese softens, deforms or flows when heat is applied. The degree of melt varies for different natural cheeses. For example, Queso Blanco, Paneer, etc. have little or no melt whereas Cheddar, Mozzarella, Jack, etc. show high levels of melt when heated.

The "melt value" of cheese was determined using the test described by Kosikowski (1982) in his book "Cheese and Fermented Milk Foods" 2nd edition. The test essentially involves cutting a cylindrical section (diameter of about 1.5 inches, height of about 0.1875 inch and weighing about 5.4 grams) of unmelted cheese. The cheese was placed in a covered glass Petri dish and heated in an conventional oven at 232.2°C (450°F) for 5 minutes or in a microwave oven at maximum power for 10 seconds. The difference in diameter of the melted and unmelted cheese was taken as melt value. A melt value of zero indicates no melt.

The term "melt-controlled cheese" is used herein to describe a cheese in which the melt has been controlled by integrating curds of cheese with different melt properties and which has a melt value which is different than a natural cheese with similar or like flavor and/or texture.

EXAMPLE 1

Preparation of California no-melt cooking cheese (Curd I).

One hundred gallons (390.4 kilograms, kg) of milk (containing 3.6% fat, 3.2% protein, pH 6.7), was weighed into a stainless steel, water-jacketed vat. Calcium chloride (101.6 grams, g) was dissolved in about 500 milliliters (mL) water and stirred into the milk. The jacket was filled with cold water to approximately the same level as the milk in the vat. Steam was slowly injected into the jacket to raise the temperature of the milk to 85°C over one hour.

The milk was held at 85°C for 30 minutes. Then, about 70 liters (about 18.5 gallons) of a 2% solution of citric/lactic/acetic acid blends (in the ratio of 30:40:30) were slowly added to the hot milk with mild agitation. The pH of the curd-whey mixture in the vat was 4.4. Visible coagulation of the milk occurred at pH of about 4.9. The process of acid addition was completed within 10 minutes. The temperature of the curd-whey mixture in the vat at this stage was about 73-75°C (165-167°F) where it was held for about 10 minutes under quiescent conditions, with the vat covered. Then, the vat was uncovered and a strainer was placed into the drain opening, and the valve was opened to drain whey. Simultaneously, the hot water in the jacket was drained. After draining of most of the whey, the curd was trenched for complete whey removal. Cold city water was circulated through the jacket to cool the curd. Salt (1189 grams) was then mixed into the curd in approximately three equal applications at time intervals of about 3-4 minutes between applications. At the initial application of salt, the curd ceased to expel whey.

Preparation of rennet curd (Curd II) - Mozzarella-like flavor.

Fifty gallons (195.22 kg) of milk were placed in a water-jacketed vat. The milk was warmed to 36.7°C. Approximately 500 milliliters of cold 2% lactic acid was added to the milk to reduce its pH to 6.5. Commercial strains of *Lactobacillus bulgaricus* and *Streptococcus thennophilus* cultures (obtained from Chr. Hansen's Laboratories, Milwaukee, Wisconsin) were cultured separately in autoclaved 12% reconstituted skim milk powder. One liter of each culture was added to the milk.

Then, 38.7 millilters of single strength veal rennet (obtained from Sanofi Bio-Industries, Waukesha, Wisconsin) were diluted in one liter of cold de-ionized water and stirred into the milk. The rennet-treated milk was left undisturbed to coagulate. The coagulum was cut with a 3/8-inch curd knife. The curd particles were left undisturbed in the whey for 5 min. Simultaneously, the curds were stirred gently and steam was let in the jacket of the vat. Heating was continued slowly, while stirring the contents of the vat until the temperature reached 38.9°C (102°F) in preferably, 30 minutes. The temperature was maintained at 38.9°C (102°F) for 30 min. while stirring the curds in the whey. Then, the whey was removed from the curd. At this point, the curd particles may begin to mat together. Preferably, the curd particles

are not allowed to mat by continuous stirring until the curd pH reached 5.5. Salt (488 grams) was added in three increments.

Various ratios of salted Curd I and II were mixed. For example, 95% Curd I and 5% Curd II (38 pounds (17.25 kg) Curd 1 and 2 pounds (0.91 kg) Curd II), were placed in a jacketed cheese cooker with two rotating screws. Steam was let into the jacket of the cooker and the curd mixture was heated to 60°C (140°F) within 5 minutes with shearing. The composition of the cheeses containing Curd I to Curd II ratios of 5:95, 50:50 and 95:5 are in Table 1. The melt values of various ratios of Curd I and Curd II and of a commercial Mozzarella are given in Table 2.

Table 1:

The composition of the finished cheese resulting from 5:95, 50:50 and 95:5 ratios of Curd I and Curd II of Exemple I.						
Curd Combination			Cheese Composition			
Curd I	Curd II	Moisture	Fat	Protein	Salt	pH
		%	%	%	%	
5	95	43.06	19.5	27.8	2.1	5.5
50	50	47.48	19.3	23.3	2.3	5.5
95	5	48.83	21.5	19.9	2.2	5.6

Table 2:

The melt values of the cheese resulting from various ratios of Curd I and Curd II of Example I and commercial Mozzarella.			
Curd Combination		Melt value (inches) in oven	
Curd I	Curd II	Conventional	Microwave
0	100	0.9	1.12
5	95	0.88	1
50	50	0.25	0.75
60	40	0.13	0.25
95	5	less than 0.05	less than 0.05
100	0	0	0
Commercial Mozzarella		0.95	1.19

EXAMPLE II

Preparation of California no-melt cooking cheese (Curd I) was similar the description given in Example I.

Preparation of rennet curd (Curd II) - Cheddar-like flavor.

Fifty gallons (195.22 kg) of milk were placed in a water-jacketed vat. The milk was warmed to 32.2°C. Two liters of commercial *Lactococcus lactis* subspecies *cremoris* cultures (obtaining from Chr. Hansen's Laboratories, Milwaukee, Wisconsin), grown in autoclaved 12% reconstituted skim milk powder, were added. The milk was allowed to ripen until the pH reached 6.5. This usually took about 30 to 45 minutes. Then, 38.7 milliliters of single strength veal rennet (obtained from Sanofi Bio-Industries, Waukesha, Wisconsin) were diluted in one liter of cold de-ionized water and stirred into the milk. The rennet-treated milk was left undisturbed to coagulate. The coagulum was cut with a 3/8-inch curd knife. The curd particles were left undisturbed in the whey for 5 minutes. Then, simultaneously, the curds were stirred gently and steam was let in the jacket of the vat. Heating was continued slowly, while stirring the contents of the vat until the temperature reached 38.9°C (102°F) in preferably, 30 min. While stirring, the curds in the whey, the temperature was maintained at 38.9°C (102°F) for 30 min. Whey was removed from the curd. At this point, the curd particles began to mat together. Matting was prevented by stirring the curd particles until their pH reached 5.5. Salt (488 grams) was added in three increments.

Various ratios of salted Curd I and II were mixed. For example, 95% Curd I and 5% Curd II (38 lb (17.25 kg) Curd I and 2 lb (0.91 kg) Curd II) were placed in a jacketed cheese cooker with two rotating screws. Steam was let into the jacket of the cooker and the curd mixture was heated to 48.9°C (120°F) within 5 min with shearing. The composition of the cheeses containing Curd I to Curd II ratios of 5:95, 50:50, 95:5 are given in Table 3. The melt values of various

ratios of Curd I and Curd II and a commercial Cheddar are given in Table 4.

Table 3:

The composition of the finished cheese resulting from 5:95, 50;50 and 95:5 ratios of Curd I and Curd II of Example II.						
Curd Combination			Cheese Composition			
Curd I	Curd II	Moisture	Fat	Protein	Salt	pH
		%	%	%	%	
5	95	39.56	25.8	26.0	1.9	5.4
50	50	45.42	26.0	19.9	2.1	5.5
95	5	49.56	22.5	19.3	2.2	5.5

Table 4:

The melt values of the cheese resulting from various ratios of Curd I and Curd II of Example II and commercial Cheddar.			
Curd Combination		Melt value (inches) in oven	
Curd I	Curd II	Conventional	Microwave
0	100	1.0	1.30
5	95	1.0	1.25
50	50	0.13	0.50
95	5	less 0.1	less than 0.25
100	0	0	0
Commercial Cheddar		1.0	1.25

It will be appreciated from the detailed description of the illustrative embodiment and the examples provided herein that the melt and melt value of a cheese product can be selected by varying the ratio of acid curd to rennet curd. Moreover, it is possible to provide a uniform texture and control the melt properties without the addition of stabilizers, vegetable gums or other additives and without lengthy or costly additional process steps.

Although illustrative embodiments of the invention have been described, however, it is to be understood that various modifications and substitutions may be made by those skilled in the art without departing from the novel spirit and scope of the present invention.

Claims

1. A method of making melt-controlled cheese comprising forming an acid curd through a process comprising adding acid directly to hot milk; forming a rennet curd through a process comprising adding starter culture and rennet to milk; and integrating said acid curd and said rennet curd.

2. The method of claim 1 wherein the method of integrating further comprises combining said acid curd and said rennet curd at a temperature of between about 26°C and about 80°C.

3. The method of claim 1 wherein the method of forming said acid curd further comprises:

   adding calcium chloride to milk;
   heating said milk slowly to between about 71°C and about 93°C;
   holding said milk at a temperature of between about 71°C and about 93°C for about 5 minutes to about 1 hour;
   adding hot, food-grade organic acid to reduce the pH of said milk to between about 5.0 to about 4.2 to form a curd; and
   removing the whey.

4. The method of claim 3 wherein said acid is selected from the group consisting of acetic acid, lactic acid, citric acid, malic acid and blends thereof.

5. The method of claim 3 wherein said acid comprises a 0.5% to 10% solution of a food-grade organic acid.

6. The method of claim 1 wherein the method of forming said rennet curd further comprises:

heating milk to between about 31°C and about 39°C;
acidifying said milk to about pH 6.5;
adding starter culture to said milk;
adding a rennet coagulant to said milk to form a curd;
cutting the curd;
cooking the curd; and
removing the whey.

7. The method of claim 6 wherein said starter culture is selected from the group consisting of *Streptococcus thennophilus, Lactobacillus bulgaricus, Lactobacillus helveticus, Lactococcus lactis* subspecies *cremoris, Lactococcus lactis* subspecies *lactis* and mixtures thereof.

8. The method of claim 6 wherein said starter culture comprises one or more lactic acid producing bacteria.

9. The method of claim 6 wherein said rennet coagulant is selected from the group consisting of single and double strength rennet and is added at a rate of 15 to 120 milliliters per 1000 pounds of milk.

10. A method of making melt-controlled cheese comprising integrating the curd of an acid-set, non-melting cheese and the curd of a rennet-coagulated cheese to provide a cheese with a substantially uniform texture and melt value.

11. A method of selecting the melt of a cheese product by integrating a preselected ratio of an acid-set, non-melting cheese curd and a rennet-coagulated cheese curd.

12. A product of the process of claim 1.

13. A melt-controlled cheese product comprising an acid-set, non-melting cheese curd and a cheese curd selected from the group consisting of Cheddar, Mozzarella, Colby, Monterey Jack, Swiss (Emmental), Gouda, Edam, Feta, Gruyere, Blue, Queso Fresco, Queso Blanco and Ricotta.

14. The melt-controlled cheese product of claim 13 having from about 38% to about 55% moisture.

15. The melt-controlled cheese product of claim 13 having from about 15% to about 30% fat.

16. The melt-controlled cheese product of claim 13 having from about 1.5% to about 2.5% salt.

17. The melt-controlled cheese product of claim 13 having from about 10% to about 30% protein.

18. The melt-controlled cheese product of claim 13 having a melt value of 0 to 1.

19. A melt-controlled cheese product comprising an acid-set, non-melting cheese curd and a rennet-coagulated cheese curd comprising 38% to 55% moisture, 15% to 30% fat, 18% to 30% protein and 1.8% to 2.5% salt and a melt value of 0 to 1.

European Patent Office

EUROPEAN SEARCH REPORT

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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
THE HAGUE	20 October 1997	Desmedt, G

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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T : theory or principle underlying the invention
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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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EUROPEAN SEARCH REPORT

Application Number
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DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.6)
A	US 4 680 181 A (M. LAEVITT)		

TECHNICAL FIELDS SEARCHED (Int.Cl.6)

The present search report has been drawn up for all claims

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THE HAGUE	20 October 1997	Desmedt, G

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D : document cited in the application
L : document cited for other reasons

& : member of the same patent family, corresponding document

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(54) Minced meat analogue and method of preparing such product

(57) One aspect of the invention relates to a minced meat analogue that is composed of composite strands that contain a plurality of proteinaceous fibres and an interstitial material, said minced meat analogue containing:
- 10-25 wt.% of protein;
- 0.5-10 wt.% of a cross-linked polysaccharide selected from alginate, pectin and combinations thereof;
- 1.5-10 wt.% of fat;
- 0.0001-5 wt.% of red colouring substances; and
- 40-90 wt.% water;

wherein protein, cross-linked polysaccharide and water together constitute at least 80 wt.% of the fibres; and wherein at least 10% of the fat and most of the red colouring substances is contained in the interstitial material. Another aspect of the invention relates to a method of preparing a minced meat analogue.

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Description

TECHNICAL FIELD OF THE INVENTION

[0001] The present invention relates to a minced meat analogue and to a method of preparing such a minced meat analogue. The minced meat analogue according to the present invention has the appearance of freshly ground minced meat and can suitably be stored in a refrigerator for three weeks or more.

BACKGROUND OF THE INVENTION

[0002] Protein is a major source of nutrition, the consumption of which is an important part of well-balanced diets. Although meat is a major source of protein, the presence of certain components in the meat (e.g. cholesterol and saturated fat) may present a health risk. Furthermore, certain individuals, regardless of the nutritional advantages to be gained from meat consumption, choose not to consume meat due to certain religious and/or personal beliefs. Thus, the development of alternative non-meat sources of protein has been and remains an important goal within the food industry.

[0003] Over the years, considerable effort has been spent in an effort to develop coarse, ground meat analogue products that have a meat-like flavour and texture, but which do not contain any meat.

[0004] US 2005/0003071 describes a process for making a vegetable base meat analogue, which may be used in a variety of vegetarian food products, such as burger patties and sausages. The US patent application teaches a process comprising the steps of:

- adding methylcellulose into a water/ice mix, followed by blending to form a cream;
- blending in a modified gluten;
- blending in oil to make an emulsion base;
- blending in a modified starch and flavouring ingredients to form a flavoured emulsion base;
- cooking the flavoured emulsion base to make a vegetable base meat analogue;
- cooling the vegetable base meat analogue; and
- grinding the vegetable base meat analogue into vegetable base meat analogue pieces. The US patent application further teaches that food colouring may be blended into the emulsion base together with the flavouring ingredients.

[0005] US 2002/0142086 describes a cooked sausage analogue product, comprising:

- a continuous phase binder composition containing powdered vegetable protein, a binder and water;
- a structured filamentous protein component dispersed within said continuous phase binder composition and included within a binder matrix formed from the binder composition; and
- proteinaceous components dispersed discontinuously within said matrix.

The continuous phase binder composition makes up at least 30 wt.% of the formulation of the sausage analogue product. The cooked sausage analogue product is manufactured by first preparing a batter containing a blend of proteins, vegetable oil, water, seasoning and colouring agent; followed by blending in (i) ground, hydrated filamentous dry protein, (ii) textured protein ground meat analogue, and (iii) thermally structured carbohydrate gel; and finally by stuffing the batter into casings and heating for 15 minutes at 85 °C to coagulate the continuous proteinaceous gel phase.

[0006] WO 03/061400 describes a method for the preparation of a meat substitute product, wherein:

1. a protein material, a hydrocolloid which precipitates with metal cations and water are added to one another,
2. the composition from step 1) is formed into a homogenous mixture,
3. the mixture from 2) is mixed with a solution of a metal cation with a valency of at least 2, in order to form a fibrous product,
4. the fibrous product is isolated, characterised in that
5. the protein material comprises a milk protein material, and
6. the mixture of milk protein material, hydrocolloid which precipitates with metal cations and water is formed in the presence of an amount of a phosphate material.

It is observed in the international patent application that finishing materials such as flavouring, colouring, vegetable or animal fat, vegetable or animal proteins, may be added. Furthermore, it is mentioned that these finishing materials are preferably added to the homogeneous mixture of protein, hydrocolloid and water, but that it is also possible to add and mix these finishing materials after the fibrous product has been formed. It is furthermore stated in the application that the product obtained by the method can be converted into snacks, sausages or a sweet dessert-type product.

[0007] The aforementioned prior art publications fail to provide a method that enables the preparation of a meat analogue that exhibits the typical structure, texture and appearance of freshly minced meat. The meat analogue products described in these publications have in common that their appearance does not resemble that of products made of freshly prepared (minced) meat. Instead, the appearance of these prior art products is similar to that of cooked or otherwise heat-processed meat products.

SUMMARY OF THE INVENTION

[0008] The inventors have developed a method to prepare a minced meat analogue that is very similar in structure, texture and appearance to freshly prepared minced meat. The minced meat analogue according to the present invention is composed of composite strands that contain a plurality of proteinaceous fibres and an interstitial material, said minced meat analogue containing protein, a cross-linked polysaccharide, fat, red colouring substances and water. The fibres are largely made up from protein, cross-linked polysaccharide and water, whereas the interstitial material contains a certain amount of fat and most of the red colouring substances. The composite strands within the minced meat analogue comprise proteinaceous fibres that are whitish in colour, whereas the interstitial material is at least partly reddish in colour, due to the presence of the red colouring substances. Thus, these strands look very similar to those found in minced meat: the fibres contained in the strands of the present analogue resemble collagenous material and the interstitial material mimics red tissue.

[0009] The minced meat analogue of the present invention can suitably be prepared by a process comprising the following steps:

- preparing a homogeneous mixture containing protein, a water-soluble polysaccharide that precipitates with multivalent metal cations and water;
- combining the homogeneous mixture with an aqueous solution of multivalent metal cations to produce proteinaceous fibres;
- isolating said proteinaceous fibres;
- mixing said proteinaceous fibres with covering materials to form a composite, said covering materials containing fat and red colouring substances; and
- mincing said composite to produce a minced meat analogue.

BRIEF DESCRIPTION OF THE FIGURES

[0010]

Figure 1 is a picture of a minced meat analogue according to the present invention.
Figure 2 is a drawing depicting a detail of the picture shown in figure 1.

DETAILED DESCRIPTION OF THE INVENTION

[0011] Accordingly, one aspect of the invention relates to a minced meat analogue that is composed of composite strands that contain a plurality of proteinaceous fibres and an interstitial material, said minced meat analogue containing:

- 10-25 wt.% of protein;
- 0.5-10 wt.% of a cross-linked polysaccharide selected from alginate, pectin and combinations thereof;
- 1.5-10 wt.% of fat;
- 0.0001-5 wt.% of red colouring substances; and
- 40-90 wt.% water;

wherein protein, cross-linked polysaccharide and water together constitute at least 80 wt.% of the fibres; and wherein at least 10% of the fat and most of the red colouring substances is contained in the interstitial material. According to a preferred embodiment, at least 30%, more preferably at least 50% of all the fat present in the minced meat analogue is contained in the interstitial material.

[0012] Figure 1 is a picture of minced meat analogue according to the present invention. The picture shows that the minced meat analogue is composed of a number of composite strands. Furthermore, figure 2 demonstrates that the appearance of the minced meat analogue of the present invention closely resembles that of ordinary minced meat.

[0013] Figure 2 depicts a detailed image of a couple of the strands 1 shown in figure 1. These strands 1 are composed of a plurality of proteinaceous fibres 2 and an interstitial material 3. The proteinaceous fibres 2 have a pale creamy colour whereas the interstitial material 3 has a red colour.

[0014] The term "red colouring substance" as used herein refers to substances that can suitably be used in small quantities, i.e. typically less than 2 wt.%, to impart an intense reddish colour. The present invention also encompasses the use of combinations of different colouring substances that together impart a reddish colour to the minced meat analogue. A "reddish colour" means that the colour is red or a shade of orange, brown or pink that is similar to red. Most preferably, the red colouring substances impart an essentially pure red colour to the minced meat analogue. The red colouring substances may be incorporated in the present analogue as such or as part of a natural ingredient and/or a compounded ingredient.

[0015] The red colouring substances employed in accordance with the present invention may have been introduced in the minced meat analogue in the form of a colouring material that essentially consists of colouring substances or a colouring material that contains colouring substances in combination with carrier materials and/or other functional food ingredients. These carrier materials and/or functional ingredients are not encompassed by the term "red colouring substance".

[0016] In a preferred embodiment, the minced meat analogue contains at least 12 wt.% protein, whereas the fat content preferably does not exceed 8 wt.%. The concentration of cross-linked polysaccharide typically does not exceed 7 wt.%. The amount of red colouring substances, preferably does not exceed 2.5 wt.%, more preferably it does not exceed 1.5 wt.%.

[0017] The minced meat analogue of the present invention may advantageously contain levels of fat that are substantially lower than those found in ordinary minced meat product (typically above 10 wt.%). In a particularly preferred embodiment, the minced meat product contains less than 6 wt.%, more preferably less than 5 wt.% of fat. It was found that even if such low fat minced meat analogues are fried, fat uptake is relatively low, resulting in a fried minced meat analogue having a fat content that is much lower than that of ordinary fried minced meat.

[0018] In order to determine how much of a particular ingredient is contained in the fibre and/or the interstitial material, the fibres are to be separated from the interstitial material and the concentrations of the ingredients are determined by means of suitable analytical techniques. The fibres and interstitial material may suitably be separated by placing the strands on a sieve and rinsing the strands with warm water until the clean fibres remain. Any small fibre material that has passed the sieves with the rinsing water may suitably be removed therefrom by centrifugation and be recombined with the fibres retained on the sieve for analysis.

[0019] Like ordinary minced meat, the present analogue is composed of strands of e.g. extruded material. The minced meat analogue of the present invention is typically characterised in that the strands display a marbled colour pattern that is made up of reddish and whitish patches. The reddish patches coincide with concentrations of red colouring substances and the whitish patches coincide with proteinaceous fibres that do not carry a significant amount of red colouring substances. Due to this marbled appearance of the strands, the present analogue closely resembles ordinary minced meat in both structure and appearance. The marbled appearance is particularly manifest if at least 50 wt.% of the fibres in the minced meat analogue have a length of at least 1 mm, preferably of at least 3 mm.

[0020] An important advantage of the minced meat analogue resides in the fact that it can suitably be pasteurised or sterilised, without affecting the fresh appearance of the product. Consequently, in a preferred embodiment the analogue has been pasteurised or sterilised. Most preferably, the product has been pasteurised, e.g. by heating it to at least 70 °C for at least 2 minutes.

[0021] According to a particularly preferred embodiment, the red colouring substances employed in the minced meat analogue discolour when subjected to severe heating conditions, such as those employed in shallow frying, deep frying or roasting. Thus, during e.g. frying or roasting the minced meat analogue will loose its reddish colour, whereas at the same time, due to Maillard reactions occurring on the surface of the fibres, a brownish colour is developed. As a result, the fried or roast minced meat analogue so obtained closely resembles ordinary fried or roast minced meat. A particularly suitable red colouring substance that exhibits this kind of discolourisation behaviour is betanin. Most preferably, betanin is employed in the form of a beet extract.

[0022] In order to further improve the storage stability of the present analogue, it is advantageous to include a preservative. According to a particularly preferred embodiment, the preservative is predominantly incorporated in the interstitial material. Typically at least 60%, most preferably at least 75% of the preservative present in the analogue is contained in the interstitial material. Preferred preservatives include salts of food acids, such a potassium sorbate and potassium lactate. According to a particularly preferred embodiment, the minced meat analogue contains between 0.3 and 3 wt.%, especially between 0.6 and 1.8 wt.% of lactate salt, preferably potassium lactate.

[0023] The interstitial material in the present minced meat analogue serves the purpose of binding together the fibres. In addition, the interstitial material influences the texture and appearance of the product in advantageous fashion. The fat present in the interstitial material is believed to impart a tender and smooth texture, whilst the red colouring substances produce the desirable marbled colour pattern that is typical of ordinary minced meat. Typically, the interstitial materials constitutes between 1 and 30 wt.%, preferably between 5 and 25 wt.% of the minced meat analogue.

[0024] The interstitial material in the present analogue product preferably contains 10-50 wt.% fat; 0.001-15 wt.% of red colouring substances; and optionally up to 60 wt.% water. More preferably, the interstitial material contains less than

12 wt.% of red colouring substances, most preferably less than 8 wt.% of red colouring substances. The interstitial material may essentially consist of fat and red colouring. Preferably, however, the interstitial material additionally contains at least 10 wt.% water. In case the interstitial material contains water, fat is preferably present as a dispersed phase of an oil-in-water emulsion. The organoleptic quality of the minced meat analogue is exceptionally good in case the interstitial material contains:

- 5-50 wt.%, preferably 10-40 wt.% of fat;
- 0.002-12 wt.%, preferably 0.003-8 wt.% of red colouring substances;
- 20-90 wt.%, preferably 30-80 wt.% of water; and
- 2-50 wt.% , preferably 10-40 wt.% of a binding agent.

The binding agent is suitably selected from the group consisting of cellulose derivatives, natural gums, egg protein, whey protein, starch, modified starch, carrageenan, and combinations thereof. More preferably, the binding agent is a mixture of (i) a protein selected from the group consisting of whey protein, egg protein and combinations thereof and (ii) a polysaccharide selected from cellulose derivatives and modified starch. Methyl cellulose is particularly preferred due to the fact that it acts as an effective binder under warm as well as cold conditions.

[0025] The protein contained in the fibres of the minced meat analogue is preferably selected from the group consisting of dairy protein, vegetable protein and combinations thereof. According to a particularly preferred embodiment, the protein of the fibres is dairy protein. Suitable sources of dairy protein include, whey protein concentrate, caseinate, rennet casein, milk powder (including skim milk powder), curd and cheese. Most preferably, most of the protein contained in the fibres of the present analogue is derived from curd, more preferably at least 80 wt.% of the protein is derived from curd. The curd employed in the present method most preferably is a skimmed milk curd. Thus, the introduction of fat through the interstitial material may be compensated for by a reduced fat content in the fibres, without adverse effect on product quality.

[0026] The fat employed in the present product preferably is a vegetable or dairy fat. Fat contained in the proteinaceous fibres, preferably is a non-hydrogenated fat, e.g. butter oil or vegetable oil. The fat contained in the interstitial material may be a hydrogenated or a non-hydrogenated fat. In case fat is present as a continuous phase in the interstitial material, the preferred fat is a high melting fat, especially a fat with a melting point in excess of 35, preferably in excess of 40 °C. In case the fat is present in the interstitial material in the form of an oil-in-water emulsion, the preferred fat is a non-hydrogenated vegetable or dairy fat.

[0027] Another embodiment of the invention relates to a packaged minced meat analogue as described herein before, wherein the package is hermetically sealed and contains an inert atmosphere of nitrogen and carbon dioxide. In particular if the analogue product has been pasteurised or sterilised, packaging under an atmosphere of nitrogen and carbon dioxide ensures that the product may be stored in a refrigerator for several weeks without loosing quality. Typically the atmosphere of nitrogen and carbon dioxide contains nitrogen and carbon dioxide in a volume ratio of 3:1 to 1:3.

[0028] Yet another embodiment of the present invention concerns the use of a minced meat analogue as defined above in the preparation of burgers, sausages, sauces or meals. The minced meat analogue of the present invention can be incorporated in the aforementioned products in the same way as ordinary minced meat. The typical structure and texture of the present product are retained in the final product even if such product is subjected to additional heat processing.

[0029] A further aspect of the invention relates to a method of preparing a minced meat analogue, said method comprising the following steps:

- preparing a homogeneous mixture containing 5-20 wt.% of protein; 0.1-10 wt.% of water-soluble polysaccharide selected from alginate, pectin and mixtures thereof; and at least 60 wt.% water;
- combining the homogeneous mixture with an aqueous solution containing 0.1-6 wt.% of multivalent metal cations to crosslink the water-soluble polysaccharide and to produce proteinaceous fibres;
- isolating said proteinaceous fibres;
- mixing said proteinaceous fibres with covering materials in a weight ratio of 50:1 to 3:1 to form a composite, said covering materials including, by weight of the total amount of covering materials:
  - 5-50 wt.% fat;
  - 0.01-12 wt.% of red colouring substances; and
  - optionally up to 60 wt.% water; and
- mincing said composite to produce a minced meat analogue.

[0030] The concentration of multivalent metal cations in the aqueous solution refers to the concentration of said metal

cations alone, i.e. not to the amount of multivalent metal salt that may have been added to said solution.

[0031] The present method of preparing and isolating the proteinaceous fibres is very similar to the one described in WO 03/061400, which is incorporated herein by reference.

[0032] The term "homogenous mixture" as referred to in the present application encompasses emulsions, dispersions and solutions. Some proteins, for example, cheese milk protein, melt at elevated temperatures, producing a homogenous mixture comprising two liquid materials that are not soluble in one another, i.e. an emulsion. Proteins that do not melt will yield a homogeneous mixture in the form of a dispersion or a solution.

[0033] In the present method the homogeneous mixture may suitably be prepared by first mixing protein material and water, followed by the addition of alginate and/or pectin and further mixing. However, these components can also be admixed in a single step or in a different order. Mixing may be achieved by stirring, but also other mixing techniques, such as homogenization may be employed.

[0034] The water-soluble polysaccharide employed in the present method is characterised in that it precipitates with multivalent metal cations under the formation of a cross-linked network. Low methoxy pectins and alginates are particularly suitable water-soluble polysaccharides. The preferred alginate is sodium alginate. There are numerous commercially available alginates; in the context of the invention, use is made of, for example, Ca-reactive alginates such as of the type obtained from "Brown algae". Examples of suitable alginates are DMB sodium alginate (Manugel) from Kelco and FD125 from Danisco Cultor. It is also possible to use other alginates which form a precipitate with metal cations.

[0035] When the solution containing the multivalent metal cation is added to the homogenous mixture a fibrous product can be obtained in a controlled way by breaking up the skin of precipitating material that forms at the interface of the homogeneous mixture and the added solution. This may be done by continuously chopping said interface with e.g. paddles.

The multivalent metal cations contained in the aqueous solution are preferably selected from water-soluble calcium salts, water-soluble magnesium salts and mixtures thereof. Typically, these salts are applied in the aqueous solution at concentration levels at which these salts are essentially fully dissolved. Suitable calcium salts include calcium chloride, calcium acetate and calcium gluconate.

[0036] In the preparation of the proteinaceous fibres according to the present invention, the pH of the homogenous mixture is advantageously set to a value in the range from 4 to 7. The pH of the homogeneous mixture will effect the structure and texture of the proteinaceous fibres obtained in the present method. For example, to prepare a meat-type structure similar to beef, pork or chicken, starting from a milk protein material, the pH is preferably set to a value between 5.0 and 7.0. If a fish-type structure is desired, starting from milk protein material, the pH is preferably set to a value between 4.5 and 6.0.

[0037] The homogeneous mixture employed in the present method preferably contains protein and the water-soluble polysaccharide that precipitates with multivalent metal cations in a weight ratio within the range of 1:6 and 1:1.

[0038] According to a particularly preferred embodiment, the homogeneous mixture contains 5-15 wt.% of protein, 1-6 wt.% of the water-soluble polysaccharide and at least 70 wt.% of water. The homogeneous mixture may suitable contain some fat. Preferably, the amount of fat does not exceed 3 wt.%, more preferably it does not exceed 1 wt.%.

[0039] In case the homogeneous mixture is prepared with ingredients containing significant levels of multivalent metal cations (e.g. curd that contains significant amount of Ca^{2+}), care should be taken not to prematurely cross-link the water-soluble polysaccharide. In order to prevent such premature cross-linking, a sequestering agent may suitably be employed to capture the free multivalent metal cations, before they can interact with the water-soluble polysaccharide. This is suitably done by combining such a sequestering agent with any ingredients of the homogeneous mixture that contribute substantial levels of multivalent metal cations in the presence of water, followed by the addition of the water-soluble polysaccharide. Typical examples of sequestering agents include phosphates, EDTA etc, phosphates being particularly preferred. These phosphates must be capable of forming a complex with divalent metal cations, such as calcium or magnesium, and are expediently selected from alkali metal and ammonium salts of phosphoric acid of polyphosphoric acid. Typical examples of suitable phosphates include disodium hydrogen phosphate, trisodium phosphate, sodium hexametaphosphate and sodium polyphosphate $(NaP0_3)_n$ wherein n is suitably within the range of 10-40. The sequestering agents is typically added in an amount of 0.1-1.5% by weight, based on the total amount of all the constituents of the homogenous mixture.

[0040] The aqueous solution of multivalent metal cations that is used to produce the proteinaceous fibres, generally contains between 0.3 and 4 wt.%, more preferably between 0.5 and 2 wt.% of multivalent metal cations. The strength of the proteinaceous fibre, which is related to the sensation in the mouth when a bite is taken, is affected by the concentration of the multivalent cations in the aqueous solution. Typically, the higher the concentration of the multivalent cation the stronger the resulting fibre.

[0041] After the homogenous mixture has been prepared, which usually is done at a temperature of 20-90 °C, preferably of 30-90 °C and most preferably of 50-80 °C, the homogenous mixture is held at this temperature and the solution of the multivalent metal cation is added at approximately the same temperature.

[0042] The solution of multivalent metal cation and the homogeneous mixture are preferably combined gradually as

this allows the fibre formation process to be controlled carefully. This may be achieved by combining two streams of these individual components, or alternatively by adding a stream of one component to the bulk of the other component. According to a preferred embodiment, the multivalent metal cation solution is gradually introduced into a stirred vessel containing the homogeneous mixture, e.g. by spraying the solution onto the surface of the homogeneous mixture. By stirring or chopping the surface of the homogeneous mixture whilst the aqueous solutions is being added, the proteinaceous skin that forms onto said surface is continuously ruptured, resulting in the formation of fibres. The pieces of ruptured skin tend to roll-up into cylindrical structures and thus attain a fibre-like appearance.

[0043] Once the proteinaceous fibres have been formed, these fibres are preferably washed in order to remove residues of metal cations. Next, excess moisture may be removed, for example, by pressing. After isolation, the proteinaceous fibres typically have a water content of 60-90 wt.%, preferably of 65-85 wt.%.

[0044] Following the isolation of the proteinaceous fibres, the covering materials are preferably gently mixed with the protein fibres in order not to significantly damage the fibres. It is important that throughout the process the size of fibres is not reduced to such a level that the fibres are no longer visually distinguishable in the final minced meat analogue. If this happens, the product will attain a homogeneous pink colour instead of the desired marbled red/white colour pattern. Typically, at least 50 wt.% of the fibres in the minced meat analogue have a length of at least 1 mm, preferably of at least 3 mm.

[0045] As mentioned herein before, the present minced meat analogue can suitably be pasteurised or sterilised. Optionally, especially in case long storage times are foreseen, the meat analogue is frozen after pasteurisation or sterilisation. In accordance with a preferred embodiment, the minced meat analogue is pasteurised or sterilised, and packaged. The product may be packaged either before or after packaging. Preferably, the minced meat analogue is pasteurised before packaging. Even more preferably, the minced meat analogue is pasteurised or sterilised and subsequently packaged in a hermetically sealed package under an inert atmosphere of nitrogen and carbon dioxide. In a particularly effective embodiment, the minced meat analogue is frozen after pasteurisation or sterilisation and packaged in frozen form. In this way production process and market distribution can be disconnected.

[0046] The covering materials employed in the present method may suitably include at least 10% water, by weight of the total amount of covering materials. Particularly good results are obtained if the covering materials include, by weight of the total amount of covering materials:

- 5-50 wt.%, preferably 10-40 wt.% of fat;
- 0.002-12, preferably 0.003-8 wt.% of red colouring substances;
- 20-90 wt.%, preferably 30-80 wt.% of water; and
- 2=50 wt.%, preferably 10-40 wt.% of a binding agent.

[0047] The fat and binding agent are suitably admixed to the proteinaceous fibres in the form of an oil-in-water emulsion. The oil-in-water emulsion may suitably contain other ingredients such as preservatives. However, preservatives can also be introduced separate from the oil-in-water emulsion.

[0048] Preferred binding agents include cellulose derivatives, natural gums, egg protein, whey protein, starch, modified starch, carrageenan, and combinations thereof. A particularly preferred binding agent is whey protein, especially high gel whey protein. High gel whey protein when dispersed in water, forms a highly viscous solution that forms a gel when sufficient salt is added. High gel whey protein is commercially available e.g. under the product name Nutrilac® PO-7730 (Arla Food Ingredients, Denmark).

[0049] The covering materials advantageously include one or more preservatives, especially between 0.3 and 15 wt. % of lactate by weight of the total amount of covering materials, potassium lactate being particularly preferred.

[0050] The invention is further illustrated by means of the following examples:

EXAMPLES

Example 1

[0051] Skimmed milk was bactofugated at 50 °C and then pasteurised at 75 °C for 15 sec and curdled by means microbial rennet. To 600 grams of the curd so obtained, 400 gram water and 13 gram sodium polyphosphate $(NaPO_3)_n$ where n is approximately 25, were added to the curd. After heating (melting), the pH was brought to approximately 7 using NaOH in order to increase the effectiveness of calcium binding. A solution of 22.5 gram sodium alginate (Kelco® DMB) in 500 g water was prepared and the mixture containing curd, sodium polyphosphate and water was mixed with the solution containing sodium alginate, with stirring (Hobart mixer with dough kneader at low speed). Finally, under continuous stirring, the mixture was sprayed with 450 gram 4 % (m/m) $CaCl_2$ and further mixed to form the fibres.The fibres were isolated using sieving, after which they were washed.
After washing, the composition of the fibres was as follows:

	Wt.%
Dry matter	23
Protein	14
Fat	0.2
Water	77

[0052] Next, 1000 g of the fibres were mixed in a Hobart mixer with 100 g of an oil-in-water emulsion of the following composition:

	Wt.%
Water	46
High gel whey protein[1]	14
Sunflower oil	20
Potassium lactate [2]	20
[1] Nutrilac® PO-7730, ex Arla Food Ingredients, Denmark [2] Purasel® P 60% (aqueous solution), ex Purac, the Netherlanst	

[0053] The oil-in-water emulsion was prepared using a Brown combimax 650 mixer at high speed. Cooled water was introduced in the mixer. Next, potassium lactate, whey protein and oil were added under continuous stirring whilst the temperature of the mixture was maintained at below 10 ˚C. Stirring was continued until a smooth, homogeneous mass had been obtained.

[0054] After the emulsion had been mixed with the fibres with the help of a Hobart mixer (temperature below 5 ˚C), the following ingredients were added under mixing conditions in the indicated amounts:

	Grams
Flavour	12.5
Carboxymethyl cellulose[1]	15
Egg protein	20
Modified potato starch [2]	5
Red colouring (E162)[3]	3
Paprika powder	3.5
Caramel (E150a)[4]	6
[1] Methocel A, ex Dow Chemical [2] ex Griffith Laboratories, Herentals, Belgium ***s.v.p. productnaam doorgeven.*** [3] Beet red ZJB003 ex Griffith Laboratories, Herentals, Belgium [4] powder, containing 97% carbohydrates, ex Griffith Laboratories, Herentals, Belgium	

[0055] The mixture of fibres and covering materials was fed into a mincer (Krafft) and processed into a minced meat analogue. The minced meat analogue so obtained had an appearance that was very similar to that of freshly prepared

minced meat. The product was pasteurised by keeping it in an oven at a temperature of 120 °C for 15 minutes (resulting in a core temperature of more than 70 °C during at least 2 minutes), cooled to below 7 °C and subsequently packaged in a sealed package under an atmosphere of nitrogen and carbon dioxide (50:50 v/v). It was found that the packaged minced meat analogue could be stored in a refrigerator for more than 3 weeks.

Examples 2A and 2B

[0056] Example 1 was repeated, except that instead of the emulsion 20 g of sunflower oil (example 2A) or hardened palm oil (example 2B) was added. The hardened palm oil (ex Romi Smilfood, the Netherlands) had a melting point of 45 °C.

Example 3

[0057] Example 1 was repeated, except that instead of the emulsion 20 g of sunflower oil and 14 g of high gel whey protein were separately added to the proteinaceous fibres.

Examples 4A, 4B and 4C

[0058] Example 1 was repeated, except that the high gel whey protein in the emulsion was replaced by an equal amount of:

caseinate (ex DMV International)	- Example 4A
egg protein (ex. NIVE, Nunspeet, the Netherlands);	- Example 4B
whey protein concentrate (Lacprodan® ex Arla Food ingredients)	-Example 4C

Example 5

[0059] The minced meat analogues described in the above examples were shallow fried in oil at 170 °C for 3 minutes. To this end approximately 125 g of the loose analogue material was introduced into a heated frying pan containing hot oil. The amount of oil absorbed as well as the amount of water lost during frying was determined. Furthermore, moisture content and fat content were determined before and after frying. The results of these analyses are summarised in the following table:

Ex.	Weight before frying (g)	Weight after frying (g)	Weight loss (%)	Before frying		After frying	
				Moisture (wt. %)	Fat (wt.%)	Moisture (wt. %)	Fat (wt.%)
1	125	105	16	66.5	2.7	47.6	13.4
2A	130	112.5	14	64.1	2.4	46.6	10.1
2B	117	96	18	64.6	2.6	51.7	11.7
3	130	110	15	64	2.4	43.0	11.9
4A	127	113.5	11	64.6	2.5	47.7	11.2
4B	130	116	11	64.8	2.6	48.2	12.4
4C	130	114.5	12	65.2	2.5	50.9	11.5

[0060] Furthermore, the fried products were evaluated by an expert panel. The results of the evaluation are summarised in the following table:

Ex.	Ranking in order of preference	Comments
1	1	Excellent texture and frying behaviour
2A	6/7	A bit dry and 'gritty'
2B	2	Excellent texture, tends to stick somewhat to the frying pan

(continued)

Ex.	Ranking in order of preference	Comments
3	6/7	Pale appearance and not much bite
4A	4	Slightly less juice and a bit 'gritty'
4B	3	Juicy, but slightly less bite
4C	5	Less bite and slightly 'gritty'

[0061] Finally, the minced meat analogue of example 1 was compared to ordinary pork and beef minced meat. The results of this comparison are depicted in the following table:

Product	Weight loss (%)	Before frying		After frying	
		Moisture (%)	Fat (%)	Moisture (%)	Fat (%)
Example 1	16	65.5	2.7	47.6	13.4
Pork minced meat	43	67.4	12.7	37.1	28.1
Beef minced meat	33	66.7	12.8	47.0	25.1

[0062] All three products were found to be of excellent quality. These results show that during frying the minced meat analogue of the present invention looses substantially less weight than the pork and beef minced meat products. In addition, the minced meat analogue offers the advantage that, even after frying, it contains substantially less fat than the minced meat products.

Claims

1. A minced meat analogue that is composed of composite strands that contain a plurality of proteinaceous fibres and an interstitial material, said minced meat analogue containing:

   - 10-25 wt.% of protein;
   - 0.5-10 wt.% of a cross-linked polysaccharide selected from alginate, pectin and combinations thereof;
   - 1.5-10 wt.% of fat;
   - 0.0001-5 wt.% of red colouring substances; and
   - 40-90 wt.% water;

   wherein protein, cross-linked polysaccharide and water together constitute at least 80 wt.% of the fibres; and wherein at least 10% of the fat and most of the red colouring substances is contained in the interstitial material.

2. Minced meat analogue according to claim 1, wherein said minced meat analogue is **characterised in that** the strands display a marbled colour pattern that is made up of reddish and whitish patches.

3. Minced meat analogue according to claim 1 or 2, wherein the minced meat analogue has been pasteurised or sterilised.

4. Minced meat analogue, according to any one of the preceding claims, wherein the interstitial material constitutes between 1 and 30 wt.%, preferably between 5 and 25 wt.% of the minced meat analogue.

5. Minced meat analogue according to claim any one of the preceding claims, wherein the interstitial material contains 10-50 wt.% fat; 0.01-5 wt.% of red colouring; and optionally up to 60 wt.% water.

6. Minced meat analogue according to claim 5, wherein the interstitial materialcontains:

   - 5-50 wt.% fat;
   - 0.002-12 wt.% of red colouring substances;

- 20-90 wt.% water; and
- 2-50 wt.% of a binding agent.

7. Minced meat analogue according to claim 6, wherein the binding agent is selected from the group consisting of cellulose derivatives, natural gums, egg protein, whey protein, starch, modified starch, carrageenan, and combinations thereof.

8. Minced meat analogue according to claim 7, wherein the binding agent is a mixture of (i) a protein selected from the group consisting of whey protein, egg protein and combinations thereof and (ii) a polysaccharide selected from cellulose derivatives and modified starch.

9. Minced meat analogue according to any one of the preceding claims, wherein the protein contained in the proteinaceous fibres is dairy protein.

10. Minced meat analogue according to any one of the preceding claims, wherein the interstitial material contains between 0.5 and 15 wt.% of lactate salt, preferably potassium lactate.

11. A packaged minced meat analogue according to any one of the preceding claims, wherein the package is hermetically sealed and contains an inert atmosphere of nitrogen and carbon dioxide.

12. A method of preparing a burger, a sausage, a sauce of a meal, said process comprising the incorporation of a meat analogue according to any one of claims 1-10.

13. A method of preparing a minced meat analogue, said method comprising the following steps:

- preparing a homogeneous mixture containing 5-20 wt.% of protein; 0.1-10 wt.% of water-soluble polysaccharide selected from alginate, pectin and mixtures thereof; and at least 60 wt.% water;
- combining the homogeneous mixture with an aqueous solution containing 0.1-6 wt.% of multivalent metal cations to crosslink the water-soluble polysaccharide and to produce proteinaceous fibres;
- isolating said proteinaceous fibres;
- mixing said proteinaceous fibres with covering materials in a weight ratio of 50:1 to 3:1 1 to form a composite, said covering materials including , by weight of the total amount of covering materials:

  - 5-50 wt.% fat;
  - 0.01-5 wt.% of red colouring substances; and
  - optionally up to 60 wt.% water; and

- mincing said composite to produce a minced meat analogue.

14. Method according to claim 13, wherein the minced meat analogue is pasteurised or sterilised, and packaged.

15. Method according to claim 13 or 14, wherein the covering materials include:

- 5-50 wt.% fat;
- 0.002-10 wt.% of red colouring substances;
- 20-90 wt.% water; and
- 2-50 wt.% of a binding agent.

16. Method according to claim 15, wherein the binding agent is selected from the group consisting of cellulose derivatives, natural gums, egg protein, whey protein, starch, modified starch, carrageenan, and combinations thereof.

17. Method according to claim 16, wherein the binding agent is high gel whey protein.

18. Method according to any one of claims 15-17, wherein fat and binding agent are admixed to the proteinaceous fibre in the form of an oil-in-water emulsion.

Fig 1

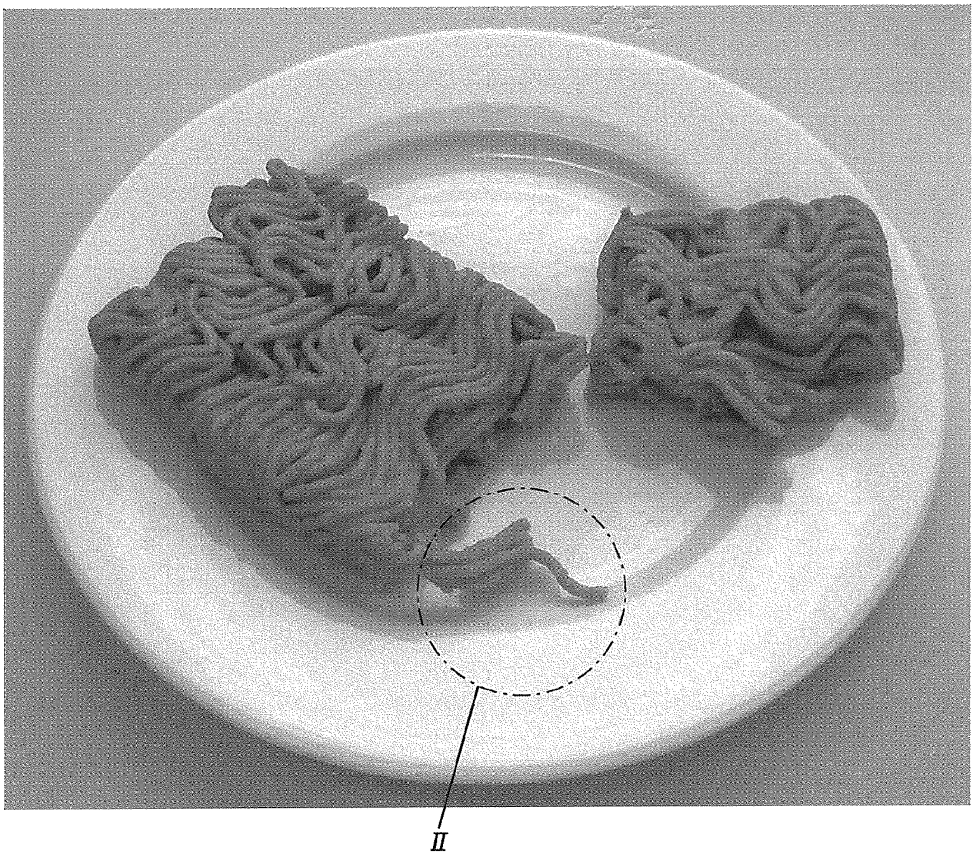
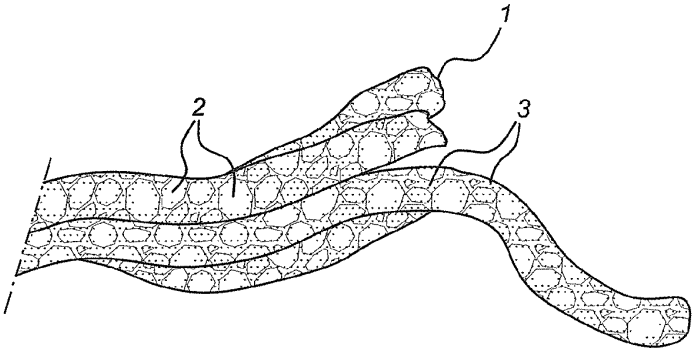


Fig 2



European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 05 10 8152

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
A	NL 1 026 391 C1 (NUG NAHRUNGS- UND GENUSSMITTEL VERTRIEBSGESELLSCHAFT MBH) 14 September 2004 (2004-09-14) * page 5, lines 30-32; claims 1-28 * * page 8, lines 5-29 *	1-18	A23J3/22 A23J3/08 A23J3/10
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D,A	US 2005/112268 A1 (KWELDAM ADRIAAN C) 26 May 2005 (2005-05-26) * the whole document *	1-18	
A	GB 2 066 644 A (RHONE-POULENC INDUSTRIES) 15 July 1981 (1981-07-15) * page 4, lines 26-75; claims 1-21 *	1-18	TECHNICAL FIELDS SEARCHED (IPC)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	13 February 2006	De Jong, E

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
P : intermediate document

T : theory or principle underlying the invention
E : earlier patent document, but published on, or after the filing date
D : document cited in the application
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EPO FORM 1503 03.82 (P04C01)

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13-02-2006

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REFERENCES CITED IN THE DESCRIPTION

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Electronic Acknowledgement Receipt

EFS ID:	25546445
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Shannon Glaeser
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	20-APR-2016
Filing Date:	10-JUL-2015
Time Stamp:	15:02:13
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	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	61366 256e3ced87f623fea16203e6cc121c0d31452e03	no	1

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2	Information Disclosure Statement (IDS) Form (SB08)	IDS_1449.pdf	109762 712ff377dde69971d7b08fcce30844ed160d11d9	no	1
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3	Foreign Reference	EP0815736.pdf	489177 69a4d4a9792f089f2a3eacdc9a5debfeab3fd7bd	no	9
Warnings:					
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4	Foreign Reference	EP1759593.pdf	9267801 992f7d1f000d0eec44acfcfc637b22c233fcbc3b	no	15
Warnings:					
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5	Non Patent Literature	Asgar_Nonmeat_Protein_Alternatives.pdf	18708338 c46963a8e7cf176292a2ab369ed5bce623e321fb	no	17
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Warnings:					
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Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	1791
Serial No.	:	14/796,970	Examiner	:	Elizabeth A. Gwartney
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

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Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

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Please consider the references listed on the enclosed PTO-1449 Form. Foreign patent documents and non-patent literature are enclosed.

This filing is being made with the filing of a Request for Continued Examination (RCE). Therefore, no fee is believed due. If this is incorrect, please apply any charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Please contact the undersigned if there are any questions regarding this Statement.

Respectfully submitted,

/April 20, 2016/

Date:_____

/M. Angela Parsons/

M. Angela Parsons, Ph.D.
Reg. No. 44,282

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Fish & Richardson P.C.
Telephone: (612) 335-5070
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Attorney Docket No.: 38767-0010001 / Client Ref: M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	Unknown
Serial No.	:	14/796,970	Examiner	:	Unknown
Filed	:	July 10, 2015	Conf. No.	:	8501

Title : METHODS AND COMPOSITIONS FOR CONSUMABLES

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P.O. Box 1450
Alexandria, VA 22313-1450

SUBMISSION OF MISSING PARTS OF APPLICATION

In order to complete this application, Applicant, as a Large Entity, submits herewith the following:

☒ A Declaration in compliance with 37 CFR §1.63; and

☒ A Power of Attorney in compliance with 37 CFR § 1.32.

No fees are believed due. If this is incorrect, please apply any charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Respectfully submitted,

/April 20, 2016/

Date:_____

/M. Angela Parsons/

_____
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Title of Invention	METHODS AND COMPOSITIONS FOR CONSUMABLES

As the below named inventor, I hereby declare that:

This declaration is directed to:

[ ] The attached application, or

[X] United States application or PCT international application number 14/796,970

filed on July 10, 2015.

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.

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LEGAL NAME OF INVENTOR

Inventor: Marija Vrljic Date (Optional): 10/7/2015

Signature: Marija Vrljic

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.

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LEGAL NAME OF INVENTOR

Inventor: Sergey Solomatin Date (Optional): 09/21/2015

Signature: 

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LEGAL NAME OF INVENTOR

Inventor: Rachel Fraser Date (Optional): 9/28/15

Signature: Rachel Fraser

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.

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LEGAL NAME OF INVENTOR

Inventor: Patrick O'Reilly Brown M.D., Ph.D. Date (Optional) : _____

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.**

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Attorney Docket No.: 38767-0010001 / Client Ref: M2CON-Track 1

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

Title of Invention	METHODS AND COMPOSITIONS FOR CONSUMABLES

As the below named inventor, I hereby declare that:

This declaration is directed to:

[ ] The attached application, or

[X] United States application or PCT international application number 14/796,970

filed on July 10, 2015.

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.

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LEGAL NAME OF INVENTOR

Inventor: Jessica Karr Date (Optional): 9.21.15

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.

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LEGAL NAME OF INVENTOR

Inventor: Celeste Holz-Schietinger Date (Optional) : 9/28/15

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.

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LEGAL NAME OF INVENTOR

Inventor: MichaelEisen Date (Optional): 10/13/15

Signature: /Michael Eisen/

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.

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LEGAL NAME OF INVENTOR

Inventor: Ranjani Varadan Date (Optional) :

Signature: Ranjani Varadan

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.

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TRANSMITTAL FOR POWER OF ATTORNEY TO ONE OR MORE REGISTERED PRACTITIONERS

NOTE: This form is to be submitted with the Power of Attorney by Applicant form (PTO/AIA/82B) to identify the application to which the Power of Attorney is directed, in accordance with 37 CFR 1.5, unless the application number and filing date are identified in the Power of Attorney by Applicant form. If neither form PTO/AIA/82A nor form PTO/AIA82B identifies the application to which the Power of Attorney is directed, the Power of Attorney will not be recognized in the application.

Application Number	14/796,970
Filing Date	July 10, 2015
First Named Inventor	Marija Vrljic
Title	METHODS AND COMPOSITIONS FOR CONSUMABLES
Art Unit	8501
Examiner Name	Elizabeth A. Gwartney
Attorney Docket Number	38767-0010001

SIGNATURE of Applicant or Patent Practitioner

Signature	/M. Angela Parsons/	Date (Optional)	
Name	M. Angela Parsons, Ph.D.	Registration Number	44,282
Title (if Applicant is a juristic entity)			
Applicant Name (if Applicant is a juristic entity)			

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

☐ *Total of _____ 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.**
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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

(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:

26191

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 to:

☐ The address associated with the above-mentioned Customer Number

OR

☒ The address associated with Customer Number: **26191**

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):

Impossible Foods 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	/Pat Brown/	Date (Optional)	4/30/2014
Name	Patrick O'Reilly Brown M.D., Ph.D.		
Title	CEO, Impossible Foods 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 _____ forms are submitted.

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POWER OF ATTORNEY BY APPLICANT

No more than ten (10) patent practitioners total may be appointed as set forth below by name and registration number. This page need not be submitted if appointing the Patent Practitioner(s) associated with a Customer Number (see form PTO/AIA/82B):

Name	Registration Number

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Electronic Acknowledgement Receipt

EFS ID:	25546903
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Judith Witzel
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	20-APR-2016
Filing Date:	10-JUL-2015
Time Stamp:	15:19:13
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	Applicant Response to Pre-Exam Formalities Notice	SubmissionMPs.pdf	68589 2b43f674828f2f6bde119457628407e388eff8be	no	1

Warnings:	
Information:	

2	Oath or Declaration filed	Declarations.pdf	4388410 5fa5c2df4daccb7d4c8f24481bac01832dd42fe8	no	8
Warnings:					
The page size in the PDF is too large. The pages should be 8.5 x 11 or A4. If this PDF is submitted, the pages will be resized upon entry into the Image File Wrapper and may affect subsequent processing					
Information:					
3	Power of Attorney	POA.pdf	2151870 da62c09a85a1305d94558b951d99523d27a7034c	no	3
Warnings:					
Information:					
			Total Files Size (in bytes):	6608869	

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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)
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PATENT APPLICATION FEE DETERMINATION RECORD Substitute for Form PTO-875	Application or Docket Number 14/796,970	Filing Date 07/10/2015	☐ To be Mailed

ENTITY: ☒ LARGE ☐ SMALL ☐ MICRO

APPLICATION AS FILED – PART I

	(Column 1)	(Column 2)		
FOR	NUMBER FILED	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 $ =	
INDEPENDENT CLAIMS (37 CFR 1.16(h))	minus 3 =	*	X $ =	
☐ 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

AMENDMENT	04/20/2016	(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	* 30	Minus	** 30	= 0	X $80 =	0
	Independent (37 CFR 1.16(h))	* 3	Minus	***4	= 0	X $420 =	0
	☐ Application Size Fee (37 CFR 1.16(s))						
	☐ FIRST PRESENTATION OF MULTIPLE DEPENDENT CLAIM (37 CFR 1.16(j))						
						TOTAL ADD'L FEE	0

AMENDMENT		(Column 1) CLAIMS REMAINING AFTER AMENDMENT		(Column 2) HIGHEST NUMBER PREVIOUSLY PAID FOR	(Column 3) PRESENT EXTRA	RATE ($)	ADDITIONAL FEE ($)
	Total (37 CFR 1.16(i))	*	Minus	**	=	X $ =	
	Independent (37 CFR 1.16(h))	*	Minus	***	=	X $ =	
	☐ 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.
** 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 number found in the appropriate box in column 1.

LIE
/SUSAN HAY/

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.

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United States Patent and Trademark Office
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APPLICATION NUMBER	FILING OR 371(C) DATE	FIRST NAMED APPLICANT	ATTY. DOCKET NO./TITLE
14/796,970	07/10/2015	Marija Vrljic	38767-0010001

CONFIRMATION NO. 8501

26191
FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS, MN 55440-1022

POA ACCEPTANCE LETTER

OC000000082588707

Date Mailed: 05/02/2016

NOTICE OF ACCEPTANCE OF POWER OF ATTORNEY

This is in response to the Power of Attorney filed 04/20/2016.

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**.

/atesfai/

Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	1791
Serial No.	:	14/796,970	Examiner	:	Elizabeth A. Gwartney
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the references listed on the enclosed PTO-1449 Form. U.S. patents and patent application publications will be provided upon request.

This statement is being filed after a Request for Continued Examination and before the mailing of a first Office Action on the merits. Therefore, no fees are believed due. If this is incorrect, please apply any charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Please contact the undersigned if there are any questions regarding this Statement.

Respectfully submitted,

/June 1, 2016/

Date:_____

/M. Angela Parsons/

M. Angela Parsons, Ph.D.
Reg. No. 44,282

Customer Number 26191
Fish & Richardson P.C.
Telephone: (612) 335-5070
Facsimile: (877) 769-7945

61325997.doc

Sheet 1 of 1

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
		Filing Date July 10, 2015	Group Art Unit 1791

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
	1.	9,011,949	4/21/2015	Brown et al.			
	2.	2015/0366233	12/24/2015	Brown et al.			

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document

Examiner Signature	Date Considered
EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.	

Substitute Disclosure Form

Electronic Acknowledgement Receipt

EFS ID:	25932490
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Shannon Glaeser
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	01-JUN-2016
Filing Date:	10-JUL-2015
Time Stamp:	09:54:41
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	Information Disclosure Statement (IDS) Form (SB08)	Transmittal.pdf	61379 cdf8859f7b19c699ef16a163f335f87303d0c2fe	no	1

Warnings:	
Information:	

This is not an USPTO supplied IDS fillable form					
2	Information Disclosure Statement (IDS) Form (SB08)	1449.pdf	103728 ee556bb9ea898d55b87eb5a5f50c3045e712cd8a	no	1

Warnings:

Information:

This is not an USPTO supplied IDS fillable form

Total Files Size (in bytes):	165107

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.

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MAILED
JUN 01 2016
OFFICE OF PETITIONS

FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS MN 55440-1022

Doc Code: TRACK1.GRANT

Decision Granting Request for Prioritized Examination (Track I or After RCE)	Application No.: 14/796,970

1. THE REQUEST FILED April 20, 2016 IS **GRANTED.**

The above-identified application has met the requirements for prioritized examination

A. ☐ for an original nonprovisional application (Track I).
B. ☒ for an application undergoing continued examination (RCE).

2. **The above-identified application will undergo prioritized examination.** The application will be accorded special status throughout its entire course of prosecution until one of the following occurs:

A. filing a **petition for extension of time** to extend the time period for filing a reply;
B. filing an **amendment to amend the application to contain more than four independent claims, more than thirty total claims**, or a multiple dependent claim;
C. filing a **request for continued examination**;
D. filing a notice of appeal;
E. filing a request for suspension of action;
F. mailing of a notice of allowance;
G. mailing of a final Office action;
H. completion of examination as defined in 37 CFR 41.102; or
I. abandonment of the application.

Telephone inquiries with regard to this decision should be directed to **Michelle R. Eason** at (571) 272-4231. In his/her absence, calls may be directed to Brian W. Brown at (571) 272-5338.

/Michelle R. Eason/
(*Signature*)

Paralegal Specialist, Office of Petitions
(Title)

U.S. Patent and Trademark Office
PTO-2298 (Rev. 02-2012)



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
14/796,970	07/10/2015	Marija Vrljic	38767-0010001	8501

26191 7590 07/12/2016
FISH & RICHARDSON P.C. (TC)
PO BOX 1022
MINNEAPOLIS, MN 55440-1022

EXAMINER	
GWARTNEY, ELIZABETH A	

ART UNIT	PAPER NUMBER
1791	

NOTIFICATION DATE	DELIVERY MODE
07/12/2016	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):

PATDOCTC@fr.com

Office Action Summary	Application No. 14/796,970	Applicant(s) VRLJIC ET AL.	
	Examiner ELIZABETH GWARTNEY	Art Unit 1791	AIA (First Inventor to File) 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 *4/20/2016*.

☐ 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) *1-5,7-9,11,12,31-35,37-41 and 43-46* 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) *1-5,7-9,11,12,31-35,37-41 and 43-46* 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: _____.

DETAILED ACTION

1. The present application is being examined under the pre-AIA first to invent provisions.

Continued Examination Under 37 CFR 1.114

2. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicants' submission filed on April 20, 2016 has been entered.

3. Claims 31 and 44 have been deleted and claims 47-52 have been added. **Claims 1-5, 7-9, 11, 12, 32-43 and 45-52 are pending.**

4. The rejection of **claims 1-5, 7-9, 11, 12 and 31-35, 37-41 and 43-46** under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Espeleta Vega et al. (US 2010/0074998) has been withdrawn in light of Applicants' submission filed April 20, 2016.

5. The previous rejections under 35 U.S.C. 112, second paragraph have been withdrawn in light of Applicants submission filed April 20, 2016.

Claim Rejections - 35 USC § 103

6. The following is a quotation of pre-AIA 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

7. The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under pre-AIA 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.

2. Ascertaining the differences between the prior art and the claims at issue.

3. Resolving the level of ordinary skill in the pertinent art.

4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

8. This application currently names joint inventors. In considering patentability of the claims under pre-AIA 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of pre-AIA 35 U.S.C. 103(c) and potential pre-AIA 35 U.S.C. 102(e), (f) or (g) prior art under pre-AIA 35 U.S.C. 103(a).

9. **Claims 1-5, 7-9, 11, 12, 32-43 and 45-52 are rejected under pre-AIA 35 U.S.C. 103(a) as being unpatentable over Hseih et al. (US 2012/0093994) in view of Proulx et al. ("Iron Bioavailability of Hemoglobin from Soy Root Nodules Using a Caco-2 Cell Culture Model" - J. Agric. Food Chem.“ 2006, p. 1518-1522).**

Regarding **claims 1, 4, 5, 7, 11, 12, 37, 43, 47, 50 and 51**, Hseih et al. disclose a process of for making a structured plant protein product (i.e. meat analog), the process comprising

extruding a mixture under conditions of elevated temperature and pressure to form the structured plant protein product, wherein the structured plant protein product comprises protein fibers that are substantially aligned, and wherein the structured plant protein product has a moisture content that is at least about 50% by weight of the structured plant protein product, and wherein the mixture comprises: (a) dry ingredients that comprise: (i) a protein component that comprises a plant-derived protein material, wherein the protein component is at an amount that is no more than about 90% by weight of the dry ingredients; (ii) a carbohydrate component at an amount that is in the range of about 2 to about 50% by weight of the dry ingredients; and (iii) a lipid component at an amount that is in the range of about 0.1 to about 5% by weight of the dry ingredients; and (b) wet ingredients that comprise water ([0013]).

Hseih et al. disclose wherein the structured plant protein product may comprises colorants wherein the concentration of colorants is adjusted to match the color of the animal meat to be simulated and a flavoring agent such as an animal meat flavor ([[0090]).

Given Hseih et al. disclose a structured plant protein product comprising a flavoring agent including animal meat flavor, it follows that the structured plant protein product would exhibit, upon cooking, meaty flavor notes.

Hseih et al. is silent with respect to a heme-containing protein from a non-animal source.

Proulx et al. teach that iron deficiency is a major nutritional problem and fortification of foods with iron has been a successful strategy for improving iron content of foods (p. 1518/Introduction). Proulx et al. teach that iron bioavailability is higher from heme iron sources because of lack of inhibition from chelating compounds (p. 1518/Introduction). Proulx et al. teach that heme iron in the human diet is almost exclusively from animal sources and its intake

has been shown to have a positive correlation with iron status (p. 1520/Results and Discussion). Proulx et al. teach that the incorporation of animal sourced heme iron is often unfeasible because of economic costs and because cultural and religious barrier forbid the consumption of meat (p. 1520-1521/Results and Discussion).

Proulx et al. teach that heme iron in the human diet is generally present in animal sources as part of hemoglobin and myoglobin but is also found in many invertebrates, bacteria, fungi and in the plant kingdom (p. 1518/Introduction). Proulx et al. teach leghemoglobin is a heme protein identified in soybean root nodules (p.1518/Introduction). Proulx et al. teach that the bioavailability of hemoglobin from soy root nodules is similar to that of heme iron from animal sources (p. 1521/Results and Discussion). Proulx et al. teach isolating and purifying plant hemoglobin from soy root nodules and using the leghemoglobin as a heme iron source in diets that are consumed by humans (i.e. adding to foodstuff -p. 1518/Introduction, p. 1519/LHb Preparation).

Given Proulx et al. teach that iron deficiency is a major nutritional problem and that fortification of foods with iron has been a successful strategy from improving iron content, since Proulx et al. teach that bioavailability is higher from heme iron sources including, leghemoglobin from soy root nodules, it would have been obvious to one of ordinary skill in the art to have fortified the structured plant protein product of Hseih et al. comprising no animal protein, with leghemoglobin from soy root nodules, to obtain a product with improved nutritional status, i.e. bioavailable source of iron.

While Proulx et al. teach the use of leghemoglobin to fortify foods with iron, the reference is silent with respect to amount.

However, the skilled artisan would know how to adjust, in routine processing, the amount of leghemoglobin added to the structured plant protein product of Hseih et al. to obtain the desired iron fortification.

Regarding **claims 2, 3, 8, 9, 48 and 49**, modified Hseih et al. disclose all of the claim limitations as set forth above. Given Proulx et al. teach a heme-containing protein (leghemoglobin) from soy root nodules, intrinsically the heme-containing protein would exhibit a VIS spectrum that would be identical to that of myoglobin from an animal and an amino acid sequence at least 70% homologous to that set forth in SEQ ID NO: 1.

Regarding **claims 5 and 12**, modified Hseih et al. disclose all of the claim limitations as set forth above.

Regarding **claims 32 and 45**, modified Hseih et al. disclose all of the claim limitations as set forth above.

Proulx et al. teach leghemoglobin isolated and purified from soy root nodules (p. 1519/LHb Preparation).

Regarding **claims 33-35, 38, 39-41, 46 and 52**, modified Hseih et al. disclose all of the claim limitations as set forth above.

Given Hseih et al. disclose soy protein in the form of soy protein isolate, soy protein concentrate, soy flour and mixtures thereof, it is clear Hseih et al. disclose isolated and purified forms of plant protein. Moreover, given Hseih et al. disclose plant proteins similar to those presently claimed, intrinsically the proteins would exhibit the claimed solubility properties.

Regarding **claims 36 and 42**, modified Hseih et al. disclose all of the claim limitations as set forth above. Given Hseih et al. disclose soy protein (i.e. legume protein), the limitations of claims 36 and 42 are satisfied.

Response to Arguments

10. **Applicants' arguments filed April 20, 2016 have been fully considered but they are not persuasive.**

Applicants submit "independent claims 1 and 7 have been amended herein to clarify the steps that are required to impart a beef-like flavor to a consumable product (independent claim 1) or that are require to make a meat replica composition having a beef flavor and aroma (independent claim 7)."

Applicants submit "Hseih does not disclose how to impart a meat flavor in meat analogs that lack meat."

Hseih et al. clearly disclose how to impart flavor in a structured plant protein product (i.e. meat analog) comprising 0% meat by flavoring with flavoring agents such as an animal meat flavor ([0090]). Given Hseih et al. disclose a structured plant protein product comprising a flavoring agent including animal meat flavor, it follows that the structured plant protein product would exhibit, upon cooking, meaty flavor notes.

Applicants submit "Hseih is completely silent with respect to iron or iron bioavailability, despite discussing various nutritional aspects of meat and meat analogs." Moreover, Applicants submit "Proulx never discloses which foods or types of foods might benefit from iron fortification, and Proulx certainly never discusses fortifying any type of meat analog or meat substitute."

Here, while Proulx et al. distinctly teaches the use of hemoglobin from soy root nodules to fortify corn tortillas, the reference also teaches the overall concept of using plant hemoglobin as a plant heme iron source in diets that are consumed by humans. Proulx et al. teach the general concept that heme iron from plants sources can provide highly bioavailable iron as a food fortificant. Given Hseih et al. is directed to a structured plant protein product (i.e. meat analog) comprising 0% meat, since Proulx et al. teach that heme iron in the human diet is generally present in animal sources as a part of hemoglobin and myoglobin and since Proulx et al. teach the use of heme iron from plant sources as a food fortificant, one of ordinary skill in the art would have been motivated to try fortifying the structured plant protein product (i.e. meat analog) of Hseih et al. as taught by Proulx et al.

Applicants submit "[c]ontrary to the Examiner, however, Hsieh provides no reason to modify their formulation – as indicated herein, Hsieh discloses how to make a meat analog taste more or less like meat and also provides numerous flavor agents, coloring agents, and vitamins and minerals for a skilled artisan to choose from." Applicants argue "[i]t has been well established that an invention is not obvious merely because the prior art *could be* modified."

Here, the motivation to combine the references comes from Proulx et al. Proulx et al. teach that iron deficiency is a major nutritional problem and fortification of foods with iron has been a successful strategy for improving iron content of foods (p. 1518/Introduction). Proulx et al. teach that iron bioavailability is higher from heme iron sources because of lack of inhibition from chelating compounds (p. 1518/Introduction). Proulx et al. teach that heme iron in the human diet is almost exclusively from animal sources and its intake has been shown to have a positive correlation with iron status (p. 1520/Results and Discussion). Proulx et al. teach that the

incorporation of animal sourced heme iron is often unfeasible because of economic costs and because cultural and religious barrier forbid the consumption of meat (p. 1520-1521/Results and Discussion).

Applicants submit "at the time the present application was filed, iron supplementation of protein-based non-meat alternatives . . . was not considered to be an art recognized problem." In fact, Applicants note "the art is replete with examples of commercially available protein-based non-meat alternatives that naturally contain an amount of iron that is essentially equivalent to ground beef . . . and, therefore, are not further supplemented with iron." Applicants also submit "at the time the present application was filed, iron supplementation of protein-based non-meat alternatives was known and practiced in the art." Applicants argue "even if iron supplementation of protein-based non-meat alternatives was a problem at the time the present application was filed, which applicants submit it was not, less complex and less expensive methods for supplementing such products with iron than the methods that are required by the pending claims . . . were widely known and used in the art." Applicants note "the U.S. Food and Drug Administration's (FDAs) database of Everything Added to Food in the United States (EAFUS) contains only iron salts and does not contain any heme-containing molecules."

While Applicants find that supplementation of protein-based non-meat alternatives was not considered a problem and that many commercially available product contain iron equivalent to ground beef, Applicants have not demonstrated that the product of Hseih et al., with no animal meat, would comprise the same levels or types of iron. Even if Hseih et al. disclosed a composition comprising no animal meat but comparable levels of iron, the idea of iron fortification in food is to add iron to enrich or strengthen the iron content. Given Proulx et al.

teach that iron deficiency is a major nutritional problem and fortification of foods with iron has been a successful strategy for improving iron content of foods (p. 1518/Introduction), one of ordinary skill in the art would have tried fortifying any foodstuff, including a meat analog, to improve its iron content.

The fact that commercially available protein-based non-meat alternatives are iron fortified with salts and that heme containing molecules have not been previously noticed as food additives, does not negate the teaching of Proulx et al. Here, Proulx et al. clearly teach the use of heme-containing proteins, leghemoglobin to iron fortify foods (*see* Introduction). Proulx et al. teach that heme iron from plant sources is a value-added product that can provide highly bioavailable iron as a food fortificant (Abstract).

Applicants submit “Hsieh contains no disclosure that would suggest to a skilled artisan that a heme-containing protein would impart a beef flavor or aroma.” Instead, Applicants not that Hsieh teaches imparting a meat flavor to a meat analog using varying amounts of meat." Applicants submit "[p]rior to the present disclosure, the claimed beef flavor or aroma imparted by the hem-containing protein would not have been expected or predicted." Applicants argue “none of the references of record disclose how to impart a beef flavor and aroma in the *absence* of any animal products.”

Applicants summarize the articles entitled “The Problem with Fake Meat" and note the different approaches to imparting a beef-like flavor to a food product in the absence of meat. Applicants submit "given the difficulties discussed in this article for imparting a beef-like flavor to non-meat products, and the less-than glowing reviews of the Beyond Meat products by the

author of this article, Applicants believe that the beef-like flavor and aroma imparted by the heme-containing protein, as recited in the claimed methods meets a long-felt need in the art."

Here, Applicants have not established that it is unexpected for heme-containing proteins to contribute to beef-like flavor ***o***r that the beef-like flavor of Applicants' claimed product is only attributable to the addition of heme-containing protein.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to ELIZABETH GWARTNEY whose telephone number is (571)270-3874. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, D. Lawrence Tarazano can be reached on (571) 272-1515. The fax phone 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.

/ELIZABETH GWARTNEY/

Primary Examiner, Art Unit 1791

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14796970	VRLJIC ET AL.
	Examiner	**Art Unit**
	ELIZABETH GWARTNEY	1791

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
=	Allowed	÷	Restricted	I	Interference	O	Objected

☐ Claims renumbered in the same order as presented by applicant ☐ CPA ☐ T.D. ☐ R.1.47

CLAIM		DATE								
Final	Original	09/10/2015	02/21/2016	07/07/2016						
	1	✓	✓	✓						
	2	✓	✓	✓						
	3	✓	✓	✓						
	4	✓	✓	✓						
	5	✓	✓	✓						
	6	✓	-	-						
	7	✓	✓	✓						
	8	✓	✓	✓						
	9	✓	✓	✓						
	10	✓	-	-						
	11	✓	✓	✓						
	12	✓	✓	✓						
	13	✓	-	-						
	14	✓	-	-						
	15	N	-	-						
	16	N	-	-						
	17	N	-	-						
	18	N	-	-						
	19	N	-	-						
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	25	N	-	-						
	26	N	-	-						
	27	N	-	-						
	28	N	-	-						
	29	N	-	-						
	30	N	-	-						
	31		✓	-						
	32		✓	✓						
	33		✓	✓						
	34		✓	✓						
	35		✓	✓						
	36		✓	✓						

Index of Claims	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14796970	VRLJIC ET AL.
	Examiner	**Art Unit**
	ELIZABETH GWARTNEY	1791

✓	Rejected	-	Cancelled	N	Non-Elected	A	Appeal
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CLAIM		DATE								
Final	Original	09/10/2015	02/21/2016	07/07/2016						
	37		✓	✓						
	38		✓	✓						
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	41		✓	✓						
	42		✓	✓						
	43		✓	✓						
	44		✓	-						
	45		✓	✓						
	46		✓	✓						
	47			✓						
	48			✓						
	49			✓						
	50			✓						
	51			✓						
	52			✓						

Receipt date: 04/20/2016

Sheet 1 of 1

Substitute Disclosure Form	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
		38767-0010001	14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant: Impossible Foods Inc.	
(37 CFR §1.98(b))		Filing Date: July 10, 2015	Group Art Unit: 1791

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No
/E.G./	1.	EP0815736	1/7/1998	EPO				
/E.G./	2.	EP1759593	3/7/2007	EPO				

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document
/E.G./	3.	Asgar et al., "Nonmeat Protein Alternatives as Meat Extenders and Meat Analogs," Comprehensive Reviews in Food Science and Food Safety, 2010, 9:513-529
/E.G./	4.	Clare et al., "Effects of Transglutaminase Catalysis on the Functional and Immunoglobulin Binding Properties of Peanut Flour Dispersions Containing Casein," J. Agric. Food Chem., 2008, 56(22):10913-10921
/E.G./	5.	Felt, "Raw Vegan Almond Ricotta Cheese," FeedYourSkull, March 12, 2012, https://feedyourskull.com/2012/03/12/raw-vegan-almond-ricotta-cheese/, 15 pages
/E.G./	6.	Kummer, "The Problem with Fake Meat," MIT Technology Review, March 31, 2015, retrieved April 20, 2016, <https://www.technologyreview.com/s/536296/the-problem-with-fake-meat/>, 11 pages
/E.G./	7.	Sterling, "Welcome to the Era of Plant -Based Meat," Food & Wine, April 13, 2016, Retrieved April 20, 2016, <http://www.foodandwine.com/blogs/welcome-era-plant-based-meat>, 3 pages

Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	07/07/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

EAST Search History

EAST Search History (Prior Art)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	9	"9011949"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/07/07 12:57
S1	705	((heme ADJ protein) OR myoglobin OR hemoglobin) WITH meat	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 10:54
S2	128	((heme ADJ protein) OR myoglobin OR hemoglobin) WITH heterologous	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 10:54
S3	6	"8927490"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 12:05
S4	1131	A23L1/31427	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 12:18
S5	0	"14796970"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2015/09/10 12:25
S8	4	"20100074998"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/19 09:21
S9	12709	vegetable ADJ protein	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/19 12:50
S10	434	(vegetable ADJ protein) AND legume	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/19 12:50
S11	353	(meat) WITH (substitute OR replica) WITH (soy OR pea)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 09:49
S12	2032	(meat) WITH (substitute OR replica)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 09:50
S13	7	(meat ADJ replica)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 09:50
S14	806	(meat ADJ substitute)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 09:50
S15	34	(meat ADJ substitute) WITH (soy ADJ protein)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 10:25
S16	1079	Hseih	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/02/21 10:28
S17	4	"20120093994"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO;	OR	OFF	2016/02/21 11:16

			DERWENT; IBM_TDB			
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S19	4	"20120093994"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/09 15:30
S20	98	(meat ADJ (substitute OR analog)) WITH (soy ADJ protein)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/03/10 15:36
S21	17	leghemoglobin WITH iron	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/07/06 14:58
S22	1	"14796970"	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/07/07 08:51
S23	16	hemoglobin AND (beef ADJ flavor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/07/07 09:07
S24	0	hemoglobin WITH (beef ADJ flavor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/07/07 09:10
S25	0	hemoglobin NEAR (beef ADJ flavor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/07/07 09:10
S26	0	leghemoglobin NEAR (beef ADJ flavor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/07/07 09:10
S27	0	globin NEAR (beef ADJ flavor)	US-PGPUB; USPAT; USOCR; FPRS; EPO; JPO; DERWENT; IBM_TDB	OR	OFF	2016/07/07 09:10

EAST Search History (Interference)

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
S6	0	"14796970"	USPAT	OR	OFF	2015/09/10 12:25
S7	0	"14796970"	US-PGPUB; USPAT	OR	OFF	2015/09/10 12:26

7/7/2016 12:58:40 PM
C:\Users\egwartney\Documents\EAST\Workspaces\14796970.wsp

Search Notes	Application/Control No.	Applicant(s)/Patent Under Reexamination
	14796970	VRLJIC ET AL.
	Examiner	Art Unit
	ELIZABETH GWARTNEY	1791

CPC- SEARCHED		
Symbol	Date	Examiner
A23L1/31427	9/10/2015	EG

CPC COMBINATION SETS - SEARCHED		
Symbol	Date	Examiner

US CLASSIFICATION SEARCHED			
Class	Subclass	Date	Examiner

SEARCH NOTES		
Search Notes	Date	Examiner
PALM inventor search completed	9/9/2015	EG
EAST text search - see search history	9/9/2015	EG
Google search / Google Scholar search - beef, chicken, pork and fish stew; heme-containing proteins from bacteria/ and in general.	9/10/2015	EG
EAST text search updated - see search history	2/21/2016	EG
Google search updated -	2/21/2016	EG
EAST text search - see search history	7/7/2016	EG
Google/Google Scholar - heme protein and meat flavor, hemoglobin and meat flavor	7/7/2016	EG

INTERFERENCE SEARCH			
US Class/ CPC Symbol	US Subclass / CPC Group	Date	Examiner

Receipt date: 06/01/2016

Sheet 1 of 1

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
		Filing Date July 10, 2015	Group Art Unit 1791

U.S. Patent Documents

Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate
/E.G./	1.	9,011,949	4/21/2015	Brown et al.			
/E.G./	2.	2015/0366233	12/24/2015	Brown et al.			

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publication Date	Country or Patent Office	Class	Subclass	Translation Yes	Translation No

Other Documents (include Author, Title, Date, and Place of Publication)

Examiner Initial	Desig. ID	Document

Examiner Signature	Date Considered
/ELIZABETH GWARTNEY/	07/07/2016

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Attorney's Docket No.: 38767-0010001 / M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	1791
Serial No.	:	14/796,970	Examiner	:	Elizabeth A. Gwartney
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

MAIL STOP AMENDMENT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

INFORMATION DISCLOSURE STATEMENT

Please consider the references listed on the enclosed PTO-1449 Form. Foreign patent documents and non-patent literature are enclosed; U.S. patents and patent application publications will be provided upon request. Copies of Communications from a foreign Patent Office in counterpart applications also are enclosed.

This statement is being filed after a first action on the merits, but before receipt of a Final Office Action or a Notice of Allowance. A submission fee in the amount of $180 as required under 37 CFR § 1.17(p) is being paid herewith. Please apply any other charges, or credits, to Deposit Account No. 06-1050, referencing the above-indicated Attorney Docket Number.

Please contact the undersigned if there are any questions regarding this Statement.

Respectfully submitted,

Date: /January 12, 2017/

/M. Angela Parsons/
M. Angela Parsons, Ph.D.
Reg. No. 44,282

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Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
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		Filing Date July 10, 2015	Group Art Unit 1791

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Examiner Initial	Desig. ID	Document Number	Publication Date	Patentee	Class	Subclass	Filing Date If Appropriate

Foreign Patent Documents or Published Foreign Patent Applications

Examiner Initial	Desig. ID	Document Number	Publicati on Date	Country or Patent Office	Class	Subclass	Translation	
							Yes	No
	1.	EP 0500132	8/26/1992	EPO				
	2.	EP 1529444	5/11/2005	EPO				
	3.	JP 2009171877	8/6/2009	JAPAN			English Abstract	
	4.	JP 2011000073	1/6/2011	JAPAN			X	
	5.	JP S54122766	9/22/1979	JAPAN			English Abstract	
	6.	JP S5959151	4/4/1984	JAPAN			English Abstract	
	7.	WO 1997/01961	1/23/1997	WIPO				

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	8.	"Veggie burgers that look, taste, and bleed like real meat," CBS News, August 9, 2016, retrieved August 25, 2016 <http://www.cbsnews.com/news/food-trend-veggie-burgers-that-look-bleed-taste-like-real-meat/>, 4 pages
	9.	"Watch Momofuku Cook Impossible Foods' Plant-Based Burger that 'Bleeds'," Vice, July 27, 2016, retrieved August 25, 2016, <https://munchies.vice.com/en/videos/watch-momofuku-cook-impossible-foods-plant-based-burger-that-bleeds>, 3 pages
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	11.	Belitz et al., "Fig. 5.19-5.21," Aroma Substances, p. 368
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	14.	Bunge et al., "Quest Heats up for Alternatives to Beef," The Wall Street Journal, Business News, November 4, 2016, page B5
	15.	Burdock, "Fenaroli's handbook of flavor ingredients," CRC press, 17 pages (2016)
	16.	Cadwallader and Macleod, "16 Instrumental methods for analyzing the flavor of muscle foods," Flavor of Meat, Meat Products and Seafoods, 18 pages (1998)

Examiner Signature	Date Considered

EXAMINER: Initials citation considered. Draw line through citation if not in conformance and not considered. Include copy of this form with next communication to applicant.

Substitute Disclosure Form

Substitute Disclosure Form U.S. Department of Commerce Patent and Trademark Office **Information Disclosure Statement by Applicant** (Use several sheets if necessary) (37 CFR §1.98(b))	Attorney Docket No. 38767-0010001	Application No. 14/796,970
	Applicant Impossible Foods Inc.	
	Filing Date July 10, 2015	Group Art Unit 1791

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
	17.	Calkins et al., "A fresh look at meat flavor," Meat Science, 77(1):63-80 (2007)
	18.	Chamlee, "Why Do People Want Veggie Burgers That Bleed?," Eater, July 25, 2016, retrieved August 25, 2016, <http://www.eater.com/2016/7/25/12270698/lab-grown-meat-beyond-burger-impossible-foods>, 11 pages
	19.	Chaudhari et al., "The cell biology of taste," 190(3):285-296 (August 2010)
	20.	Chen et al., "Effect of Urea on Volatile Generation from Maillard Reaction of Cysteine and Ribose," J. Agric. Food Chem., 48:3512-3516 (2000)
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	22.	Dai, "David Chang Adds Plant Based 'Impossible Burger' to Nishi Menu," July 26, 2016, retrieved July 27, 2016 <http://ny.eater.com/2016/7/26/12277310/david-chang-impossible-burger-nishi>, 6 pages
	23.	D'Onfro, "I tried the plant-based meat that Google wanted to buy and I never want to eat a 'real' hamburger again" Business Insider, June 12, 2016, retrieved June 14, 2016, <http://www.businessinsider.com/impossible-burgers-taste-test-2016-6>, 14 pages
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	29.	Fourth Chinese Office Action in Chinese Application No. 201280041713.1, dated 11/11/2016, 18 pages (with translation)
	30.	Gilbert et al., "The revolutionary meatless burger from Impossible Foods is perfect for begtarians and carnivores alike," Tech Insider, August 4, 2016, retrieved on August 25, 2016, <http://www.techinsider.io/the-impossible-foods-burger-review-vegetarian-2016-8>, 9 pages
	31.	Grigorakis et al., "Organoleptic and volatile aroma compounds comparison of wild and cultured gilthead sea bream (Sparus aurata): sensory differences and possible chemical basis," Aquaculture 225:109-119 (2003)
	32.	Grobart, "Making a Steak Without a Cow," Bloomberg Technology, June 21, 2016, retrieved June 23, 2016 <http://www.bloomberg.com/news/articles/2016-06-21/making-a-steak-without-the-cow>, 2 pages
	33.	Grosch, "Evaluation of the Key Odorants of Food by Dilution Experiments, Aroma Models and Omission," Chem. Senses 26:533-545 (June 2001)

Examiner Signature	Date Considered

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Substitute Disclosure Form

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0010001	14/796,970
		Applicant: Impossible Foods Inc.	
		Filing Date: July 10, 2015	Group Art Unit: 1791

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
	34.	Hannah, "A fermented feast," Bittersweet, retrieved on November 3, 2016, retrieved from <https://bittersweetblog.com/2010/06/09/a-fermented-feast/>, 2 pages
	35.	Herper, "Mission Impossible Burger: Tasting The Fake Meat That Wants To Save The World," Forbes, July 28, 2016, retrieved on August 25, 2016, <http://www.forbes.com/sites/matthewherper/2016/07/28/mission-impossible-burger-tasting-the-fake-meat-that-wants-to-save-the-world/#57781d823c43>, 6 pages
	36.	Hoshaw, "Silicon Valley's Bloody Plant Burger Smells, Tastes and Sizzles Like Meat" the salt, June 21, 2016, retrieved June 21, 2016 <http://www.npr.org/sections/thesalt/2016/06/21/482322571/silicon-valley-s-bloody-plant-burger-smells-tastes-and-sizzles-like-meat>, 8 pages
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	38.	Jublot et al., "Quantitation of sulphur aroma compounds in maillard model reaction systems of different composition," Expression of Multidisciplinary Flavour Science, 4 pages (2010)
	39.	Karahadian et al., "Action of Tocopherol-Type Compounds in Directing Reactions Forming Flavor Compounds in Autoxidizing Fish Oils," J. Amer. Oil Chem. Soc., 66:1302-8 (1989)
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	41.	Kerth and Miller, "Beef flavor: a review from chemistry to consumer," 25 pages (2015)
	42.	Khan et al., "Meat flavor precursors and factors influencing flavor precursors- A systematic review," Meat Science, 110:278-284 (December 2010)
	43.	Lane et al., "The Variety of Odors Produced in Maillard Model Systems and How They are Influenced by Reaction Conditions," The Maillard Reaction in Foods and Nutrition, American Chemical Society, pp. 141-158 (April 1983)
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	45.	Lopez, "We just tried the 'Impossible Burger' - the meatless burger NYC has been waiting for," Business Insider, July 27, 2016, retrieved on August 25, 2016, <http://www.businessinsider.com/what-the-impossible-burger-tastes-like-2016-7>, 5 pages
	46.	Marshall et al., "We Tried the "Bleeding" Vegetarian Burger And It Was Actually Good," July 27, 2016, retrieved July 28, 2016 <https://www.buzzfeed.com/chelseamarshall/bleeding-vegetable-burger?utm_term=.jaa03Kyo7#.ogV0m7MAW>, 10 pages
	47.	McGorrin, "Advances in Dairy Flavor Chemistry," Food Flavors and Chemistry: Advances of the New Millennium, Spanier, A. M.; Shahidi,F.; Parliment, T. H.; Mussinan, C. J.; Ho, C.-T.; Contis, E. T., Eds., Royal Society of Chemistry, Cambridge, pp. 67-84 (2001)
	48.	McGorrin, "Character-impact flavor and off-flavor compounds in foods," Flavor, Fragrance, and Odor Analysis, 2nd, 207-262 (2012).
	49.	McGorrin, "The significance of volatile sulfur compounds in food flavors," Volatile sulfur compounds in food 1068, 29 pages (2011).

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Substitute Disclosure Form

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No. 38767-0010001	Application No. 14/796,970
Information Disclosure Statement by Applicant (Use several sheets if necessary)		Applicant Impossible Foods Inc.	
		Filing Date July 10, 2015	Group Art Unit 1791

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
	50.	Moon et al., "Odour-active components of simulated beef flavour analyzed by solid phase microextraction and gas chromatography-mass spectrometry and -olfactometry," Food Research International, 39:294-308 (April 2006)
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Substitute Disclosure Form

Substitute Disclosure Form (37 CFR §1.98(b))	U.S. Department of Commerce Patent and Trademark Office	Attorney Docket No.	Application No.
Information Disclosure Statement by Applicant (Use several sheets if necessary)		38767-0010001	14/796,970
		Applicant: Impossible Foods Inc.	
		Filing Date: July 10, 2015	Group Art Unit: 1791

Other Documents (include Author, Title, Date, and Place of Publication)		
Examiner Initial	Desig. ID	Document
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Electronic Patent Application Fee Transmittal

Application Number:	14796970
Filing Date:	10-Jul-2015
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Filer:	M. Angela Parsons/Shannon Glaeser
Attorney Docket Number:	38767-0010001

Filed as Large Entity

Filing Fees for Utility under 35 USC 111(a)

Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Basic Filing:				
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Patent-Appeals-and-Interference:				
Post-Allowance-and-Post-Issuance:				
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Description	Fee Code	Quantity	Amount	Sub-Total in USD($)
Miscellaneous:				
Submission- Information Disclosure Stmt	1806	1	180	180
		Total in USD ($)		**180**

Electronic Acknowledgement Receipt

EFS ID:	28050592
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Shannon Glaeser
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Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Shannon Glaeser
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(54) Verfahren zur Herstellung eines quarkähnlichen Produktes aus Sojamilch

Process for the production of a curd-like product from soya milk

Procédé pour la production d'un produit semblable au blanc du lait à partir de lait de soja

(84) Benannte Vertragsstaaten:
AT BE CH DE DK ES FR GB GR IT LI LU MC NL PT SE

(30) Priorität: **22.02.1991 DE 4105692**

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US-A- 4 435 438

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EP 0 500 132 B1

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Beschreibung

Die Erfindung betrifft ein Verfahren zur Herstellung eines quarkähnlichen Produktes aus Sojamilch. Das erfindungsgemäß erhaltene Produkt weist hinsichtlich Geschmack, Geruch, Konsistenz und Aussehen milchquarkähnliche Eigenschaften auf.

Im Gegensatz zu Milchquark wird das quarkähnliche Sojaerzeugnis der Erfindung aus Sojamilch (Sojasaft) hergestellt, wobei die Sojamilch mit Hilfe von Mikroorganismen gesäuert und bei einem bestimmten pH-Bereich in die Hauptbestandteile Sojaeiweiß und Sojaserum mit Hilfe geeigneter Trennverfahren geteilt wird.

Es ist bekannt, daß die Abtrennung von Sojaeiweiß aus Sojamilch mittels Salzausfällungen erfolgen kann, wobei die Trennung nahezu im neutralen Bereich (pH 6,0 bis 7,5) erfolgt.

Hierzu wird die Sojamilch in Abhängigkeit von dem verwendeten Fällungssalz auf 60 bis 80°C erhitzt. Im Fernen Osten wird für die Ausfällung Nigari, eine Meersalzmischung, verwendet, in westlichen Ländern hingegen Calciumsulfat und Calciumchlorid. Es können auch Magnesiumsulfat, Zitronensaft, Obstessig, Essigsäure, Glucono-delta-lacton (GDL) oder verschiedene Calciumsalze (Calciumchlorid, Calciumlactat, Calciumacetat und Calciumgluconat) eingesetzt werden. Das auf diese Weise koagulierte Sojaeiweiß wird insbesondere bei Temperaturen über 60°C mittels Tüchern von dem Serum abgetrennt und durch Pressen zusätzlich entwässert. Anschließend wird der erhaltene Tofublock in Portionsstücke geschnitten, die in Wasser abgekühlt und anschließend verpackt werden.

Tofu ähnelt in seinem Gefüge einem geronnenen Hühnereiweiß, wobei die Struktur, bedingt durch das Pressen, wesentlich fester ist. Sein Gefüge ähnelt dem eines Mozzarellakäses, wobei die Tofukonsistenz allerdings nicht so elastisch ist.

Es ist weiterhin bekannt, daß man Sojaeiweiß auch allein mit Glucono-delta-lacton ausfällen kann. Diese Art der Ausfällung wird u.a. zur Herstellung von Seidentofu verwendet, wobei es sich um eine Dicklegung des gesamten, vorher konzentrierten Sojasaftes handelt. Der so erhaltene Seidentofu weist eine gallertartige, puddingartige Konsistenz auf.

Die im Verfahren der Erfindung einsetzbare Sojamilch wird üblicherweise aus ganzen geschälten Sojabohnen bzw. aus diesen durch Zerkleinern bzw. Mahlen erhaltenem Sojabohnenmehl durch Behandlung mit Wasser erhalten, vgl. Ullmanns Enzyklopädie der technischen Chemie, 4. Auflage, Band 19, S. 499 bis 503 (1980); Ullmann's Encyclopedia of Industrial Chemistry, 5th Edition, Vol. A8, p. 243 (1987), erschienen jeweils im Verlag Chemie, Weinheim. Weiterhin einsetzbar ist aus Sojamilchpulver durch Aufnehmen in Wasser erhaltene Sojamilch. So hergestellte Sojamilch enthält im wesentlichen sämtliche nützlichen Inhaltsstoffe der Sojabohne, insbesondere Proteine, Fette und Mineralstoffe, und unterscheidet sich bereits hierdurch von Proteinisolaten oder -konzentraten aus Sojabohnen, zu deren Herstellung gemäß Ullmann, 4. Auflage, Band 19, S. 501, ein entöltes zerkleinertes Sojamehl mit Laugen zur Lösung der Sojaproteine behandelt wird, wobei die Sojaproteine anschließend durch Koagulation unter Säurezusatz ausgefällt werden. Derartige Sojaproteinisolate weisen Proteingehalte zwischen etwa 50 und 90 Gew.-% auf. Der Proteingehalt von Sojamilch ist dagegen unter 50 Gew.-%, bezogen auf Trockenmasse; er liegt üblicherweise im Bereich von 40 bis 48 Gew.-%. Die Zusammensetzung (in Gew.-%) einer typischen Sojamilch im Sinne der Erfindung ergibt sich aus der folgenden Aufstellung:

Trockensubstanz:	10,2
Protein:	4,4
Kohlenhydrate:	1,6
Fett:	3,2
Mineralstoffe:	0,7
Gesamtballaststoffe:	0,3

Aus der US-A 4 309 344 ist ein Verfahren zur Herstellung eines Sojaerzeugnisses aus entfettetem Sojamehl bekannt, bei dem zunächst in der oben erläuterten Weise ein Proteinisolat durch Solubilisierung und Extraktion der Sojaproteine bei pH-Werten von mindestens 6,5, insbesondere 7 bis 10, und Ausfällung der Sojaproteine unter Säurezusatz bei pH-Werten von 4 bis 5 hergestellt wird; das ausgefällte Proteinisolat wird anschließend auf eine Temperatur im Bereich von 46 bis 62°C erhitzt und auf einen Feststoffgehalt von mehr als 44 Gew.-% entwässert. Der angegebene Temperaturbereich wird als kritisch bezeichnet. Infolge des hohen Feststoffgehaltes wird kein quarkähnliches Produkt, sondern ein Proteinisolat der hierfür üblichen Konsistenz erhalten.

In der US-A 3 944 676 wird ein Verfahren zur Herstellung eines Sojaproduktes beschrieben, bei dem ein entfettetes Sojamehl mit Wasser extrahiert sowie der wäßrige Extrakt auf einen pH-Wert von 6,5 bis 7 eingestellt und anschließend

einer Milchsäuregärung bis zu einem pH-Wert im Bereich von 4,2 bis 5,2 unterworfen wird; das erhaltene Produkt wird, abgesehen von einer Autoklavierung bei 110 bis über 120°C zum Erhalt eines Hartkäse-ähnlichen Produkts, keiner weiteren Wärmebehandlung unterworfen.

Die US-A 4 435 438 beschreibt die Herstellung eines Sojaproteinisolates, das nach der Rekonstitution mit Wasser unter Erhitzen auf 85°C ein unlösliches Gel mit einer Struktur von geronnenem Hühnereiweiß ergibt. Als Ausgangsmaterial werden entfettetes Sojabohnenmehl oder -grieß und Sojaproteinkonzentrate oder -isolate eingesetzt, die zunächst mit Wasser extrahiert werden. Der Extrakt wird mit Säuren auf einen pH von 4 bis 5 gebracht und zum Entfernen von wasserlöslichen Kohlenhydraten, Proteinen und Mineralien gewaschen. Anschließend wird das Produkt in Wasser aufgenommen und mit Basen auf einen pH von 7 bis 8 gebracht, wobei sich das Protein löst. Anschließend wird auf eine Temperatur im Bereich von 60 bis über 110°C erhitzt, wobei das gelbildende Isolat erhalten wird. Auch hier wird kein quarkähnliches Produkt im Sinne der Erfindung erhalten.

Die DE-B 21 25 728 betrifft die Herstellung eines Proteinisolats aus entöltem Sojabohnenmehl durch Behandlung mit Wasser bei pH-Werten über 7, insbesondere 8 bis 11, Erhitzen der Lösung auf Temperaturen im Bereich von 71 bis 155°C und Ausfällung des Proteinisolats bei einem pH-Wert von 4,5 bis 5,5 durch Säurezusatz. Auch hier wird kein quarkähnliches Produkt im Sinne der Erfindung erhalten.

Schließlich ist in Patent Abstracts of Japan, C-759, Vol. 14, Nr. 431 (1990) ein Verfahren beschrieben, bei dem Sojamilch aus Sojabohnen, denen der überwiegende Anteil (60 bis 80 Gew.-%) der enthaltenen Kohlenhydrate entzogen wurde, einer Milchsäuregärung unterworfen wird; das vergorene Material wird anschließend durch Erhitzen koaguliert, wobei, da ein Wasserentzug nicht vorgesehen ist, ein Seidentofu-artiges Produkt erhalten wird.

Aus GB-A-2 095 295 ist es bekannt, ein tofu-artiges Eiweißkonzentrat aus entfettetem Sojabohnenmaterial herzustellen. Das erhaltene Produkt ist körnig mit Partikelgrößen im Bereich von vorzugsweise 1 bis 10 mm.

Aus Patent Abstracts of Japan Vol. 13, No. 197(C-592) ist es bekannt, durch Koagulierung des in der Sojamilch enthaltenen Proteins ein gelartiges Tofuprodukt herzustellen.

Sojaerzeugnisse mit milchquarkähnlichen Eigenschaften sind bisher nicht bekanntgeworden; die Erfindung ist auf die Bereitstellung eines derartigen Sojaproduktes gerichtet.

Diese Aufgabe wird erfindungsgemäß durch ein Verfahren gelöst, das durch die folgenden Schritte gekennzeichnet ist:

a) chemische oder mikrobiologische Säuerung von Sojamilch bis zum Erreichen eines pH-Wertes im Bereich von 4,2 bis 4,9 und

b) Erhitzen des gemäß Stufe a) erhaltenen, gesäuerten Produktes auf eine Temperatur im Bereich von 65 bis 95°C, insbesondere 70 bis 90°C, und

c) Abtrennung einer quarkähnlichen, einen Eiweißgehalt im Bereich von 6,0 bis 12,0, insbesondere von 8,4 bis 11,5 Gew.-% aufweisenden Phase in dem genannten Temperaturbereich.

Üblicherweise weist die vorgenannte quarkähnliche Phase eine Trockenmasse im Bereich von 14 bis 22, insbesondere von 19 bis 22 Gew.-%, auf.

Die vorstehenden Gehalte von Eiweiß und Trockenmasse ergeben eine befriedigende Konsistenz der Produkte.

Das Verfahren der Erfindung kann in den üblicherweise in Betrieben der milchverarbeitenden Industrie vorhandenen Gerätschaften und Apparaten, insbesondere Separatoren und Homogenisatoren, durchgeführt werden.

Gemäß einer vorteilhaften Ausführungsform der Erfindung erhitzt man die Sojamilch vor der Säuerung auf Temperaturen im Bereich von 70 bis 145, insbesondere von 85 bis 142°C, um das Ausgangsmaterial zu pasteurisieren bzw. zu sterilisieren. Zur Ausbeuteerhöhung kann eine pH-Anhebung über einen pH-Wert von 7,0 mit entsprechenden Basen bzw. Salzen erfolgen.

Gemäß einer weiteren vorteilhaften Ausführungsform der Erfindung führt man die chemische Säuerung mit an sich bekannten, organoleptisch verträglichen Säuren, insbesondere organischen Säuren, und/oder Säurebildnern, z.B. Glucono-delta-lacton, durch.

Gemäß einer weiteren vorteilhaften Ausführungsform der Erfindung verwendet man für die mikrobiologische Säuerung mesophile oder thermophile, Kohlenhydrate abbauende Mikroorganismen, wie sie üblicherweise in der Milchindustrie bei der Herstellung von gesäuerten Produkten eingesetzt werden, insbesondere handelsübliche, an Sojamilch adaptierte Joghurtkulturen. Besonders bevorzugt sind dabei Streptococcus thermophilus, und/oder Lactobacillus bulgaricus als thermophile Mikroorganismen, wobei Streptococcus filant zusätzlich zur Strukturverbesserung des Produkts eingesetzt werden kann.

Zu Mikroorganismenstämmen, die in der Milchindustrie für die Säuerung üblich sind und auch im Verfahren der Erfindung eingesetzt werden können, gehören auch mesophile Mikroorganismen, z.B. Streptococcus lactis, Streptococcus cremoris, Leuconostoc cremoris und Streptococcus diacetylactis, die speziell dann eingesetzt werden können, wenn sie an Sojamilch adaptiert sind. Dabei ist jedoch zu beachten, daß diese Mikroorganismen im Gegensatz zu ther-

mophilen Stämmen erheblich längere Bebrütungszeiten aufgrund der niedrigeren Bebrütungstemperaturen erfordern. Die erfindungsgemäß bevorzugten thermophilen Mikroorganismen sind in der Milchquarkherstellung nicht üblich.

Es können sowohl konventionell gezüchtete als auch tiefgefrorene, konzentrierte, pelletisierte Kulturen verwendet werden.

Geeignete Säuerungstemperaturen liegen im Bereich von 18 bis 48°C; bevorzugt führt man die Säuerung der Sojamilch bei Temperaturen im Bereich von 32 bis 45°C durch.

Das gemäß dem Verfahren der Erfindung erhaltene quarkähnliche Sojaprodukt weist eine einwandfreie Konsistenz auf. Es kann jedoch erwünscht und gegebenenfalls auch vorteilhaft sein, das erhaltene Sojaprodukt vor der Abfüllung zu homogenisieren, um eine glattere Struktur zu erhalten. Bevorzugt erfolgt diese Homogenisierung bei Temperaturen im Bereich von 4 bis 95, insbesondere von 10 bis 80°C; man kann auch eine andere Art der mechanischen Behandlung zur Strukturverbesserung wählen, z.B. durch Einwirkung von Scherkräften. Weiterhin kann das Produkt mit Luft oder Schutzgasen aufgeschlagen werden.

Gemäß einer weiteren vorteilhaften Ausführungsform der Erfindung setzt man den homogenisierten Feststoffen Früchte oder Kräuter, gegebenenfalls jeweils in zubereiteter Form, zu. Selbstverständlich ist es auch möglich, den Sojaerzeugnissen Zucker, Salz oder andere Gewürze oder auch Speisefette zuzusetzen. Dabei ist zu beachten, daß durch diese Zusätze die Zusammensetzung der Produkte, insbesondere im Hinblick auf Trockenmasse und Eiweißgehalt, beeinflußt wird; so wird durch einen Fettzusatz der Feststoffgehalt erhöht und der Eiweißgehalt erniedrigt, wie sich aus der folgenden Aufstellung ergibt (eine Fettstufe von 30 % entspricht einem üblichen, aus Sojamilch ohne Zusätze hergestellten quarkähnlichen Erzeugnis).

Fettgehalt in der Trockenmasse ca.	30 %	40 %	70 %
Trockenmasse	16,61	18,55	30,11
Eiweiß	7,90	7,66	6,23
Fett	5,13	7,42	21,08
Kohlenhydrate	2,78	2,77	2,20
Mineralstoffe (Alle Angaben in Gew.-%)	0,80	0,70	0,60

Die vorstehenden Angaben sind Mittelwerte mehrerer typischer Produkte der Erfindung.

Somit sind bei erfindungsgemäßen Produkten Trockenmassen bis über 30 Gew.-%, insbesondere bis 35 Gew.-%, erreichbar.

Höhere Fettgehalte im Endprodukt lassen sich auch durch eine Auffettung der Sojamilch vor der Säuerung erreichen; hierbei kann die Sojamilch mit Speisefetten auf einen Fettgehalt bis zu 8 % eingestellt werden.

Die Erfindung betrifft weiterhin ein Sojaerzeugnis mit milchquarkähnlichen Eigenschaften hinsichtlich Geschmack, Geruch, Konsistenz und Aussehen sowie mit einer Haltbarkeit in Abwesenheit von Bindemitteln in der quarkähnlichen Phase bei einer Heißabfüllung bzw. einer kalt-aseptischen Arbeitsweise nach dem Erhitzen der gesäuerten Sojamilch bei luftdichter Lagerung bei Umgebungstemperaturen von mindestens 4, insbesondere mindestens 6 Wochen. Die maximale Haltbarkeit unter diesen Bedingungen kann bis zu 3 Monaten und mehr betragen; die Haltbarkeit wird nicht von mikrobiologischen Vorgängen, sondern durch chemisch-physikalische Veränderungen bestimmt. Dies stellt einen wichtigen Unterschied zu Quarkerzeugnissen aus Kuhmilch dar. Diese können mit einer vergleichbaren Haltbarkeit nämlich nur dann hergestellt werden, wenn man ihnen vor der notwendigen Stufe des Erhitzens Bindemittel zusetzt.

Bei der Vergärung der Sojamilch wird im Gegensatz zur Kuhmilch, bei der die Lactose in Milchsäure umgewandelt wird, die Saccharose als Substrat für die Milchsäurebildung von den Mikroorganismen abgebaut. Während der Lactoseanteil in Kuhmilch bei etwa 4,6 % liegt, beträgt der Kohlenhydratanteil in der Sojamilch etwa 1,6 % in Abhängigkeit von den Herstellungsverfahren, wobei die Sojamilch keine Lactose enthält und ihr vor der Vergärung auch keine Lactose zugegeben werden muß.

Bei der traditionellen Herstellung von Kuhmilchquark wird die Ausgangsmilch 2 bis 3 Stunden nach der Kulturzugabe (Vorreifungszeit) mit Lab versetzt, wobei die Bebrütung zwischen 20 und 30°C ca. 15 Stunden lang erfolgt. Eine Labzugabe ist bei dem Verfahren der Erfindung nicht erforderlich.

Gemäß dem Verfahren der Erfindung hat sich nach der Bebrütung der Sojamilch eine feste Gallerte ausgebildet, die anschließend auf 65 bis 95, insbesondere auf 70 bis 90°C erhitzt wird. Die heiße, gesäuerte Sojamilch wird bei dieser Temperatur über einen Düsenseparator gefahren, wobei eine Trennung in eine quarkähnliche Masse mit hohem Eiweißanteil und Serum erfolgt. Anstelle eines Düsenseparators kann auch ein Quarksack oder ein entsprechender Quarkfertiger eingesetzt werden, mit dem sich ähnliche Ergebnisse erzielen lassen. Weiterhin kann die Abtrennung der quarkähnlichen Phase auch durch Ultrafiltration erfolgen.

Bei einer Separierung bei Temperaturen von etwa 30°C, die in der Molkereiindustrie nach dem traditionellen Speisequarkverfahren üblich sind, ist keine einwandfreie Trennung von Sojaeiweiß und Serum zu erzielen; zudem ist ein derartiges Produkt in bezug auf Geschmack, Geruch, Konsistenz und Aussehen unbefriedigend.

Für die Versuche, über die im folgenden berichtet wird, wurde ein Alfa-Laval-Separator, Baujahr 1978, mit einer Separierleistung von 10.000 l/h, bezogen auf gesäuerte Magermilch, und bei Vorversuchen ein Westfalia-Düsenseparator, Typ KNA 3-06-076, mit einer Leistung von 1000 l/h, bezogen auf gesäuerte Magermilch, verwendet. Ähnliche Ergebnisse ließen sich auch in Sackversuchen beim Auspressen anstelle von Separatoren erzielen.

Für eine bessere Übersichtlichkeit werden nachfolgend nur die mit dem Alfa-Laval-Separator erhaltenen Ergebnisse wiedergegeben.

Um eine einwandfreie Trennung quarkähnliches Produkt - Serum zu erhalten, wurde die gesäuerte Sojamilch auf 85°C im Plattenwärmeaustauscher erhitzt und bei dieser Temperatur in den Separator gefördert. Durch die Haubenkühlung des Separators kühlt sich hierbei das Produkt ab, so daß die Austrittstemperatur des Sojaquarks um 70°C liegt.

Mit dem Alfa-Laval-Separator konnte für die Trennung nur mit wesentlich verminderter Zulaufleistung mit 5 bar Gegendruck auf der Serumseite gefahren werden, wobei die folgenden Ergebnisse mit einer Sojamilch von 9,93 % T.S. (Eiweiß 4,24 %, Fett 2,97 %, Kohlenhydrate 2,10 %) erzielt wurden; diese Ergebnisse sind in der folgenden Tabelle zusammengefaßt.

Tabelle 1

Trockenmasse und Eiweißgehalt in Abhängigkeit der Zulaufmenge				
Zulaufmenge	Eiweißgehalt Quark	Eiweißgehalt Serum	T.S. Quark	T.S. Serum
3500 l/h	9,31 %	0,51 %	19,08 %	3,03 %
4000 l/h	11,44 %	0,56 %	21,16 %	2,99 %
4500 l/h	8,44 %	0,50 %	17,46 %	2,98 %
5000 l/h	10,19 %	0,76 %	20,04 %	3,37 %
5500 l/h	11,05 %	0,85 %	21,11 %	3,61 %
6000 l/h	11,37 %	1,13 %	21,92 %	4,20 %

Bei einem anderen Versuch wurde das Ergebnis gemäß Tabelle 2 bei einer Zulaufleistung von 4500 l/h gesäuerter Sojamilch ermittelt.

Tabelle 2

	Eiweiß %	Trockenmasse %
Ausgangsmilch	4,13	9,82
Quark	8,57	17,85
Molke	0,50	3,03

Bei unterschiedlichen Zulaufmengen zum Separator wurde die Zusammensetzung des Sojaquarks und des Serums verändert, so daß man bei Zulaufleistungen zwischen 3500 und 4500 l/h Eiweißwerte im Serum um 0,5 % vorfand. Von 5000 bis 7000 l/h steigt der Eiweißwert über 1 % an; dies ließ sich schon optisch anhand des trüben Serums feststellen.

Der Trockenmassegehalt der Molke verhielt sich analog, d.h. er ist bis zu 4500 l/h konstant und stieg dann an.

Die Versuche haben weiterhin ergeben, daß die Konsistenz des Sojaquarks durch die Zulaufleistung beeinflußt werden kann. Bei der Zulaufmenge von 5500 und 4500 l/h war das Gefüge des Sojaquarks etwas grießig, bei 3.500 und 4.000 l/h wurde ein glatteres Gefüge erzielt.

Bei den Versuchen hat sich weiterhin gezeigt, daß die Separierleistung abhängig von der Temperatur ist. Selbst bei 50°C Ausgangstemperatur am Separator war noch eine Trennung möglich, nur war die Trockensubstanz der quarkähnlichen Masse unbefriedigend, d.h. sie lag hierbei um 12 % T.S.. Eine einwandfreie Trennung bei dem verwendeten

Separator war bei einer Separatorausgangstemperatur von 41°C nicht mehr vorhanden. Bei einer Zulaufmenge von 4500 l/h war in dem ablaufenden Serum bereits schon optisch ein relativ hoher Eiweißanteil zu erkennen (Trübung).

Bei Speisequark aus Kuhmilch wird bei dem Separieren ein Produkt erzielt, das weitestgehend unabhängig von unterschiedlichen Zulaufmengen eine feste Relation von T.S. zu Eiweiß aufweist, wobei der Gesetzgeber in Deutschland 18 % T.S. mit einem Eiweißgehalt von 12 % vorgeschrieben hat.

Bezüglich der Quarkausbeute des Sojaquarks ist im Gegensatz zu den Verfahren der Kuhmilchquarkherstellung ein deutlicher Unterschied zu erkennen. Das schlechteste Verhältnis kg Sojamilcheinsatz : Quark lag bei 3,3 : 1. Bei einer Zulaufmenge von 4500 l/h, bei der das optisch beste Endprodukt und gute Molkeneiweißwerte vorlagen, konnte ein Verhältnis von 2,5 : 1 erzielt werden. Bei der traditionellen Quarkherstellung aus Kuhmilch mit dem Separator liegt das Ausbeuteverhältnis bei 4,8 : 1.

Um dieses Verhältnis zu verbessern, wurde für die Quarkherstellung aus Kuhmilch das Thermoquarkverfahren entwickelt. Hierbei wird durch thermische Vorbehandlung der Ausgangsmilch eine Verbindung von Kasein und Serumproteinen (Copräcipitatbildung) erreicht, wobei weiterhin die gesäuerte Magermilch auf 60°C erhitzt und vor der Separierung auf etwa 40°C gekühlt wird. Hierbei gelangen die Serumproteine während der Separierung mit in die Quarkphase und gehen nicht mit dem Serum verloren. Das Ausbeuteverhältnis liegt bei diesem Verfahren (Magermilch : Quark) bei ca. 4,2 : 1; bei Ultrafiltrationsverfahren liegen ähnliche Verhältnisse vor.

Gemäß dem Verfahren der Erfindung kann der Sojaquark zur Verbesserung der Konsistenz, wie bereits weiter oben ausgeführt wurde, nach der Separierung homogenisiert werden. Hierzu kann der Sojaquark über eine einstufige oder zweistufige Homogenisieranlage gefahren werden. Die Druckeinstellung liegt bei einem einstufigen Homogenisator um 100 bar, bei einem zweistufigen Separator wurden Drücke von 150/50 bar gewählt. Unterbleibt diese Homogenisierung, zeigt der Sojaquark eine leicht grießige Konsistenz. Eine demgegenüber gewünschte Glattheit bzw. verringerte Grießigkeit kann somit über den bzw. die Homogenisierungsdrücke gesteuert werden.

Das quarkähnliche Erzeugnis ist aufschlagfähig, wobei mit einem Aufschlaggerät, Leistung 150 l/h, der Fa. Euro Mix bei einer Produkttemperatur von 8°C und bei 52°C ein Aufschlag von 20 % mit Stickstoff erzielt wurde.

Die Erfindung wird im folgenden anhand von bevorzugten Ausführungsbeispielen näher erläutert.

In den Beispielen wurde der o.g. Alfa-Laval-Separator sowie ein üblicher Homogenisator verwendet.

Beispiel 1.

Sojasaft der oben erwähnten Zusammensetzung mit einem auf 7,3 eingestellten pH-Wert wurde auf 90°C erhitzt und auf 45°C abgekühlt. Anschließend erfolgte die Zugabe einer handelsüblichen Mikroorganismenkultur, bestehend aus Streptococcus thermophilus und Lactobacillus bulgaricus im Verhältnis von etwa 1 : 1 sowie einem Zusatz von 5 % Streptococcus filant; diese Kultur war konventionell weitergezüchtet worden und wurde der Sojamilch in einer Menge von 1 Gew.-% zugesetzt. Anschließend erfolgte die Säuerung bis zu einem pH-Wert von 4,5; dies nahm etwa 18 h in Anspruch.

Die gesäuerte Sojamilch wurde anschließend auf 80°C erhitzt und das Eiweiß von dem Serum durch Separieren abgetrennt. Das erhaltene, quarkähnliche Produkt wurde auf 10°C abgekühlt.

Die nachfolgenden Beispiele wurden im wesentlichen gemäß der in Beispiel 1 beschriebenen Weise durchgeführt, wobei jedoch eine tiefgefrorene, konzentrierte, pelletisierte Kultur, bestehend aus den Mikroorganismen gemäß Beispiel 1, verwendet wurde.

Beispiel 2.

Sojamilch, UHT-erhitzt auf 135°C, pH-Wert eingestellt auf 7,5,
Abkühlung auf 45°C,
Zugabe der Mikroorganismen, 0,02 Gew.-%,
Säuerung bis pH 4,7,
Erhitzen auf 80°C,
Separieren im Düsenseparator,
Homogenisieren, einstufig, 100 bar,
Abfüllen in Verpackungseinheiten,
Abkühlen.

Zur Erleichterung des betrieblichen Ablaufs kann hier auch eine Zwischenstapelung des quarkähnlichen Produktes durchgeführt werden. Hierzu erfolgt nach der Separierung eine Zwischenstapelung bei etwa 6°C. Vor der Homogenisierung wird der Sojaquark wieder auf 80°C erhitzt. Diese Arbeitsweise wird in dem folgenden Beispiel 3 erläutert.

Beispiel 3.

Sojamilch, erhitzt auf 85°C,
Abkühlen auf 40°C,
Zugabe der Mikroorganismen (0,02 Gew.-%) (tiefgefrorene, konzentrierte Kultur),
Säuerung bis pH 4,5,
Erhitzen auf 80°C,
Separieren im Düsenseparator,
Kühlen des Produktes auf 6°C,
Zwischenstapeln,
Erhitzen auf 80°C,
Homogenisieren, zweistufig bei 150/50 bar,
Abfüllen,
Abkühlen.

Das Produkt kann vor dem Abfüllen in der oben erläuterten Weise aufgeschlagen werden.

Das Homogenisieren des quarkähnlichen Sojaproduktes kann auch in kaltem Zustand oder nach einer Erwärmung auf 30°C erfolgen, so daß nach dem Homogenisieren für die Haltbarkeitsverlängerung die Erhitzung auf eine Temperatur von vorzugsweise über 65°C erfolgt.

Bei der Homogenisierung vor der Zwischenstapelung, bei sonst unverändertem Verfahrensplan, erhält man ein Endprodukt, welches sowohl optisch als auch organoleptisch leicht grießig ist, vgl. das folgende Beispiel 4.

Beispiel 4.

Sojamilch, erhitzt auf 90°C,
Abkühlen auf 45°C,
Zugabe der Mikroorganismen (0,02 %) (tiefgefrorene, konzentrierte Kultur),
Säuerung bis pH 4,4,
Erhitzen auf 80°C,
Separieren im Düsenseparator,
Kühlen des quarkähnlichen Produktes auf 30°C,
Homogenisieren bei 30°C, einstufig, 60 bar,
Zwischenstapeln bei 6°C,
Erhitzen auf 68°C,
Abfüllen,
Abkühlen auf 8°C.

Vor bzw. nach der Erhitzung kann die Zugabe einer Frucht- bzw. Kräuterzubereitung erfolgen, wobei auch eine kaltaseptische Abfüllung zur Haltbarkeitsverlängerung neben der Heißabfüllung durchgeführt werden kann.

Der Anteil der Fruchtzubereitung liegt bei natürlicher Süße zwischen 18 und 25 % und bei einer Standardfruchtzubereitung bei 14 bis 18 %, wobei hier noch mit Zucker oder Zuckeraustauschstoffen oder Süßstoffen nachgesüßt werden kann. Bei den Kräutersojaquarkzubereitungen werden dem Quark 2 bis 22 % Kräuter bzw. Kräuterzubereitung zudosiert.

Sojaquark und Frucht- oder Kräuterzubereitungen werden vermischt und zusammen auf 70°C erhitzt. Der Frucht/Kräutersojaquark kann direkt bei 70°C oder kaltaseptisch abgefüllt, versiegelt und anschließend auf 4 bis 6°C abgekühlt werden; dies zeigen die folgenden Beispiele 5 und 6.

Beispiel 5.

Sojamilch, erhitzt auf 90°C,
Abkühlen auf 45°C,
Zugabe der Mikroorganismen (0,02 Gew.-%) (tiefgefrorene, konzentrierte Kultur),
Säuerung bis pH 4,5,
Erhitzen auf 80°C,
Separieren im Düsenseparator,
Kühlen des quarkähnlichen Produktes auf 6°C,
Zwischenstapeln,
Anwärmen auf 30°C,
Homogenisieren, zweistufig, 100/100 bar,

Zugabe der Frucht- oder Kräuterzubereitung,
Erhitzen auf 70°C,
Abfüllen, Verschließen und Abkühlen.

Bei Beispiel 6 kann die Abfüllung zusätzlich unter sterilen Bedingungen erfolgen, damit eine Haltbarkeitsverlängerung gegeben ist. Hierbei sollte der Verfahrensweg nach dem zweiten Erhitzen auf 80°C reinfektionsfrei ausgelegt werden.

Beispiel 6.

Sojamilch, erhitzt auf 80°C,
Abkühlen auf 40°C,
Zugabe der Mikroorganismen (0,02 Gew.-%), (tiefgefrorene, konzentrierte Kultur),
Säuerung bis pH 4,7,
Erhitzen auf 80°C,
Separieren im Düsenseparator,
Kühlen des quarkähnlichen Produktes auf 6°C,
Zwischenstapeln,
Anwärmen auf 30°C,
Homogenisieren bei 30°C,
Abkühlen auf unter 10°C,
Zugabe der Frucht- oder Kräuterzubereitung,
kaltaseptische Abfüllung.

Patentansprüche

1. Verfahren zur Herstellung eines quarkähnlichen Produktes aus Sojamilch, gekennzeichnet durch die Schritte

   a) chemische oder mikrobiologische Säuerung von Sojamilch bis zum Erreichen eines pH-Wertes im Bereich von 4,2 bis 4,9, und

   b) Erhitzen des gemäß Stufe a) erhaltenen, gesäuerten Produktes auf eine Temperatur im Bereich von 65 bis 95°C, insbesondere 70 bis 90°C, und

   c) Abtrennung einer quarkähnlichen, einen Eiweißgehalt im Bereich von 6,0 bis 12,0, insbesondere von 8,4 bis 11,5 Gew.-%, aufweisenden Phase in dem genannten Temperaturbereich.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß man die Sojamilch vor der Säuerung auf Temperaturen im Bereich von 70 bis 145°, insbesondere 85 bis 142°C erhitzt und auf die Temperatur des Säuerungsschrittes abkühlt.

3. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß man organoleptisch verträgliche Säuren und/oder Glucono-delta-lacton als chemisches Säuerungsmittel verwendet.

4. Verfahren nach Anspruch 1 oder 2, dadurch gekennzeichnet, daß man für die mikrobiologische Säuerung mesophile oder thermophile, Kohlenhydrate abbauende Mikroorganismen verwendet.

5. Verfahren nach Anspruch 4, dadurch gekennzeichnet, daß man für die mikrobiologische Säuerung Streptococcus thermophilus und/oder Lactobacillus bulgaricus verwendet.

6. Verfahren nach mindestens einem der Ansprüche 1 bis 5, dadurch gekennzeichnet, daß man die Säuerung der Sojamilch bei einer Temperatur im Bereich von 32 bis 45°C durchführt.

7. Verfahren nach mindestens einem der Ansprüche 1 bis 6, dadurch gekennzeichnet, daß man das abgetrennte quarkähnliche Produkt homogenisiert.

8. Verfahren nach mindestens einem der Ansprüche 1 bis 7, dadurch gekennzeichnet, daß man die Homogenisierung der Feststoffe bei Temperaturen im Bereich von 10 bis 95, insbesondere von 30 bis 80°C, durchführt.

9. Verfahren nach mindestens einem der Ansprüche 1 bis 8, dadurch gekennzeichnet, daß man das quarkähnliche Produkt mit Luft oder Schutzgasen aufschlägt.

10. Verfahren nach mindestens einem der Ansprüche 1 bis 9, dadurch gekennzeichnet, daß man dem homogenisierten Produkt Früchte oder Kräuter, gegebenenfalls jeweils in zubereiteter Form, zusetzt.

11. Sojaerzeugnis mit milchquarkähnlichen Eigenschaften hinsichtlich Geschmack, Geruch, Konsistenz und Aussehen sowie mit einer Haltbarkeit in Abwesenheit von Bindemitteln in der quarkähnlichen Phase bei einer Heißabfüllung bzw. einer kalt-aseptischen Arbeitsweise nach dem Erhitzen der gesäuerten Sojamilch bei luftdichter Lagerung bei Umgebungstemperaturen von mindestens 4, insbesondere mindestens 6 Wochen, erhältlich durch ein Verfahren nach mindestens einem der Ansprüche 1 bis 10.

Claims

1. A method for the preparation of a curd-like product from soya milk, characterised by the steps of

   a) chemical or microbiological souring of soya milk until reaching a pH value in the range of from 4.2 to 4.9, and

   b) heating the soured product obtained according to step a) to a temperature in the range of from 65 to 95°C, in particular from 70 to 90°C, and

   c) separation of a curd-like phase having an albumen content in the range of from 6.0 to 12.0, in particular from 8.4 to 11.5 % by weight, in said temperature range.

2. A method according to Claim 1, characterised in that, before the souring, the soya milk is heated to temperatures in the range of from 70 to 145°, in particular 85 to 142°C, and is cooled to the temperature of the souring step.

3. A method according to Claim 1 or 2, characterised in that organoleptically compatible acids and/or glucono-delta-lacton are used as the chemical souring agent.

4. A method according to Claim 1 or 2, characterised in that mesophilic or thermophilic microorganisms, which decompose carbohydrates, are used for the microbiological souring.

5. A method according to Claim 4, characterised in that Streptococcus thermophilus and/or Lactobacillus bulgaricus are used for the microbiological souring.

6. A method according to any one of Claims 1 to 5, characterised in that the souring of the soya milk is carried out at a temperature in the range of from 32 to 45°C.

7. A method according to any one of Claims 1 to 6, characterised in that the separated curd-like product is homogenised.

8. A method according to any one of Claims 1 to 7, characterised in that the homogenisation of the solids is carried out at temperatures in the range of from 10 to 95, in particular from 30 to 80°C.

9. A method according to any one of Claims 1 to 8, characterised in that the curd-like product is acted upon with air or protective gases.

10. A method according to any one of Claims 1 to 9, characterised in that fruit or herbs, optionally each in a prepared form, are added to the homogenized product.

11. A soya product with milk curd-like properties in respect of taste, smell, consistency and appearance, and with a keeping quality, in the absence of binding agents, in the curd-like phase with hot filling or a cold-aseptic mode of operation after the heating of the soured soya milk under air-tight storage at ambient temperature of at least 4 weeks, in particular 6 weeks, which can be obtained in accordance with at least one method of Claims 1 to 10.

Revendications

1. Procédé pour la fabrication d'un produit de type caillé à partir de lait de soja, caractérisé par les étapes suivantes:

a) acidification chimique ou microbiologique de lait de soja jusqu'à l'obtention d'un pH dans la plage de 4,2 à 4,9, et

b) chauffage du produit acidifié, obtenu selon l'étape a), à une température dans la plage allant de 65 à 95°C, en particulier de 70 à 90°C, et

c) séparation d'une phase de type caillé, présentant une teneur en protéines dans la plage allant de 6,0 à 12,0, en particulier de 8,4 à 11,5 % en poids, dans la plage de températures indiquée.

2. Procédé selon la revendication 1, caractérisé en ce que, avant l'acidification, on chauffe le lait de soja à des températures dans la plage allant de 70 à 145°, en particulier de 85 à 142°C, et on le refroidit jusqu'à la température de l'étape d'acidification.

3. Procédé selon la revendication 1 ou 2, caractérisé en ce que l'on utilise comme agent d'acidification chimique des acides organoleptiquement acceptables et/ou la glucono-δ-lactone.

4. Procédé selon la revendication 1 ou 2, caractérisé en ce que, pour l'acidification microbiologique, on utilise des micro-organismes mésophiles ou thermophiles, dégradant les glucides.

5. Procédé selon la revendication 4, caractérisé en ce que, pour l'acidification microbiologique, on utilise *Streptococcus thermophilus* et/ou *Lactobacillus bulgaricus.*

6. Procédé selon au moins l'une des revendications 1 à 5, caractérisé en ce que l'on effectue l'acidification du lait de soja à une température dans la plage allant de 32 à 45°C.

7. Procédé selon au moins l'une des revendications 1 à 6, caractérisé en ce que l'on homogénéise le produit de type caillé séparé.

8. Procédé selon au moins l'une des revendications 1 à 7, caractérisé en ce que l'on effectue l'homogénéisation des substances solides à des températures dans la plage allant de 10 à 95, en particulier de 30 à 80°C.

9. Procédé selon au moins l'une des revendications 1 à 8, caractérisé en ce que l'on fait monter le produit de type caillé avec de l'air ou des gaz protecteurs.

10. Procédé selon au moins l'une des revendications 1 à 9, caractérisé en ce que l'on ajoute au produit homogénéisé des fruits ou des herbes, éventuellement chacun sous forme préparée.

11. Produit à base de soja, présentant des propriétés de type caillé de lait eu égard au goût, à l'odeur, à la consistance et à l'aspect, ainsi qu'une aptitude à la conservation en absence de liants dans la phase de type caillé, dans le cas d'un remplissage à chaud ou d'un mode opératoire aseptique-froid après le chauffage du lait de soja acidifié, avec un stockage à l'abri de l'air et aux températures ambiantes, d'au moins 4 semaines, en particulier d'au moins 6 semaines, pouvant être obtenu selon au moins un procédé des revendications 1 à 10.

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(54) Caillé à base de lait végétal fermenté et procédé de fabrication d'un tel caillé

(57) L'invention concerne un produit alimentaire de type fromage à base de lait végétal fermenté.

Ce produit alimentaire est caractérisé en ce qu'il est constitué d'un caillé de lait végétal fermenté, pré-affiné, présentant un taux de matières sèches rapporté au poids total du produit compris entre 12 et 18 %, de préférence compris entre 14 et 16 % et une teneur en sel rapporté exprimée en poids au poids total du produit comprise entre 0,5 % et 2 %, de préférence entre 1 % et 1,5 %, ce caillé ayant été éventuellement soumis à une étape de transformation par mise en forme et/ou par un affinage supplémentaire.

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Description

[0001] La présente invention concerne un produit alimentaire de type fromage, une matrice fromagère et un caillé à base de lait végétal fermenté ainsi qu'un procédé de fabrication d'un tel caillé.

[0002] Le lait végétal est utilisé dans l'industrie agroalimentaire depuis de nombreuses années. Un progrès important a été fait dans les années 1990 suite à la mise au point d'un procédé de fermentation de lait végétal décrit notamment dans le brevet EP-A-0.521.331. Ce brevet concerne en effet un procédé de fermentation de lait de soja utilisant un inoculum à base d'au moins deux souches spécifiques de Lactococcus conduisant à des produits à texture de type yaourt. De tels produits sont toutefois inutilisables en tant que substitut de fromage.

[0003] Un autre brevet, à savoir le brevet GB-A-1.356.363, décrit quant à lui un procédé de fabrication de produits alimentaires résultant de la fermentation lactique de lait de soja dans lequel il est nécessaire, après fermentation, de mettre en oeuvre une étape de chauffage du produit obtenu. Ces produits ne présentent pas cependant les qualités organoleptiques souhaitées et présentent une odeur et un goût végétal désagréables.

[0004] Les caractéristiques de l'égouttage qui ne peuvent constituer un pré-affinage, et du couple taux de matières sèches/concentration en sel ne permettent pas l'obtention d'un produit neutre dont les caractéristiques organoleptiques seraient assimilables à celles des produits issus de lait d'origine animale. D'autres exemples de préparation de produits alimentaires sont notamment décrits dans les brevets US-3.944.676, US-6.254.900 et US-5.597.594.

[0005] Un but de la présente invention est donc de proposer un nouveau produit alimentaire de type fromage ainsi qu'une matrice fromagère et un caillé de lait végétal dont les caractéristiques organoleptiques en font des produits neutres et fermes assimilables aux fromages traditionnels obtenus à partir de lait d'origine animale.

[0006] Un autre but de la présente invention est de proposer un caillé de lait végétal apte à être soumis à des étapes de transformation pour permettre l'obtention de toutes les formes de fromages fabriqués aujourd'hui à partir de lait d'origine animale.

[0007] A cet effet, l'invention a pour objet un produit alimentaire de type fromage à base de lait végétal fermenté, caractérisé en ce qu'il est constitué d'un caillé de lait végétal fermenté, pré-affiné, présentant un taux de matières sèches rapporté au poids total du produit compris entre 12 et 18 %, de préférence compris entre 14 et 16 % et une teneur en sel exprimée en poids rapporté au poids total du produit comprise entre 0,5 % et 2 %, de préférence entre 1 % et 1,5 %, ce caillé ayant été éventuellement soumis à une étape de transformation par mise en forme et/ou par un affinage supplémentaire.

[0008] L'invention a encore pour objet une matrice fromagère à base de lait végétal fermenté, pré-affiné, caractérisée en ce qu'elle est constituée d'un caillé de lait végétal pré-affiné présentant un taux de matières sèches rapporté au poids total de la matrice compris entre 12 et 18 %, de préférence compris entre 14 et 16 % et une teneur en sel exprimée en poids rapporté au poids total de la matrice comprise entre 0,5 % et 2 %, de préférence entre 1 % et 1,5 %.

[0009] L'invention a encore pour objet un caillé de lait végétal fermenté pour l'obtention de la matrice ou du produit de type fromage décrits ci-dessus, caractérisé en ce qu'il est constitué de lait végétal ensemencé en ferments lactiques et laissé à fermenter en présence d'adjuvants à la fermentation incluant au moins des sels de calcium et/ou de magnésium.

[0010] L'invention a encore pour objet un procédé de fabrication d'un caillé de lait végétal fermenté à texture ferme du type décrit ci-dessus, notamment pour l'obtention d'une matrice fromagère, caractérisé en ce qu'il comporte au moins une étape consistant à ensemencer du lait végétal en ferments lactiques puis à laisser à fermenter en présence d'adjuvants à la fermentation incluant au moins des sels de calcium et/ou de magnésium.

[0011] Les étapes d'égouttage et de pré-affinage sont des étapes fondamentales pour obtenir un produit alimentaire de type fromage à texture neutre et ferme dont les propriétés organoleptiques peuvent être assimilées à celles obtenues à partir de lait d'origine animale.

[0012] On note que la mise en oeuvre de sel de calcium ou de magnésium pendant la fabrication du caillé permet l'obtention de cette texture ferme. L'étape de salage qui s'opère après l'affinage permet quant à elle d'obtenir une matrice fromagère stable apte à une utilisation en l'état sous forme de fromage frais ou sous forme de fromage obtenu après des traitements supplémentaires d'affinage et de transformation.

[0013] L'invention sera bien comprise à la lecture de la description suivante d'exemples de réalisation.

[0014] Comme mentionné ci-dessus, l'objet de l'invention est d'obtenir un produit alimentaire de type fromage à base de lait végétal fermenté. Ce produit alimentaire de type fromage est constitué d'un caillé de lait végétal fermenté, pré-affiné, présentant un taux de matières sèches exprimé en poids rapporté au poids total du produit compris entre 12 et 18 %, de préférence compris entre 14 et 16 %, et une teneur en sel exprimée en poids rapporté en poids total du produit comprise entre 0,5 % et 2 %, de préférence entre 1 % et 1,5 %. On parlera de produit alimentaire de type fromage plus particulièrement lorsque ce caillé égoutté et pré-affiné aura été soumis à une étape supplémentaire de transformation par mise en forme et/ou par un affinage supplémentaire. On parlera de matrice fromagère à base de lait végétal fermenté préalablement à toute étape de mise en forme. Les étapes de mise en forme seront plus particulièrement décrites dans les exemples fournis ci-après.

[0015] Pour permettre l'obtention de tels produits alimentaires de type fromage à base de lait végétal fermenté, il est nécessaire d'obtenir au départ un caillé de lait végétal fermenté. Ce caillé de lait végétal est constitué de lait végétal ensemencé en ferments lactiques et laissé à fermenter en présence d'adjuvants à la fermentation incluant au moins des sels de calcium et/ou de magnésium. Ce lait végétal devant être ensemencé en ferments présente une teneur en protéines, exprimée en poids, rapporté au poids total du lait, supérieure à 3,6 %, de préférence entre 4 et 5 %, une teneur en matières grasses inférieure à 3 %, de préférence entre 1,5 et 2,5 % et un pH compris entre 6 et 6,8. Cette matière première, lorsqu'il s'agit de soja, est préparée par les techniques traditionnelles à partir de fèves de soja et d'eau puis éventuellement pasteurisée et/ou stérilisée.

[0016] Les ferments lactiques utilisés pour la réalisation de l'inoculum sont constitués d'au moins trois souches de ferments lactiques, tels que Lactoccocus lactis subsp. lactis, Lactoccocus lactis subsp. Cremoris et Lactoccocus lactis subsp. Lactis var. diacetylactis. Les adjuvants de fermentation incluent quant à eux en outre une source d'hydrates de carbone, en particulier de monosaccharides, du potassium, du sodium et éventuellement un mélange végétal à base d'extraits de levure et d'huile végétale. A titre d'exemple, il peut être ajouté à du lait, 0,01 % d'un mélange spécifique de ferments tel que décrit ci-dessus, 2,7 % de fructose cristallisé ou du concentrât de pommes qui vont permettre, par cet apport de monosaccharides, le développement des ferments, 0,14 % de sel marin, dont les ions sodium et potassium favorisent la fermentation, 0,60 % de sulfate de calcium, qui permettront de générer un caillé à texture ferme de type base fromagère et éventuellement 0,1 % de bouillon végétal composé principalement d'extraits de levures et d'huile de tournesol dans le but de favoriser la pousse des ferments.

[0017] Les sels de calcium et/ou de magnésium, introduits en tant qu'adjuvant de fermentation, sont des sels solubles dans l'eau et représentent de 0,40 à 0,80 % en poids, de préférence 0,60 % en poids par rapport à la quantité totale de lait nécessaire à la fabrication. Les ferments lactiques sont quant à eux ajoutés dans une proportion correspondant en poids à 0,005 à 0,015 %, de préférence à 0,01 % du poids total de lait nécessaire à la fabrication.

[0018] Préalablement à cette étape, qui consiste à ensemencer du lait végétal en ferments lactiques puis à fermenter en présence d'adjuvants à la fermentation incluant au moins des sels de calcium et/ou de magnésium, il est nécessaire de chauffer le lait végétal conservé à froid jusqu'à une température inférieure à 20°C. Lorsque cette température est atteinte, les adjuvants de fermentation puis les ferments peuvent être ajoutés. On maintient ensuite la température voisine de 20°C pendant toute la durée de fermentation. La fermentation est interrompue par abaissement de température lorsque le pH du lait est inférieur ou égal à 4,6.

[0019] Une fois l'étape de fermentation achevée, le caillé obtenu est alors soumis à une étape d'égouttage en vue de l'obtention d'un caillé présentant un taux de matière sèche compris entre 12 et 18 %, de préférence compris entre 14 et 16 %. Bien évidemment, l'étape d'assèchement du caillé par élimination du sérum en vue d'obtenir un taux de matières sèches prédéterminé peut être obtenu par un autre mode de mise en oeuvre que l'égouttage même si l'égouttage constitue un mode de réalisation préféré. L'étape d'égouttage s'effectue de préférence à une température inférieure à 10°C, de préférence comprise entre 4°C et 6°C, pendant une période de 2 à 10 jours, de préférence voisine de 4 jours en vue d'obtenir un pré-affinage du caillé dont le taux de matières sèches est maintenu entre 12 et 18 %, de préférence compris entre 14 et 16 %.

[0020] Une fois cette étape de pré-affinage achevée, on ajoute au caillé égoutté et pré-affiné, du sel dans une proportion comprise entre 0,5 et 2 %, de préférence comprise entre 1 et 1,5 % puis on soumet le caillé additionné de sel à un brassage en vue de l'obtention d'une matrice fromagère stable. Cette matrice fromagère stable constitue le produit commun à tous les produits de type fromage à base de lait végétal fermenté qui peuvent être obtenus dans le cadre de l'invention. On pourra obtenir ainsi des fromages frais, des fromages à pâte molle, des fromages à pâte persillée, des fromages à pâte pressée cuite, des fromages à pâte pressée non cuits, etc. qui présenteront des caractéristiques qualitatives (texture, aromatisation naturelle, goût) très proches de celles des fromages traditionnels. La matrice fromagère de base présente quant à elle des caractéristiques et des propriétés organoleptiques très proches de celles des fromages frais de chèvre.

[0021] Ainsi, à titre d'exemple, il est décrit ci-après la préparation d'affiné de soja frais qui peut être considéré comme un produit équivalent aux fromages frais de chèvre. Sa fabrication comprend les étapes suivantes. La matrice fromagère obtenue ci-dessus est mise en moule à raison d'environ 8 kg pour une plaque de 40 petits moules. L'ensemble est stocké à 5°C pendant deux jours puis démoulé. Il est procédé à un affinage complémentaire à 5°C pendant 4 jours et à un ajustement du poids de chaque affiné à 120 grammes. Des condiments, tels que poivre, ciboulette, échalote, etc. sont éventuellement additionnés en surface du produit. Le produit est conditionné puis stocké à 5°C jusqu'à sa commercialisation. Ces produits ont une durée de vie, à l'état réfrigéré, de l'ordre de 4 semaines. Cet affiné frais peut aussi être préparé à la grecque sous forme de petits cubes et conservé dans de l'huile avec des condiments à la manière de la fêta.

[0022] L'exemple ci-après concerne plus particulièrement la préparation de tommes affinées de soja. Ce produit est fabriqué selon une technologie très voisine de celle des fromages pressés à pâte non cuite telle que la tomme de chèvre ou de vache, le St Nectaire, le St Paulin, la raclette, la mimolette, le cheddar, etc. Le pro-

cédé d'obtention d'une telle tomme affinée de soja inclut les étapes suivantes. A nouveau, la matrice fromagère décrite ci-dessus est mise en moule à raison d'environ 1,9 kg/moule. Le moule est mis sous presse pendant 5 heures à 5°C avec augmentation progressive de la pression de 0,5 bars à 4 bars. L'ensemble est démoulé pour obtenir une masse de la tomme voisine de 1,6 kg. On procède ensuite à un affinage en hâloir à 5°C pendant 2 semaines avec un retournement des tommes tous les deux jours, puis tous les quatre jours et un saumurage de la face supérieure par pulvérisation d'eau salée saturée. La tomme obtenue présente une masse voisine de 1,2 kg. Cette tomme est conditionnée puis stockée à 5°C jusqu'à commercialisation. Les tommes peuvent être commercialisées entières ou en portions et ont une durée de vie, à l'état réfrigéré, de l'ordre de 8 semaines.

[0023] L'exemple décrit ci-après concerne quant à lui un procédé de fabrication de bleu affiné de soja. Ce produit est fabriqué selon une technologie équivalente à celle des fromages à pâte persillée de type roquefort, bleu d'Auvergne, Fourme d'Ambert, Gorgonzola, etc. Ce procédé de fabrication comprend à nouveau une étape de mise en moule de la matrice fromagère issue du procédé décrit ci-dessus à raison d'environ 1,9 kg par moule. Ces moules sont mis sous presse pendant 5 heures à 5°C avec augmentation progressive de la pression de 0,5 bars à 4 bars. Les moules sont démoulés pour obtenir une masse de la tomme voisine de 1,6 kg. On procède ensuite à une micro-injection de souches Penicillium roqueforti puis on affine en hâloir à 10°C pendant 4 semaines. On observe alors un développement des moisissures internes. On conditionne le produit puis on le stocke à 5°C jusqu'à commercialisation.

[0024] L'exemple décrit ci-après concerne quant à lui un exemple de préparation de meule affinée de soja. Les meules affinées de soja sont fabriquées selon une technologie très voisine de celle des fromages pressés à pâte cuite, tels que Gruyère, Comté, Beaufort, Emmental, Fribourg, Parmesan, etc. Ces produits peuvent être présentés sous forme de meules, de portions, de tranchettes, de mini-meules ou de râpés. Le procédé d'obtention d'un tel produit inclut une étape de préparation à froid dans une plage de température comprise entre 6 et 14°C d'une mêlée dans laquelle la matrice fromagère décrite ci-dessus est mélangée à de l'amidon de blé, des carraghénanes et du bicarbonate de sodium. Les proportions respectives des différents ingrédients sont les suivantes :

- matrice fromagère : 88,81 %
- amidon de blé 10,18 %
- carraghénanes 0,81 %
- bicarbonate de sodium 0,20 %

[0025] Il est ensuite procédé à un embossage de la mêlée dans des boyaux de petit diamètre, par exemple de 60 mm pour des mini-meules, ou de grand diamètre, tel qu'un diamètre de 120 mm pour des meules et des blocs à trancher ou à râper. Ces boyaux sont moulés pour obtenir la forme voulue puis sont cuits pendant deux heures et demie à 85°C. Les moules sont ensuite refroidis puis stockés au froid à une température comprise entre 0 et 6°C pendant 24 heures minimum. Il est ensuite procédé à un démoulage et à un tranchage à l'épaisseur désirée avant un conditionnement en sachet. Les sachets peuvent ensuite être pasteurisés avec un palier de 35 minutes à 90°C. Les produits sont ensuite stockés à une température comprise entre 0 et 4°C jusqu'à commercialisation de ces derniers. Ainsi, les meules et mini-meules obtenues peuvent être commercialisées entières, en portions, en tranchettes ou sous forme de râpés et ont une durée de vie à l'état réfrigéré de l'ordre de quatre mois.

[0026] Les exemples ci-dessus illustrent la possibilité de transformer la matrice fromagère obtenue en de nombreux produits de type fromager en adaptant les techniques traditionnelles de la fromagerie. La qualité des produits obtenus en terme de texture et de goût est supérieure à celle des succédanés de fromage à base de soja présent actuellement sur le marché.

Revendications

1. Produit alimentaire de type fromage à base de lait végétal fermenté,
   caractérisé en ce qu'il est constitué d'un caillé de lait végétal fermenté, pré-affiné, présentant un taux de matières sèches, rapporté au poids total du produit, compris entre 12 et 18 %, de préférence compris entre 14 et 16 %, et une teneur en sel exprimée en poids rapporté au poids total du produit comprise entre 0,5 % et 2 %, de préférence entre 1 % et 1,5 %, ce caillé ayant été éventuellement soumis à une étape de transformation par mise en forme et/ou par un affinage supplémentaire.

2. Matrice fromagère à base de lait végétal fermenté, **caractérisée en ce qu'**elle est constituée d'un caillé de lait végétal, fermenté, pré-affiné, présentant un taux de matières sèches rapporté au poids total de la matrice compris entre 12 et 18 %, de préférence compris entre 14 et 16 % et une teneur en sel exprimée en poids, rapporté au poids total de la matrice, comprise entre 0,5 % et 2 %, de préférence entre 1 % et 1,5 %.

3. Matrice fromagère selon la revendication 2, **caractérisée en ce que** le lait végétal fermenté est pré-affiné par stockage à froid à une température inférieure à 10°C, de préférence comprise entre 4°C et 6°C, pendant une période de 2 à 10 jours, de préférence voisine de 4 jours.

4. Caillé de lait végétal fermenté pour l'obtention d'une matrice fromagère de type fromage ou d'un produit conforme à l'une des revendications 1 à 3, **caractérisé en ce qu'**il est constitué de lait végétal ensemencé en ferments lactiques et laissé à fermenter en présence d'adjuvants à la fermentation incluant au moins des sels de calcium et/ou de magnésium.

5. Caillé selon la revendication 4, **caractérisé en ce que** le lait végétal devant être ensemencé en ferments présente une teneur en protéines, exprimée en poids, rapporté au poids total du lait, supérieure à 3,6 %, de préférence entre 4 et 5 %, une teneur en matières grasses inférieure à 3 %, de préférence entre 1,5 et 2,5 %, et un pH compris entre 6 et 6,8.

6. Caillé selon l'une des revendications 4 et 5, **caractérisé en ce que** les ferments lactiques sont constitués d'au moins trois souches de ferments lactiques, tels que Lactoccocus lactis subsp. lactis, Lactoccocus lactis subsp. Cremoris et Lactoccocus lactis subsp. Lactis var. diacetylactis.

7. Caillé selon l'une des revendications 4 à 6, **caractérisé en ce que** les adjuvants de fermentation incluent en outre une source d'hydrates de carbone, en particulier de monosaccharides, du potassium, du sodium et éventuellement un mélange végétal à base d'extraits de levure et d'huile végétale.

8. Caillé selon l'une des revendications 4 à 7, **caractérisé en ce que** les sels de calcium et/ou de magnésium sont des sels solubles dans l'eau et représentent de 0,40 à 0,80 % en poids, de préférence 0,60 % en poids, par rapport à la quantité totale de lait nécessaire à la fabrication.

9. Caillé selon l'une des revendications 4 à 8, **caractérisé en ce que** les ferments lactiques sont ajoutés dans une proportion correspondant en poids, à 0,005 à 0,015 %, de préférence à 0,01 %, du poids total de lait nécessaire à la fabrication.

10. Procédé de fabrication d'un caillé de lait végétal fermenté à texture ferme conforme à l'une des revendications 4 à 9, notamment pour l'obtention d'une matrice fromagère conforme à l'une des revendications 2 et 3, **caractérisé en ce qu'**il comporte au moins une étape consistant à ensemencer du lait végétal en ferments lactiques puis à laisser à fermenter en présence d'adjuvants à la fermentation incluant au moins des sels de calcium et/ou de magnésium.

11. Procédé de fabrication selon la revendication 10, **caractérisé en ce qu'**il consiste, préalablement à l'ensemencement, à chauffer le lait végétal conservé à froid jusqu'à une température inférieure à 20°C, à rajouter les adjuvants de fermentation puis les ferments, et à maintenir la température voisine de 20°C, pendant toute la durée de fermentation

12. Procédé de fabrication selon l'une des revendications 10 et 11, **caractérisé en ce qu'**il consiste à interrompre la fermentation par abaissement de température lorsque le pH du lait est inférieur ou égal à 4,6.

13. Procédé de fabrication selon l'une des revendications 10 à 12, **caractérisé en ce qu'**il consiste à soumettre le caillé obtenu à l'issue de la fermentation à une étape d'égouttage en vue de l'obtention d'un caillé présentant un taux de matière sèche compris entre 12 % et 18 %, de préférence compris entre 14 et 16 %.

14. Procédé de fabrication selon la revendication 13, **caractérisé en ce qu'**il consiste à égoutter le caillé à une température inférieure à 10°C, de préférence comprise entre 4°C et 6°C pendant une durée de 2 à 10 jours, de préférence voisine de 4 jours, en vue d'obtenir un pré-affinage du caillé dont le taux de matières sèches est compris entre 12 et 18 %, de préférence compris entre 14 et 16 %.

15. Procédé de fabrication selon l'une des revendications 13 et 14, **caractérisé en ce qu'**il consiste à ajouter au caillé égoutté et pré-affiné du sel, dans une proportion comprise entre 0,5 % et 2 %, de préférence comprise entre 1 % et 1,5 %, et à soumettre le caillé additionné de sel à un brassage en vue de l'obtention d'une matrice fromagère stable.

Office européen des brevets

RAPPORT DE RECHERCHE EUROPEENNE

Numéro de la demande
EP 04 29 2633

DOCUMENTS CONSIDERES COMME PERTINENTS

Catégorie	Citation du document avec indication, en cas de besoin, des parties pertinentes	Revendication concernée	CLASSEMENT DE LA DEMANDE (Int.Cl.7)
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Lieu de la recherche	Date d'achèvement de la recherche	Examinateur
La Haye	26 janvier 2005	Desmedt, G

CATEGORIE DES DOCUMENTS CITES

X : particulièrement pertinent à lui seul
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O : divulgation non-écrite
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2

ANNEXE AU RAPPORT DE RECHERCHE EUROPEENNE RELATIF A LA DEMANDE DE BREVET EUROPEEN NO. EP 04 29 2633

La présente annexe indique les membres de la famille de brevets relatifs aux documents brevets cités dans le rapport de recherche européenne visé ci-dessus.
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26-01-2005

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Pour tout renseignement concernant cette annexe : voir Journal Officiel de l'Office européen des brevets, No.12/82

Espacenet

Bibliographic data: JP2009171877 (A) — 2009-08-06

METHOD FOR PRODUCING PURE VEGETABLE CHEESE-LIKE FOOD PRODUCT

Inventor(s): SASAKI TOSHIO; KITANO FUMIYO ± (SASAKI TOSHIO, ; KITANO FUMIYO)

Applicant(s): SASAKI TOSHIO ± (SASAKI TOSHIO)

Classification: **- international:** ***A23C20/02; A23L11/00***
- cooperative:

Application number: JP20080012318 20080123

Priority number (s): JP20080012318 20080123

Abstract of JP2009171877 (A)

PROBLEM TO BE SOLVED: To provide a method for producing a pure vegetable cheese-like food product, which is intended for solving such problems that a conventional vegetable cheese-like food product using lactic acid bacterium or Bacillus natto has defects of being unable to adjust sour taste and eliminate natto smell, and mixing of dairy products such as cream and cheese has been a mainstream for improvement of flavor, and there is only a product which continues use of a vegetable raw material or vegetable oil or fat. ;SOLUTION: This method for producing the pure vegetable cheese-like food product includes using butyric acid bacteria for fermentation, which produce butyric acid as one component of cheese smell, producing curds by long time fermentation, and filtering a solid part and a liquid part using gauze without using a coagulating agent such as rennet so as to obtain a solid concentrating on protein. As a result of this, the pure vegetable cheese-like food product which is not inferior in flavor and does not contain a food additive or a flavoring agent at all can be supplied to a person who has an allergy to dairy products, an obesity person, or a person who aims at a diet. ;COPYRIGHT: (C)2009,JPO&INPIT

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(54)【発明の名称】純植物性チーズ様食品の製造法

(57)【要約】

【課題】従来の植物性チーズ様食品は、乳酸菌や納豆菌を使用したものであり、酸味の調整やナットウ臭の消去が出来ない、などの欠点があり、風味の改良のために、乳製品のクリームやチーズの混合が主流となり植物性の原料または植物性の油脂を使用している、というにとどまる製品ばかりであった。
【解決手段】チーズ臭の一成分である酪酸を生産する酪酸菌を発酵に利用すること、さらに、長時間醗酵によって完全にカードを生成させることによって、レンネットなどの凝固剤を使用することなく、固形部と液体部を、ガーゼ等を用いてろ過し、たんぱく質を中心とした固形物を得る事ができ、風味的にも遜色なく、乳製品アレルギーの人や、肥満体の人、ダイエットを目指している人々に、食品添加物、着香料など一才含まぬ、純粋の植物性チーズ様食品を供給することが出来る。
【選択図】なし

【特許請求の範囲】
【請求項１】
豆乳を使用し酪酸菌を用いて発酵させ、生成したカードをそのまま、若しくは加熱殺菌後、固液分離を行い、固形分を所定の水分まで脱水して得られる固形状またはクリーム状のチーズ様の食品の製造法。
【請求項２】
野菜のピューレ、果実、果汁を混合した、請求項１記載のチーズ様の食品の製造法

【請求項３】
種実類（ピーナツ、カシュウナッツ、アーモンド、ゴマなど）の乳液を混合して得る請求項１記載のチーズ様の食品の製造法
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、乳製品アレルギーの人や、肥満体の人の健康に寄与することを目的とした、チーズ様食品に関するものである。
【背景技術】
【０００２】
従来の植物性チーズ様製品には乳酸菌を使用して製造したものがある（例えば特許文献１参照。）。
【０００３】
又、納豆菌または納豆を用いて製造したものがある（例えば特許文献２参照。）。
【０００４】
又、風味向上のため、豆乳製品に、乳製品のチーズを混合して製造するなどがなされている（例えば特許文献３参照。）。
【０００５】
なかには乳製品と添加物と増粘ゲル化剤と植物油を使用して固めたものが植物性チーズとして出回っているのが現状であると推察される。
【特許文献１】特開平０７－２３６４１７号　公報
【特許文献２】特開２００１－０００１０４号　公報
【特許文献３】特開２００１－２７５６００号　公報
【発明の開示】
【発明が解決しようとする課題】
【０００６】
これら従来のもので、乳酸菌を用いたものは熟成期間中に乳酸の蓄積により酸味の利いた製品になりがちであり、納豆菌を用いたものは、如何しても、ナットウ臭を感じる製品となり、嗜好性の面から問題があった。
【０００７】
又、乳製品やチーズを混合したものは、植物性チーズとは言いがたい。
【０００８】
本発明は、このような従来の植物性チーズと称するものの問題点を解決しようとするものであり、完全に植物性の原料のみを用いて純植物性のチーズ様の製品を製造することを目的としたものである。
【課題を解決するための手段】
【０００９】
本発明は乳製品のチーズの風味成分の一部が、酪酸よりなることに注目し、酪酸を生産する酪酸菌を使用して醗酵させることを選択することにより、酸味の調整や、ナットウ臭の発生などを防ぎ、チーズらしさを発現できることを見出した。
【００１０】
本発明は、大豆を水に浸漬後、粉砕して得られる豆乳を酪酸菌によって醗酵させ、カー

ドをそのまま、若しくは加熱殺菌して固形分と液部を分離し、固形分を所定の水分まで脱水して、固形部を微粉砕し、プレーンタイプのクリーム状に、さらに加圧脱水して、固形状の植物性チーズ様食品を製造し、希望に応じて塩や香辛料にて調味して製品とするものである。

【００１１】

また、この豆乳に野菜などの果汁を加えて酪酸菌を使用して醗酵させることも可能であり、カシュウナッツやゴマなどの種実類を使用することも出来る。

【００１２】

しかし、原則として食品添加物は一切使用せず、塩以外は植物性のものだけを使用することによって、純植物性と称するにふさわしい製品とすることが出来る。

【発明の効果】

【００１３】

乳製品アレルギーの人は年々増加傾向にあり、この人たちにとっての嗜好の制限は、人には理解できないほどの辛さを秘めているものであり、大豆もアレルゲンとして指定はされているが、この患者は限られており、乳製品アレルギーほど深刻ではない。

【００１４】

これらアレルギーの患者にとって、安心して食することの出来る、チーズケーキやピザなどの提供により、食の楽しみを与えることが出来る。

【００１５】

又、メタボリック症候群の人が問題視されており、これらの人は脂肪分のとりすぎが原因の一つとされており、豆乳から作った、植物性チーズ様食品に置き換えることにより、脂肪の摂取量を減ずる事が出来るので、病気予防にも貢献するものと思われ、ダイエットを目指す女性層にも受け入れられるであろう。

【発明を実施するための最良の形態】

【００１６】

本発明は、様々な製品を生み出だすことが出来るが、クリーム状のものを最良の形態と思考する。なぜならば、このクリーム状の製品は、野菜と組み合わせたチーズケーキなどに使用することが可能であり、ピザなどにも使用できる。

【００１７】

固形状に加工したものは、おつまみとしての利用があり、本来の乳製品チーズに代替できるので、ダイエットなどを考える人々に貢献する形態であろう。

【実施例】

【００１８】

豆乳１リッターに酪酸菌ＡＢＰ末１ｇを加えよく混合した後、３８度にて２４時間醗酵させ、出来たカードに水１リッターを加えて加熱し、９５度５分間保持後ガーゼで固体と液体部を分離し、固体部をミキサーにて粉砕し、４００ｇのクリーム状の製品を得た。

【００１９】

この製品に塩とペッパーを加えてよく混ぜ合わせ、２ｋｇの荷重をかけて脱水し２００ｇの固形状のブロックを得、冷蔵庫にて３ヶ月熟成させたものは、大豆臭も消失し、完全にチーズの質感と程よい風味を持つものが得られた。

【００２０】

豆乳８００ｇに野菜ジュース２００ｇを混ぜ合わせ、酪酸菌を加えて、よく混合した後、前記と同様にして醗酵させ、４００ｇのクリーム状の製品を得、野菜の風味と色合いがクリーム状の製品に移行して完成品となったが、後から野菜ジュースを加えたものは、製品になりえず、色合いも移行させることは出来なかった。

【００２１】

ピーナツとアーモンドを水に浸漬した後、粉砕し乳液を得、この単独、及び豆乳と混合したものを前記と同様にして醗酵させ、同じく製品にすることが出来たが、しかし製品の収量が落ちること、製造コストが上がることから普及型には出来ないと推定された。

【産業上の利用可能性】

【００２２】
本発明によるクリーム状の製品をシェフに依頼して６種類の純植物性の構成にてチーズケーキを試作して頂いたところ、真に美味しいチーズケーキが完成し、洋菓子の原料としての需要も開拓できることを実証し、このことより、乳製品アレルギーの人たちにケーキを食することの楽しみを与え得る製品である。
【００２３】
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(54)CHEESELIKE FOOD COMPOSITION AND METHOD FOR PRODUCING THE SAME

(57)Abstract

PROBLEM TO BE SOLVED: To provide a cheeselike food composition containing a vegetable protein having physical properties and an eat feeling, resembling to a soft cheese as a protein component.

SOLUTION: This food composition is provided by having a cheese like texture characterized by containing 0.5 to 10 mass% soybean protein as a solid part and 15 to 35 mass% wheat protein as the solid part based on the whole amount of the food composition, and coagulating the soybean protein.

Previous Document 1/1 Next Docum

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CLAIMS DETAILED DESCRIPTION

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CLAIMS

[Claim(s)]
[Claim 1]
A food constituent comprising:
It is soybean protein of the 0.5 - 10 mass % as a formed element to the food constituent whole quantity.
An organization like a cheese head, wherein soybean protein has solidified including wheat protein of the 15 - 35 mass % as a formed element.

[Claim 2]
The food constituent according to claim 1 in which a grinding thing of a congelation which solidified a milky lotion of soybean protein with a coagulant solidifies soybean protein.
[Claim 3]
The food constituent according to claim 1 or 2 which further contains transglutaminase and/or fats and oils.
[Claim 4]
A food constituent of an any one of the Claims 1-3 description which soybean protein has solidified by heating and/or coagulant addition.
[Claim 5]
A food constituent of an any one of the Claims 1-4 description which has an organization like a cheese head with ******.
[Claim 6]
A manufacturing method of a food constituent characterized by comprising the following.
It is soybean protein of the 0.5 - 10 mass % as a formed element to the raw material whole quantity.
A raw material which contains wheat protein of the 15 - 35 mass % as a formed element is mixed.
An organization like a cheese head solidifying soybean protein by heating and/or coagulant addition.

[Claim 7]
A method according to claim 6 of being the grinding thing which soybean protein as a raw material ground preliminarily a congelation which solidified a milky lotion of soybean protein with a coagulant, and was formed.
[Claim 8]
A way according to claim 6 or 7 a raw material further contains transglutaminase and/or fats and oils.
[Claim 9]
After uniforming a raw material containing soybean protein and water, a coagulant is added and it mixes, and wheat protein is added, and it mixes, and subsequently heat-treats,

adding a coagulant, mixing, adding wheat protein, mixing, and settling subsequently, after uniforming a raw material containing soybean protein and water -- or
After uniforming a raw material containing soybean protein and water, it mixes moreover and subsequently heat-treats wheat protein.
A method according to any one of claims 6 to 8 by which it is characterized.

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CLAIMS DETAILED DESCRIPTION

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DETAILED DESCRIPTION

[Detailed Description of the Invention]
[Field of the Invention]
[0001]
The present invention provides a food constituent like a cheese head which carries out the main component of the vegetable protein, and a manufacturing method for the same.
[Background of the Invention]
[0002]
Development of the foodstuffs like a cheese head which carry out the main component of the vegetable protein is performed as a substitute of a cheese head from the demand of reduction of animal protein intake, reduction of cost, improvement in a nutritive value, etc.
[0003]
The manufacturing method of the foodstuffs like a cheese head mulling and heating the compound containing the tofu, the fats and oils, the thermal coagulation substance, and stabilizer which contain 10 to 50% of soybean solid content is described in the Patent document 1. It describes that the hard - elastic foodstuffs like a cheese head are obtained by this method in the Patent document 1.
[0004]
The manufacturing method of the foodstuffs like a cheese head mulling and heating the compound which contains [water] 0.5-3 copies for 1.5 copies and edible oil and fat at least to one copy of protein weight in the mixture of soybean protein and wheat protein is described in the Patent document 2. It describes that 1:1 thru/or 1:0.1 is preferable as a weight ratio of soybean protein and wheat protein. According to the Patent document 2, the foodstuffs like a cheese head which have mouthfeel with the smoothness and the resistance to the teeth which a cheese head has by this method are provided.
[0005]
The manufacturing method of the soybean protein foodstuffs like a cheese head carrying out fermentation aging is disclosed in the Patent document 3 by adding lactic acid bacteria.
[0006]
The manufacturing method of new gel-like food made into gel is described in the Patent document 4 by making transglutaminase act on the emulsified liquid containing protein, and fats and oils and water. The cheese head is mentioned as an example of gel-like food.
[Citation list]
[Patent literature]
[0007]
[Patent document 1] JP,S60-78541,A
[Patent document 2] JP,S55-88653,A
[Patent document 3] JP,S46-5025,B
[Patent document 4] JP,S59-59151,A
[Description of the Invention]

[Problem to be solved by the invention]
[0008]
The foodstuffs like a cheese head are developed from the former as above-mentioned. The foodstuffs like a cheese head obtained by which method with the deer do not have satisfying mouthfeel as compared with a actual cheese head, either. The foodstuffs like a cheese head in particular that have mouthfeel of an elastic cheese head and the characteristics of physical properties (extensibility which pulls thread in the cheese head for pizza toast especially) are not provided conventionally.
[0009]
Then, an object of the present invention is to provide the food constituent like a cheese head which has physical properties and mouthfeel similar to an elastic cheese head and which contains vegetable protein as a protein component.
[Means for solving problem]
[0010]
The inventors are as having blended soybean protein and wheat protein with the surprising thing at specific concentration which is not conventionally known in the food constituent like a cheese head, and having made it solidify soybean protein.
**** -- it found out that the foodstuffs like a cheese head which have physical properties and mouthfeel similar to an elastic cheese head were formed. The present invention includes the following invention.
[0011]
(1) The food constituent which has an organization like a cheese head, wherein soybean protein has solidified including wheat protein of the 15 - 35 mass % as soybean protein of the 0.5 - 10 mass %, and a formed element as a formed element to the food constituent whole quantity.
[0012]
(2) The food constituent of (1) description in which the grinding thing of the congelation which solidified the milky lotion of soybean protein with the coagulant solidifies soybean protein.
(3) The food constituent of (1) or (2) descriptions which further contains transglutaminase and/or fats and oils.
(4) The food constituent described in any of (1) - (3) which soybean protein has solidified by heating and/or coagulant addition.
(5) The food constituent described in any of (1) - (4) which has an organization like a cheese head with ******.
[0013]
To the raw material whole quantity, as a formed element (6) Soybean protein of the 0.5 - 10 mass %, A manufacturing method of the food constituent which has an organization like a cheese head solidifying [mixing the raw material which contains wheat protein of the 15 - 35 mass % as a formed element, and] soybean protein by heating and/or coagulant addition.
(7) The method of (6) descriptions which are the grinding thing which soybean protein as a raw material ground preliminarily the congelation which solidified the milky lotion of soybean protein with the coagulant, and was formed.
[0014]
(8) The method of (6) or (7) descriptions that a raw material further contains transglutaminase and/or fats and oils.
(9) A coagulant is added and mix, add wheat protein, mix, and subsequently heat-treat, after uniforming the raw material containing soybean protein and water,
adding a coagulant, mixing, adding wheat protein, mixing, and settling subsequently, after uniforming the raw material containing soybean protein and water -- or
After uniforming the raw material containing soybean protein and water, it mixes moreover and subsequently heat-treats wheat protein.
A method described in any of (6) - (8) by which it is characterized.
[Effect of the Invention]
[0015]
The food constituent like a cheese head provided by the present invention has physical properties and mouthfeel similar to an elastic cheese head.
[Description of Embodiments]
[0016]
1. Raw material and combination
The food constituent like a cheese head of the present invention contains wheat protein of the 15 - 35 mass % as soybean protein of the 0.5 - 10 mass %, and a formed element as a formed element to the food constituent whole quantity (full weight as wet weight of the food constituent like a cheese head). By combining two kinds of protein within the scope of this quantity, mouthfeel and extensibility (********) which an elastic cheese head has are given to a surprising thing. As for the compounding amount of soybean protein, it is preferable that it is especially the one to 4 mass % as a formed element to the food constituent whole quantity (wet weight). As for the compounding amount of wheat protein, it is preferable that it is especially the 20 to 30 mass % as a formed element to the food constituent whole quantity (wet weight). In this Description, the amount of each raw material used is described as a ratio

over the full weight as wet weight of the food constituent like a cheese head of the raw material concerned, as long as there is no special description.

[0017]

The soybean protein used as a raw material may exist with what kind of form.

For example, the thing of the form of separation soybean protein, degreasing soybean cake, soybean flour, soybean milk, soybean milk powder, etc. can be used. Any material may be a form of the shape of a solid, such as powder, and it may be the liquefied form dissolved or suspended in water. Soybean protein can also be used with the form of the grinding thing which ground the congelation (namely, tofu and a tofu prototype) which solidified the milky lotion of soybean protein with the coagulant. The above-mentioned compounding amount of soybean protein is concerned with the form of a raw material, there is and it is computed based on the formed element of the soybean protein contained into a raw material. [no]

[0018]

As a raw material, the wheat protein used may exist with what kind of form, and can use the thing of the form of gluten, gliadin, etc. Any material may be a solid state of powder etc. and it may be the liquefied form dissolved or suspended in water. The above-mentioned compounding amount of wheat protein is concerned with the form of a raw material, there is and it is computed based on the formed element of the wheat protein contained into a raw material. [no]

[0019]

The organization like a cheese head is formed by the combination of the solidified soybean protein and the wheat protein which has viscoelasticity. Namely, in the present invention, in the raw material mixture which contains soybean protein and wheat protein at specific concentration, solidify soybean protein and. By giving an organization the viscoelasticity of wheat protein, it becomes possible to offer the food constituent like an elastic cheese head which has ****** suitably.

[0020]

As for the moisture content in the food constituent of the present invention, it is preferable the 15 to 55 mass % and that it is the 30 to 45 mass % suitably. Water may be added as some other raw materials with the form of the grinding thing etc. which ground the congelation which solidified the milky lotion of soybean protein with the coagulant.

[0021]

As for the food constituent of the present invention, it is preferable to contain fats and oils further. As for fats and oils, it is preferable to the food constituent whole quantity 15-30 mass % The 0.01 to 40 mass % and to be contained suitably. By adding fats and oils, a food constituent is smooth and becomes a thing of taste, physical properties with sufficient mouth-melt, and mouthfeel. Especially if fats and oils are edible animal-and-vegetable-oils fat, they will not be limited, for example, they can use soybean oil, sunflower seed oil, oleum rapae, corn oil, etc.

[0022]

As for the food constituent of the present invention, it is preferable to contain transglutaminase further. As for transglutaminase, it is preferable 0.01-1 mass % To be contained to the food constituent whole quantity with the form of the enzyme preparations marketed generally. By adding transglutaminase, a food constituent has an appropriate crisp feeling and it can prevent becoming physical properties which the appearance like gum cannot bite off easily.

[0023]

When solidifying soybean protein by coagulant addition, a coagulant will be contained in the food constituent which is a final product. As a coagulant, acid coagulants, such as salt coagulants, such as a calcium chloride, a magnesium chloride, calcium sulfate, and magnesium sulfate, gluconic acid and lactic acid, can be used. Especially if it is sufficient quantity, the addition amount of a coagulant will not be limited in order to solidify soybean protein, but typically, it is the 0.1 to 1 mass % as a formed element to the food constituent whole quantity.

[0024]

A seasoning, perfume, a pigment, etc. can be further blended with the food constituent of the present invention in proper quantity if needed.

[0025]

2. Manufacturing method

The food constituent which has an organization like a cheese head of the present invention can be manufactured by a method including mixing the raw material which contains soybean protein and wheat protein of the specified quantity at least, and solidifying soybean protein. The coagulation of soybean protein has especially a preferable thing for which heating coagulation and coagulant addition are used together and performed. And it is most to a cheese head. [resistance to the teeth taste, and mouth-melt]

It is because near foodstuffs are obtained.

[0026]

Neither soybean protein, wheat protein, an addition order of other components nor the time in particular of coagulation processing is limited.

[0027]

By the embodiment used as a raw material, the grinding thing which ground the congelation

(namely, tofu and a tofu prototype) which solidified the milky lotion of soybean protein with the coagulant as soybean protein, It is preferable to perform the process which further solidifies soybean protein by heating the mixture obtained at the process of mixing the aforementioned grinding thing with other raw material components, such as wheat protein, and the process, or adding a coagulant into the aforementioned mixture, or adding into the aforementioned mixture, and ranking next and heating a coagulant into it.

[0028]

In the embodiment which blends transglutaminase, in order to make transglutaminase act, it is preferable to further perform the process of holding the raw material mixture containing this for 5 to 60 minutes in temperature of 25-60 degrees C. The above-mentioned temperature points out the temperature of goods of a raw material mixture, and in this Description, as long as there is no special description, temperature is described as what points out the temperature of goods of an object.

[0029]

In the embodiment which blends transglutaminase, in order to deactivate transglutaminase, it is preferable to further perform the process of heating the raw material mixture after making transglutaminase acting for several minutes at enzyme inactivation temperature (about 90 degrees C).

[0030]

The heating step for making transglutaminase act and the heating step for making it deactivated can serve as the process of carrying out heating coagulation of the soybean protein in a raw material mixture.

[0031]

2.1. Embodiment which solidifies by using coagulant addition and heating coagulation together

The method of including the mixing process which mixes water, soybean protein, wheat protein, a coagulant, and other raw materials, and the heating step which heats the obtained mixture and solidifies soybean protein as the method of the present invention which uses coagulant addition and heating coagulation together as coagulation processing of soybean protein is mentioned.

[0032]

In a mixing process, the coagulation by a coagulant advances to some extent. The procedure in particular for mixing a raw material is not limited, but can be determined as appropriate according to the mixing means to be used. A whole raw material may be added simultaneously, and it may mix, and, in addition to order, may mix. In one embodiment, including soybean protein and water, if needed Fats and oils etc., After uniforming the raw material containing other components other than wheat protein and a coagulant with an agitated type homogenizer, a high-pressure homogenizer, etc., a whole raw material is mixed by adding a coagulant and wheat protein to the uniformed thing, and mixing. It is preferable to add a coagulant to the uniformed aforementioned thing, to mix, to add wheat protein subsequently and to mix. The food constituent like a cheese head of a homogeneous organization can be offered by preparing the thing which uniformed preliminarily raw materials (raw material containing especially soybean protein, water, and fats and oils) other than wheat protein and a coagulant containing soybean protein and water. When using it with the form of the grinding thing which ground the congelation (namely, tofu and a tofu prototype) which solidified the milky lotion of soybean protein for soybean protein and water with the coagulant, it is preferable to grind the aforementioned congelation by a mixer etc. preliminarily.

[0033]

The form of a request of the obtained mixture can be processed and a heating step can be presented. For example, it can be filled up with the obtained mixture in a mold-shaped well-closed container, and it can be heated the whole container.

[0034]

As for the temperature in a heating step, 25-60 degrees C is preferable, and, as for cooking time, for 5 to 60 minutes is preferable. In a heating step, an operation of transglutaminase also advances by the embodiment which blends transglutaminase.

[0035]

It is ****** about a mixture because of the inactivation of an enzyme in the embodiment which blends transglutaminase.

It is preferable to further include the process heated for several minutes at the temperature of ****** (about 90 degrees C).

[0036]

2.2. Embodiment which solidifies only by coagulant addition

The method of including the mixing process which mixes water, soybean protein, wheat protein, a coagulant, and other raw materials, and the standing process which setties the obtained mixture and solidifies soybean protein as the method of the present invention which performs only coagulant addition as soybean protein coagulation processing is mentioned. The procedure same with having described by the above 2.1 as a procedure of a mixing process is employable. That is, a whole raw material may be mixed by package and, in addition to order, it may mix, and a coagulant and wheat protein may be added to the thing which uniformed preliminarily the raw material which contains soybean protein and water and further contains

other components other than wheat protein and coagulants, such as fats and oils, if needed, and it may mix. The form of a request of the mixture obtained before and behind the standing process is processible.

[0037]

As for standing, it is preferable to carry out for 1 to 15 minutes at 10-40 degrees C of ambient temperature.

In the embodiment which blends transglutaminase, it is preferable to further include the heating step for inactivation of the aforementioned enzyme.

[0038]

2.3. Embodiment which solidifies only by heating coagulation

The method of including water, soybean protein, wheat protein and the mixing process that mixes other raw materials, and the heating step which heats the obtained mixture and solidifies soybean protein as the method of the present invention which performs only heating coagulation as soybean protein coagulation processing is mentioned.

[0039]

The procedure in particular of mixing of a raw material is not limited, but can be determined as appropriate according to the mixing means to be used. A whole raw material may be added simultaneously, and it may mix, and, in addition to order, may uniform. According to one embodiment, after uniforming the raw material which contains soybean protein and water and further contains other components other than wheat protein, such as fats and oils, if needed with an agitated type homogenizer, a high-pressure homogenizer, etc., a whole raw material is mixed by adding wheat protein to the uniformed thing and mixing.

[0040]

The form of a request of the obtained mixture can be processed and a heating step can be presented. For example, it can be filled up with a mixture in a mold-shaped well-closed container, and it can be heated the whole container.

[0041]

The procedure same with having described by the above 2.1 as a procedure like a heating step is employable.

[0042]

In the embodiment which blends transglutaminase, it is preferable to further include the heating step for inactivation of the aforementioned enzyme.

[Working example]

[0043]

Hereinafter, based on an working example, the embodiment of the present invention is described more specifically.

Working example 1

1. Raw material

[0044]

[Table 1]

	質量部
水	３７．２
大豆タンパク質 「フジプロＦ」（不二製油社製、形態：乾燥粉末）	２．１
小麦タンパク質 「グリアＡ」（アサマ化成社製、形態：乾燥粉末）	２２．０
植物性油脂	２２．１
トランスグルタミナーゼ	０．４
調味料	１５．７
フレーバー、色素	０．１
凝固剤 （濃度５０質量％乳酸溶液）	０．４
合計	１００

[0045]

2. Manufacturing process

The mixture obtained by mixing pouring soybean protein and water on a mixer and other raw materials except wheat protein and a coagulant were uniformed for 60 to 120 seconds at 3000-8000 rpm with the homogenizer (DX-10 type / product made by NIHONSEIKI).

[0046]

The coagulant (lactic acid solution) was added to the uniformity thing, and it mixed.

Wheat protein was further added to the obtained mixture, and it mixed.

[0047]

The mixture obtained in the above-mentioned procedure was molded in the shape of a slice, and the container made from a resin made film was filled up, and it vacuum-packed.

[0048]

Transglutaminase was made to act, while putting the mixture of the letter of a slice with which the container was filled up in hot water, heat-treating it for 10 minutes at 55 degrees C and

solidifying soybean protein in a mixture.

[0049]

While putting the mixture of the letter of a slice put into the container in hot water, heat-treating it for 2 minutes at 90 degrees C and solidifying soybean protein, after deactivating transglutaminase, it cooled and kept it in the refrigerator.

In this way, the foodstuffs like a cheese head were created.

[0050]

3. Quality assessment

The foodstuffs like a cheese head created by the above-mentioned process are put on aluminum foil, and are burned for about 2 minutes by a toaster oven. After taking out from a toaster, while it was warm, both hands pulled right and left and it evaluated "extensibility." It contained in the mouth and resistance to the teeth, a crisp feeling, and taste estimated "mouthfeel."

[0051]

[Table 2]

	伸び性
◎	約５cm以上伸びる
○	約３～５cm伸びる
△	約１～３cm伸びる
×	全く伸びない

[0052]

[Table 3]

	食感
◎	軟質チーズ様
○	ややガム状 または、ややモソモソ状
△	軟質チーズとして許容される下限（ガム様，モソモソ状等.）
×	軟質チーズとして成立し得ない食感（飲み込みにくいほどガム様等）

[0053]

Extensibility and mouthfeel are O and the foodstuffs like a cheese head of the working example 1 have physical properties and mouthfeel equivalent to a cheese head with ******, and flavor.

[0054]

The working examples 2-5 and the comparative examples 1-4

The letter foodstuffs of a slice like a cheese head were obtained by the same raw material combination (that is, the quantity (mass part) of other raw materials other than soybean protein in the working-example 1 table 1 and wheat protein is not changed) and procedure as the working example 1 except having changed the mass part of soybean protein and wheat protein. The same operation and standard as the working example 1 estimated mouthfeel and flavor for the obtained foodstuffs.

[0055]

The compounding amount of soybean protein of each working example and a comparative example and wheat protein, mouthfeel, and flavor are shown in the following tables.

[0056]

[Table 4]

特徴										
							ガム様	固まらず	モソモソ	ガム様
評価	食感	◎	△	○	△	○	×	×	×	×
	性									

	小麦ｶﾝﾊﾟｸ質 配合量	大豆ｶﾝﾊﾟｸ質 配合量	ｶﾝﾊﾟｸ質 質量比 (対実施例1)		小麦ｶﾝﾊﾟｸ質 配合比率 (対全原料)	大豆ｶﾝﾊﾟｸ質 配合比率 (対全原料)	伸び
	質量部	質量部	小麦 ｶﾝﾊﾟｸ質	大豆 ｶﾝﾊﾟｸ質	質量%	質量%	
実施例1	22.0	2.1	1	1	22	2.1	◎
実施例2	37.4	2.1	1.7	1	33	1.8	○
実施例3	15.4	2.1	0.7	1	17	2.2	△
実施例4	22.0	8.4	1	4	21	7.9	△
実施例5	22.0	0.7	1	0.33	22	0.7	◎
比較例1	44.0	2.1	2	1	36	1.7	○
比較例2	11.0	2.1	0.5	1	12	2.4	×
比較例3	22.0	12.6	1	6	20	11.4	△
比較例4	22.0	0.0	1	0	23	0	◎

[0057]
A homogenizer (DX-10 type / product made by NIHONSEIKI) is used for working-example 6 tofu, and it is 300.
40 parts by mass (when 40 parts by mass of bean curd paste is used) of bean curd paste which was uniformed for 60 to 120 seconds at 0-8000 rpm, and was prepared in median size of about 10micro soybean protein is 2.1 mass % included as a daily dose of a formed element in a whole raw material -- having -- except for the point of replacing with and using 2.1 parts

by mass of soybean protein, and 37.2 parts by mass of water for the mixture covered over the mixer, the letter foodstuffs of a slice like a cheese head were obtained like the working example 1. The performance of the obtained foodstuffs was equivalent to what was obtained in working example 1.

[0058]

Working example 7: Example which does not use transglutaminase

1. Raw material

[0059]

[Table 5]

	質量部
水	38．0
大豆タンパク質 「フジプロF」（不二製油社製、形態：乾燥粉末）	2．1
小麦タンパク質 「グリアA」（アサマ化成社製、形態：乾燥粉末）	22．0
植物性油脂	21．7
調味料	15．7
フレーバー、色素	0．1
凝固剤 （濃度50質量%乳酸溶液）	0．4
合計	100

[0060]

2. Manufacturing process

With the homogenizer (DX-10 type / product made by NIHONSEIKI), at 3000-8000 rpm, it mixed for 60 to 120 seconds, and uniformed other raw materials except the mixture obtained by mixing pouring soybean protein and water on a mixer, and wheat protein and a coagulant.

[0061]

The coagulant (lactic acid) was added to the uniformed thing, and it mixed. Each raw material used the same thing as the working example 1.

Wheat protein was further added to the obtained mixture, and it mixed.

[0062]

After settling the mixture obtained in the above-mentioned procedure for 5 minutes at 25 degrees C of ambient temperature, it molded in the shape of a slice, and the container made from a resin made film was filled up, and it vacuum-packed.

[0063]

3. Quality assessment

When the same procedure as the working example 1 estimated, "extensibility" is O, "mouthfeel" is ** and having physical properties and mouthfeel equivalent to a cheese head with ******, and flavor was checked.

[0064]

Working example 8

The letter foodstuffs of a slice like a cheese head were obtained like the working example 7 except using a magnesium chloride instead of lactic acid as a coagulant. "Extensibility" is [O and "mouthfeel of performance of obtained foodstuffs"] **.

It was equivalent to what was obtained in working example 7.

[0065]

Working example 9

Letter foods of a slice which are the appearances like a cheese head by the same procedure as the working example 1 except for the point of not using a coagulant, the point using 38.0 parts by mass of water, and the point of not performing the process which adds a coagulant to the uniformed raw material and it mixes

Elegance was obtained. Extensibility is [O and mouthfeel of performance of obtained foodstuffs] O.

It was substantially equivalent to what was obtained in working example 1.

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[Translation done.]

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最終頁に続く

(54)【発明の名称】チーズ様食品組成物及びその製造方法

(57)【要約】
【課題】本発明は、軟質チーズに類似した物性及び食感を有する、植物タンパク質をタンパク質成分として含有するチーズ様食品組成物を提供することを目的とする。
【解決手段】本発明者らは、食品組成物全量に対して固形成分として０．５～１０質量％の大豆タンパク質と、固形成分として１５～３５質量％の小麦タンパク質とを含み、大豆タンパク質が凝固していることを特徴とするチーズ様組織を有する食品組成物により上記課題が解決されることを見出した。
【選択図】なし

【特許請求の範囲】
【請求項１】
食品組成物全量に対して固形成分として０．５～１０質量％の大豆タンパク質と、固形成分として１５～３５質量％の小麦タンパク質とを含み、大豆タンパク質が凝固していることを特徴とする、チーズ様組織を有する食品組成物。
【請求項２】
大豆タンパク質は、大豆タンパク質の乳液を凝固剤で凝固させた凝固物の粉砕物が凝固したものである、請求項１記載の食品組成物。
【請求項３】
トランスグルタミナーゼ及び／又は油脂を更に含む、請求項１又は２記載の食品組成物。
【請求項４】
大豆タンパク質が、加熱及び／又は凝固剤添加により凝固している、請求項１～３の何れか１項記載の食品組成物。
【請求項５】
曳糸能のあるチーズ様組織を有する、請求項１～４の何れか１項記載の食品組成物。
【請求項６】
原料全量に対して固形成分として０．５～１０質量％の大豆タンパク質と、固形成分として１５～３５質量％の小麦タンパク質とを含む原料を混合すること、並びに、大豆タンパク質を加熱及び／又は凝固剤添加により凝固させることを特徴とする、チーズ様組織を有する食品組成物の製造方法。
【請求項７】
原料としての大豆タンパク質が、予め、大豆タンパク質の乳液を凝固剤で凝固させた凝固物を粉砕して形成された粉砕物である、請求項６記載の方法。
【請求項８】
原料がトランスグルタミナーゼ及び／又は油脂を更に含む、請求項６又は７記載の方法。
【請求項９】
大豆タンパク質及び水を含む原料を均質化した後、凝固剤を加えて混合し、小麦タンパク質を加えて混合し、次いで加熱処理すること、
大豆タンパク質及び水を含む原料を均質化した後、凝固剤を加えて混合し、小麦タンパク質を加えて混合し、次いで静置すること、あるいは、
大豆タンパク質及び水を含む原料を均質化した後、小麦タンパク質を加えて混合し、次いで加熱処理すること
を特徴とする、請求項６～８の何れかに記載の方法。
【発明の詳細な説明】
【技術分野】
【０００１】
本発明は、植物タンパク質を主成分とするチーズ様食品組成物及びその製造方法を提供する。
【背景技術】
【０００２】
動物性タンパク質摂取量の低減、コストの低減、栄養価の向上等の要求から、チーズの代替物として、植物タンパク質を主成分とするチーズ様食品の開発が行われている。
【０００３】
特許文献１には、大豆固形分１０～５０％を含有する豆腐、油脂、熱凝固性物質及び安定剤を含む配合物を混練し、加熱することを特徴とするチーズ様食品の製造方法が記載されている。特許文献１には、この方法により硬質～軟質のチーズ様食品が得られると記載されている。
【０００４】

特許文献２には、大豆タンパク質及び小麦タンパク質の混合物中のタンパク質重量１部に対し、水を１．５部及び食用油脂を０．５～３部を少なくとも含む配合物を混練し、加熱することを特徴とするチーズ様食品の製造方法が記載されている。大豆タンパク質と小麦タンパク質との重量比として１：１乃至１：０．１が好ましいと記載されている。特許文献２によれば、この方法によりチーズの持つ滑らかさ及び歯応えのある食感を有するチーズ様食品が提供される。

【０００５】

特許文献３には乳酸菌を添加することにより発酵熟成させることを特徴とするチーズ様大豆タンパク食品の製造法が開示されている。

【０００６】

特許文献４にはタンパク質と、油脂と水とを含む乳化液にトランスグルタミナーゼを作用させることによりゲル状にする、新規なゲル状食品の製造方法が記載されている。ゲル状食品の具体例としてチーズが挙げられている。

【先行技術文献】

【特許文献】

【０００７】

【特許文献１】特開昭６０－７８５４１号公報
【特許文献２】特開昭５５－８８６５３号公報
【特許文献３】特公昭４６－５０２５号公報
【特許文献４】特開昭５９－５９１５１号公報

【発明の開示】

【発明が解決しようとする課題】

【０００８】

上記の通りチーズ様食品は従来から開発されている。しかながらいずれの方法で得られたチーズ様食品も、実際のチーズと比較して満足できる食感を有するものではなかった。特に、軟質チーズの食感や物性（特に、ピザ・トースト用チーズにおける糸を曳くような伸び性）の特徴を有するチーズ様食品は従来提供されていない。

【０００９】

そこで本発明は、軟質チーズに類似した物性及び食感を有する、植物タンパク質をタンパク質成分として含有するチーズ様食品組成物を提供することを目的とする。

【課題を解決するための手段】

【００１０】

本発明者らは、驚くべきことに、大豆タンパク質と小麦タンパク質とを、チーズ様食品組成物において従来知られていない特定の濃度で配合し、大豆タンパク質を凝固させたときに、軟質チーズに類似した物性及び食感を有するチーズ様食品が形成されることを見出した。本発明は以下の発明を包含する。

【００１１】

（１）食品組成物全量に対して固形成分として０．５～１０質量％の大豆タンパク質と、固形成分として１５～３５質量％の小麦タンパク質とを含み、大豆タンパク質が凝固していることを特徴とする、チーズ様組織を有する食品組成物。

【００１２】

（２）大豆タンパク質は、大豆タンパク質の乳液を凝固剤で凝固させた凝固物の粉砕物が凝固したものである、（１）記載の食品組成物。
（３）トランスグルタミナーゼ及び／又は油脂を更に含む、（１）又は（２）記載の食品組成物。
（４）大豆タンパク質が、加熱及び／又は凝固剤添加により凝固している、（１）～（３）の何れかに記載の食品組成物。
（５）曳糸能のあるチーズ様組織を有する、（１）～（４）の何れかに記載の食品組成物。

【００１３】

（６）原料全量に対して固形成分として０．５～１０質量％の大豆タンパク質と、固形成分として１５～３５質量％の小麦タンパク質とを含む原料を混合すること、並びに、大豆タンパク質を加熱及び／又は凝固剤添加により凝固させることを特徴とする、チーズ様組織を有する食品組成物の製造方法。
（７）原料としての大豆タンパク質が、予め、大豆タンパク質の乳液を凝固剤で凝固させた凝固物を粉砕して形成された粉砕物である、（６）記載の方法。
【００１４】
（８）原料がトランスグルタミナーゼ及び／又は油脂を更に含む、（６）又は（７）記載の方法。
（９）大豆タンパク質及び水を含む原料を均質化した後、凝固剤を加えて混合し、小麦タンパク質を加えて混合し、次いで加熱処理すること、
大豆タンパク質及び水を含む原料を均質化した後、凝固剤を加えて混合し、小麦タンパク質を加えて混合し、次いで静置すること、あるいは、
大豆タンパク質及び水を含む原料を均質化した後、小麦タンパク質を加えて混合し、次いで加熱処理すること
を特徴とする、（６）～（８）の何れかに記載の方法。
【発明の効果】
【００１５】
本発明により提供されるチーズ様食品組成物は軟質チーズに類似した物性及び食感を有する。
【発明を実施するための形態】
【００１６】
１．原料及び配合
本発明のチーズ様食品組成物は、食品組成物全量（チーズ様食品組成物の湿重量としての全重量）に対して固形成分として０．５～１０質量％の大豆タンパク質と、固形成分として１５～３５質量％の小麦タンパク質とを含有することを特徴とする。この量の範囲内で二種類のタンパク質を組み合わせることにより、驚くべきことに、軟質チーズが有する食感及び伸び性（糸曳き性）が付与される。大豆タンパク質の配合量は、食品組成物全量（湿重量）に対して固形成分として１～４質量％であることが特に好ましい。小麦タンパク質の配合量は、食品組成物全量（湿重量）に対して固形成分として２０～３０質量％であることが特に好ましい。本明細書において、各原料の使用量は、特段の説明がない限り、当該原料のチーズ様食品組成物の湿重量としての全重量に対する割合として記載する。
【００１７】
原料として用いられる大豆タンパク質はどのような形態で存在するものであってもよく、例えば、分離大豆タンパク質、脱脂大豆粕、大豆粉、豆乳、豆乳粉末等の形態のものが使用できる。いずれの材料も粉体などの固体状の形態であってもよいし、水に溶解または懸濁された液状の形態であってもよい。また、大豆タンパク質は、大豆タンパク質の乳液を凝固剤で凝固させた凝固物（すなわち、豆腐及び豆腐類似物）を粉砕した粉砕物の形態で使用することもできる。大豆タンパク質の上記の配合量は、原料の形態に関わりなく、原料中に含有される大豆タンパク質の固形成分に基づいて算出される。
【００１８】
原料として用いられる小麦タンパク質はどのような形態で存在するものであってもよく、例えば、グルテン、グリアジン等の形態のものが使用できる。いずれの材料も粉体などの固体状であってもよいし、水に溶解または懸濁された液状の形態であってもよい。小麦タンパク質の上記の配合量は、原料の形態に関わりなく、原料中に含有される小麦タンパク質の固形成分に基づいて算出される。
【００１９】
凝固した大豆タンパク質と、粘弾性を有する小麦タンパク質との組み合わせにより、チーズ様組織が形成される。すなわち本発明では、大豆タンパク質と小麦タンパク質とを特定の濃度で含む原料混合物において、大豆タンパク質を凝固させると共に、小麦タンパク

質の粘弾性を組織に付与することによって、軟質チーズ様の、好適には曳糸能を有する食品組成物を供することが可能となる。

【００２０】

本発明の食品組成物中の水分量は１５～５５質量％、好適には３０～４５質量％であることが好ましい。水は、大豆タンパク質の乳液を凝固剤で凝固させた凝固物を粉砕した粉砕物等の形態で、他の原料の一部分として添加されてもよい。

【００２１】

本発明の食品組成物は更に油脂を含有することが好ましい。油脂は食品組成物全量に対して０．０１～４０質量％、好適には１５～３０質量％含まれることが好ましい。油脂を添加することにより、食品組成物が滑らかで舌触り及び口溶けの良い物性及び食感のものとなる。油脂は食用の動植物油脂であれば特に限定されず、例えば大豆油、ひまわり油、菜種油、コーン油等を使用することができる。

【００２２】

本発明の食品組成物は更にトランスグルタミナーゼを含有することが好ましい。トランスグルタミナーゼは、一般に市販されている酵素製剤の形態で、食品組成物全量に対して０．０１～１質量％含まれることが好ましい。トランスグルタミナーゼを添加することにより食品組成物が適度な歯切れ感を有し、ガム様の噛み切りにくい物性になることを防止することができる。

【００２３】

大豆タンパク質の凝固を凝固剤添加により行う場合、最終製品である食品組成物中には凝固剤が含まれることとなる。凝固剤としては、塩化カルシウム、塩化マグネシウム、硫酸カルシウム、硫酸マグネシウム等の塩凝固剤や、グルコン酸、乳酸等の酸凝固剤が使用できる。凝固剤の添加量は、大豆タンパク質を凝固させるために十分な量であれば特に限定されないが、典型的には、食品組成物全量に対して固形成分として０．１～１質量％である。

【００２４】

本発明の食品組成物には更に、調味料、香料、色素等を必要に応じて適量配合することができる。

【００２５】

２．製造方法

本発明のチーズ様組織を有する食品組成物は、所定量の大豆タンパク質と小麦タンパク質とを少なくとも含む原料を混合すること、並びに、大豆タンパク質を凝固させることを含む方法により製造することができる。大豆タンパク質の凝固は、加熱凝固と凝固剤添加とを併用して行うことが特に好ましい。歯応え、舌触り及び口溶けに関してチーズに最も近い食品が得られるからである。

【００２６】

大豆タンパク質、小麦タンパク質、他の成分の添加順序や、凝固処理の時期は特に限定されない。

【００２７】

大豆タンパク質として、大豆タンパク質の乳液を凝固剤で凝固させた凝固物（すなわち、豆腐及び豆腐類似物）を粉砕した粉砕物を原料として使用する実施形態では、前記粉砕物を小麦タンパク質等の他の原料成分と混合する工程と、該工程で得られた混合物を加熱するか、前記混合物に凝固剤を添加するか、前記混合物に凝固剤を添加し次いで加熱することにより、大豆タンパク質を更に凝固させる工程とを行うことが好ましい。

【００２８】

トランスグルタミナーゼを配合する実施形態では、トランスグルタミナーゼを作用させるために、これを含む原料混合物を、２５～６０℃の温度に５～６０分間保持する工程を更に行うことが好ましい。上記の温度は原料混合物の品温を指し、本明細書において、特段の説明がない限り、温度は対象物の品温を指すものとして記載する。

【００２９】

トランスグルタミナーゼを配合する実施形態では、トランスグルタミナーゼを失活させるために、トランスグルタミナーゼを作用させた後の原料混合物を酵素失活温度（約９０℃）で数分間加熱する工程を更に行うことが好ましい。

【００３０】

トランスグルタミナーゼを作用させるための加熱工程及び失活させるための加熱工程は、原料混合物中の大豆タンパク質を加熱凝固する工程を兼ねることができる。

【００３１】

２．１．凝固剤添加と加熱凝固とを併用して凝固を行う実施形態

大豆タンパク質の凝固処理として凝固剤添加と加熱凝固とを併用する本発明の方法としては、水、大豆タンパク質、小麦タンパク質、凝固剤及び他の原料を混合する混合工程と、得られた混合物を加熱して大豆タンパク質を凝固させる加熱工程とを含む方法が挙げられる。

【００３２】

混合工程では凝固剤による凝固がある程度進行する。原料を混合するための手順は特に限定されず、使用する混合手段に応じて適宜決定することができる。全原料を同時に加えて混合してもよいし、順に加えて混合してもよい。一実施形態では、大豆タンパク質及び水を含み、更に必要に応じて油脂等の、小麦タンパク質及び凝固剤以外の他の成分を含む原料を撹拌型ホモジナイザー、高圧ホモジナイザー等で均質化した後、均質化した物に凝固剤及び小麦タンパク質を加えて混合することにより全原料の混合を行う。前記の均質化した物に凝固剤を加えて混合し、次いで小麦タンパク質を加えて混合することが好ましい。大豆タンパク質及び水を含む、小麦タンパク質及び凝固剤以外の原料（特に大豆タンパク質、水及び油脂を含む原料）を予め均質化した物を調製することにより、均質組織のチーズ様食品組成物を供することができる。大豆タンパク質及び水を、大豆タンパク質の乳液を凝固剤で凝固させた凝固物（すなわち、豆腐及び豆腐類似物）を粉砕した粉砕物の形態で使用する場合、予めミキサー等で前記凝固物を粉砕しておくことが好ましい。

【００３３】

得られた混合物を所望の形状に加工し、加熱工程に供することができる。例えば得られた混合物を鋳型形状の密閉容器内に充填し、容器ごと加熱することができる。

【００３４】

加熱工程における温度は２５～６０℃が好ましく、加熱時間は５～６０分間が好ましい。加熱工程において、トランスグルタミナーゼを配合する実施形態では、トランスグルタミナーゼの作用も進行する。

【００３５】

トランスグルタミナーゼを配合する実施形態では、酵素の失活のために混合物を酵素失活温度（約９０℃）の温度で数分間加熱する工程を更に含むことが好ましい。

【００３６】

２．２．凝固剤添加のみにより凝固を行う実施形態

大豆タンパク質凝固処理として凝固剤添加のみを行う本発明の方法としては、水、大豆タンパク質、小麦タンパク質、凝固剤及び他の原料を混合する混合工程と、得られた混合物を静置して大豆タンパク質を凝固させる静置工程とを含む方法が挙げられる。混合工程の手順としては、上記２．１で説明したのと同様の手順を採用することができる。つまり、全原料を一括で混合してもよいし、順に加えて混合してもよいし、大豆タンパク質及び水を含み、必要に応じて油脂等の、小麦タンパク質及び凝固剤以外の他の成分を更に含む原料を予め均質化した物に凝固剤及び小麦タンパク質を加えて混合してもよい。また、静置工程の前後において、得られた混合物を所望の形状に加工することができる。

【００３７】

静置は雰囲気温度１０～４０℃において１～１５分間行うことが好ましい。

トランスグルタミナーゼを配合する実施形態では、前記酵素の失活のための加熱工程を更に含むことが好ましい。

【００３８】

２．３．加熱凝固のみにより凝固を行う実施形態

大豆タンパク質凝固処理として加熱凝固のみを行う本発明の方法としては、水、大豆タンパク質、小麦タンパク質、及び他の原料を混合する混合工程と、得られた混合物を加熱して大豆タンパク質を凝固させる加熱工程とを含む方法が挙げられる。

【００３９】

原料の混合の手順は特に限定されず、使用する混合手段に応じて適宜決定することができる。全原料を同時に加えて混合してもよいし、順に加えて均質化してもよい。一実施形態では、大豆タンパク質及び水を含み、必要に応じて油脂等の、小麦タンパク質以外の他の成分を更に含む原料を撹拌型ホモジナイザー、高圧ホモジナイザー等で均質化した後、均質化した物に小麦タンパク質を加えて混合することにより全原料の混合を行う。

【００４０】

得られた混合物を所望の形状に加工し、加熱工程に供することができる。例えば混合物を鋳型形状の密閉容器内に充填し、容器ごと加熱することができる。

【００４１】

加熱工程程の手順としては、上記２．１で説明したのと同様の手順を採用することができる。

【００４２】

トランスグルタミナーゼを配合する実施形態では、前記酵素の失活のための加熱工程を更に含むことが好ましい。

【実施例】

【００４３】

以下、実施例に基づいて本発明の実施形態をより具体的に説明する。

実施例１

１．原料

【００４４】

【表１】

	質量部
水	３７．２
大豆タンパク質 「フジプロＦ」（不二製油社製、形態：乾燥粉末）	２．１
小麦タンパク質 「グリアＡ」（アサマ化成社製、形態：乾燥粉末）	２２．０
植物性油脂	２２．１
トランスグルタミナーゼ	０．４
調味料	１５．７
フレーバー、色素	０．１
凝固剤 （濃度５０質量％乳酸溶液）	０．４
合計	１００

【００４５】

２．製造工程

大豆タンパク質と水をミキサーにかけて混合し、得られた混合物と、小麦タンパク質及び凝固剤を除く他の原料とを、ホモジナイザー（ＤＸ－１０型／ＮＩＨＯＮＳＥＩＫＩ社製）により、３０００～８０００ｒｐｍで６０～１２０秒間均質化した。

【００４６】

均質化物に凝固剤（乳酸溶液）を加えて混合した。

得られた混合物に更に小麦タンパク質を加えて混合した。

【００４７】

上記手順で得られた混合物をスライス状に成型し、樹脂製フィルム製容器に充填して真空包装した。

【００４８】

容器に充填したスライス状の混合物を、湯中に入れて５５℃で１０分間加熱処理して、混合物中の大豆タンパク質を凝固させるとともに、トランスグルタミナーゼを作用させた。

【００４９】

さらに、容器に入れたスライス状の混合物を、湯中に入れて９０℃で２分間加熱処理して、大豆タンパク質を凝固させるとともにトランスグルタミナーゼを失活させた後、冷却して冷蔵庫で保管した。

こうしてチーズ様食品を作成した。

【００５０】

３．性能評価

上記工程により作成したチーズ様食品を、アルミホイルに乗せ、オーブントースターで約２分間焼く。トースターから取り出した後、温かいうちに両手で左右に引っ張り「伸び性」を評価した。また、口に含み、歯応え、歯切れ感、舌触りで「食感」を評価した。

【００５１】

【表２】

	伸び性
◎	約５cm以上伸びる
○	約３～５cm伸びる
△	約１～３cm伸びる
×	全く伸びない

【００５２】

【表３】

	食感
◎	軟質チーズ様
○	ややガム状 または、ややモソモソ状
△	軟質チーズとして許容される下限 （ガム様，モソモソ状等.）
×	軟質チーズとして成立し得ない食感 （飲み込みにくいほどガム様等）

【００５３】

実施例１のチーズ様食品は伸び性、食感ともに◎であり、曳糸能のあるチーズと同等の物性と食感、風味を有するものであった。

【００５４】

実施例２～５及び比較例１～４

大豆タンパクと小麦タンパクの質量部を変えた以外は、実施例１と同様の原料配合（すなわち、実施例１表１における大豆タンパクと小麦タンパク以外の他の原料の量（質量部）は変更してない）及び手順によりチーズ様のスライス状食品を得た。得られた食品を実施例１と同様の操作及び基準により食感および風味を評価した。

【００５５】

各実施例、比較例の大豆タンパクと小麦タンパクの配合量及び食感、風味を以下の表に示す。

【００５６】

Case No.: IPR2023-00206
U.S. Patent No. 10,039,306

【表４】

	小麦ﾀﾝﾊﾟｸ質配合量	大豆ﾀﾝﾊﾟｸ質配合量	ﾀﾝﾊﾟｸ質質量比（対実施例１）		小麦ﾀﾝﾊﾟｸ質配合比率（対全原料）	大豆ﾀﾝﾊﾟｸ質配合比率（対全原料）	評価		特徴
	質量部	質量部	小麦ﾀﾝﾊﾟｸ質	大豆ﾀﾝﾊﾟｸ質	質量%	質量%	伸び性	食感	
実施例１	２２．０	２．１	１	１	２２	２．１	◎	◎	
実施例２	３７．４	２．１	１．７	１	３３	１．８	○	△	
実施例３	１５．４	２．１	０．７	１	１７	２．２	△	○	
実施例４	２２．０	８．４	１	４	２１	７．９	△	△	
実施例５	２２．０	０．７	１	０．３３	２２	０．７	◎	○	
比較例１	４４．０	２．１	２	１	３６	１．７	○	×	ガム様
比較例２	１１．０	２．１	０．５	１	１２	２．４	×	×	固まらず
比較例３	２２．０	１２．６	１	６	２０	１１．４	△	×	モソモソ
比較例４	２２．０	０．０	１	０	２３	０	◎	×	ガム様

【００５７】
実施例６

Motif Exhibit 1148, Page 2022 of 3341

豆腐をホモジナイザー（ＤＸ－１０型／ＮＩＨＯＮＳＥＩＫＩ社製）を用いて、３０００～８０００ｒｐｍで６０～１２０秒間均質化し、メジアン径１０μ程度に調製した豆腐ペースト４０質量部（豆腐ペースト４０質量部を用いたとき、全原料中に大豆タンパク質は固形成分の分量として２．１質量％含まれる）を、大豆タンパク質２．１質量部と水３７．２質量部とをミキサーにかけた混合物に代えて用いる点を除いて、実施例１と同様にして、チーズ様のスライス状食品を得た。得られた食品の性能は、実施例１で得られたものと同等であった。

【００５８】

実施例７：トランスグルタミナーゼを使用しない例

１．原料

【００５９】

【表５】

	質量部
水	３８．０
大豆タンパク質 「フジプロＦ」（不二製油社製、形態：乾燥粉末）	２．１
小麦タンパク質 「グリアＡ」（アサマ化成社製、形態：乾燥粉末）	２２．０
植物性油脂	２１．７
調味料	１５．７
フレーバー、色素	０．１
凝固剤 （濃度５０質量％乳酸溶液）	０．４
合計	１００

【００６０】

２．製造工程

大豆タンパク質と水をミキサーにかけて混合し、得られた混合物と、小麦タンパク質及び凝固剤を除く他の原料を、ホモジナイザー（ＤＸ－１０型／ＮＩＨＯＮＳＥＩＫＩ社製）により、３０００～８０００ｒｐｍで６０～１２０秒間混合して均質化した。

【００６１】

均質化した物に凝固剤（乳酸）を加えて混合した。各原料は実施例１と同様のものを用いた。

得られた混合物に更に小麦タンパク質を加えて混合した。

【００６２】

上記手順で得られた混合物を雰囲気温度２５℃において５分間静置したのち、スライス状に成型し、樹脂製フィルム製容器に充填して真空包装した。

【００６３】

３．性能評価

実施例１と同様の手順で評価を行ったところ、「伸び性」が◎、「食感」が△であり、曳糸能のあるチーズと同等の物性と食感、風味を有することが確認された。

【００６４】

実施例８

凝固剤として乳酸の代わりに塩化マグネシウムを用いる以外は、実施例７と同様にして、チーズ様のスライス状食品を得た。得られた食品の性能は、「伸び性」が◎、「食感」が△であり、実施例７で得られたものと同等であった。

【００６５】

実施例９

凝固剤を用いない点、水３８．０質量部を用いる点、均質化した原料に凝固剤を加えて

混合する工程を行わない点を除いて実施例１と同様の手順によりチーズ様のスライス状食品を得た。得られた食品の性能は、伸び性が◎、食感が○であり、実施例１で得られたものとほぼ同等であった。

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PRODUCTIOM OF CHEESE LIKE FOOD

Inventor(s): RADOKURIFU FURANKURIN ROBINSON

Applicant(s): MILES LAB

Classification: - international: ***A23C20/02; A23L11/00; A23L25/00;*** (IPC1-7): A23C19/00; A23L1/20; A23L1/36
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Abstract not available for JPS54122766 (A)
Abstract of corresponding document: GB2016255 (A)

Synthetic cheese like products are prepared by the steps of forming an aqueous slurry of full-fat oleaginous seed material at a pH below about 3.5, subjecting the aqueous slurry to shear conditions sufficient to disrupt the natural cellular structure of the seed material, adjusting the pH of the slurry to the seed protein's isoelectric point to precipitate protein, separating the entire insoluble portion from the slurry, homogenizing the insoluble portion, adjusting the pH of the homogenized insoluble portion to about 5.3 to 7.0, and blending sufficient flavouring agents therewith to produce a cheese-like flavour. The seed material may be beans, lentils, peanuts, soybeans, rapeseed, safflower, or sunflower. Additional fats may be blended with the product. Gums, colourants, casein, albumin, preservatives, salt and starch may also be present.

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(21)Application number : 57-170637
(22)Date of filing : 29.09.1982
(71)Applicant : AJINOMOTO CO INC
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(54)PREPARATION OF NOVEL GELATINOUS FOOD

(57)Abstract
PURPOSE: To prepare the titled novel food, by adding a specific amount of transglutaminase to an emulsion containing more than specific amounts of proteins, oils and fats, and water, thereby gelanitizing the emulsion.
CONSTITUTION: An emulsion or slurry containing ≥2wt% of proteins, ≥2wt% of oils or fats and ≥40wt% of water is adjusted at 30W40°C, added with 1 unit of a transglutaminase solution per 1g of protein, lightly stirred, and left at rest for 10W30min at room temperature. The protein may be milk, casein, defatted oil seed, soya milk, conditioned soya milk, etc., and the oil and fat may be the constituent fat of fresh milk. Since transglutaminase loses its activity slowly at normal temperature, it is unnecessary to use a particular inactivation treatment. Since the gelling mechanism of the gel is the crosslinking reaction through covalent bonds, the gel is stable to heat and unmeltable with heat.

Motif Exhibit 1148, Page 2027 of 3341
Case No.: IPR2023-00206
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(54) Title: A PROCESS FOR MAKING CHEESE

(57) Abstract

The present invention relates to a process for making cheese comprising: a) adding to cheesemilk a transglutaminase, incubating for a suitable period, b) incubating with a rennet so as to cause clotting, and c) separating whey from the coagulate, and d) processing the coagulate into cheese. Also the cheese products produced by said process are contemplated. The invention is also directed towards the use of transglutaminase for maintaining proteins in the cheese material during a conventional cheese-making process.

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Title: A process for making cheese

FIELD OF THE INVENTION

The present invention relates to a process for making cheese in improved yields by the use of a transglutaminase, and further cheese products produced by said process.

The invention is also directed towards the use of transglutaminase for maintaining proteins in the cheese material during a cheese-making process.

BACKGROUND OF THE INVENTION

The ability of ruminants to convert grass and other plant materials, being indigestible to man, into valuable nutritious matter, such as milk and meat, has for thousands of years been essential for the existence of a great many people all over the world.

Man has made butter and cheese from milk for many years. Originally cheese-making served as a method for preserving excess milk in the summer.

The industrial manufacturing of cheese started up more than 100 years ago, as the capability of handling large amounts of milk reached a sufficient technical stage and rennet became commercially available.

General principle of cheese-making

In the production of cheese it is necessary to coagulate the cheesemilk to be able to separate the cheese matter *e.g.* casein from the whey. The milk can be coagulated either by acid treatment or enzyme curdling. In both cases the casein is made insoluble, which leads to the formation of a coherent substances. However, the two coherent coagulated substances (*i.e.* the cheese material) differ. The coagulate becomes firmer and

more elastic when using milk coagulating enzymes, such as rennet (a preparation of rennin which is also called chymosin), in comparison with the coagulate formed when using acids.

Products containing chymosin, which can be isolated from the fourth stomach of calves, have for many years been used for this purpose. Shortage of calf stomachs has in the last decades resulted in the introduction of other milk coagulating enzymes such as bovine pepsin, porcine pepsin as well as microbial enzymes. All these enzymes are characterized by having specificity towards the peptide bond between residue 105 phenylalanine and residue 106 methionine or a bond adjacent to that in kappa-casein. This means that by employing these enzymes in cheese-making, the kappa-casein is split at the junction between para-kappa-casein and a macropeptide moiety called glycomacropeptide (GMP) carrying the negative charges. When this occurs the macropeptide diffuses into the whey, its stabilizing effect is lost, and the protein micelles can start to aggregate once sufficient amounts of kappa-casein has been hydrolyzed.

This diffusion of macropeptide into the whey means that quite a lot of the milk dry matter is lost into the whey. Whey typically consists of 0.85 % protein, 0.36 % fat and 5.14 % sugars (USDA Table of Standard Reference. US Government Printing Office, 1986). For further elaboration on the enzymatic coagulation of milk see *e.g.* D.G. Dalgleish in Advanced Dairy Chemistry, Vol 1, ed by P.F. Fox Elsevier, London 1992.

<u>Enzymes and cheese-making</u>

Enzymes have an important role in the making of cheese and for the flavour, texture, mouth feeling etc. of cheese products.

Certain enzymes are added *e.g.* to obtain a desired texture. Other enzymes, which are present in the milk raw material, are inactivated *e.g.* to avoid an undesired flavour.

For instance, the above mentioned milk coagulating enzymes (*e.g.* rennet) are added at a certain point of time in the cheese-making process to secure the coagulation of the cheese material. Such enzymes are proteases which besides coagulating the milk material further cause a limited degree of breakdown of the milk proteins. This is of importance for the texture and flavour.

Lipases present in the milk will result in liberation of short chain fatty acids from the milk fat triglycerides, which will contribute to a harsh flavour. This can be avoided by heat treating (*i.e.* usually by pasteurization) the cheesemilk. However, for cheese types such as Danablue and Boerenkaas a harsh flavour is desired.

Lysozyme, which is a glucosidase, is known to be added to the cheese as a preservative. Lysozyme hydrolyzes certain mucopolysaccharides and mucopeptides, which cause lysis of the cell wall of bacteria, such as bacterial cell wall of the genus *Clostridium* sp.

Transglutaminases are also known to be used for manufacturing milk and milk-like products, such as cheese. Even though the precise action of transglutaminase is not completely understood, it is believed that transglutaminase cross-links proteins in the milk or milk-like product, whereby a lattice or network is generated. This causes gelling of the aqueous phase of such products which can be advantageous.

WO 94/21130 (Novo Nordisk A/S) discloses a method for production of a non-acidified edible gel on milk basis comprising addition of transglutaminase and rennet to milk, followed by a heat treatment. Hereby a functionally and/or organoleptically satisfactory edible gel is obtained, which can be used as mousse, cheese or pudding etc.

From WO 94/21129 (Novo Nordisk A/S) it is known that addition of transglutaminase to milk or milk-like products such as cheese, will lead to products having a pleasant consistency and mouth feeling and exhibit satisfactory organoleptic properties. Further such products can be produced without adding emulsifiers and stabilizers.

WO 93/22930 (Novo Nordisk A/S) describes a method for the production of a milk-like product by adding transglutaminase to a liquid containing milk proteins. The liquid contains Ca^{++}, if required, in an amount sufficient for the reaction catalyzed by the transglutaminase, and the pH of the liquid, if required, is adjusted to a value of between 5.5 and 7.5. Hereby a milk-like product which is physically more stable is obtained.

From JP-A-5959151 it appears that modified milk products in gel form can be obtained by addition of transglutaminase to milk.

From JP-A-2276541 it appears that a fibrous, tissue containing protein food can be obtained on the basis of a casein solution, transglutaminase and a milk coagulating enzyme.

JP-A-6030770 concerns a method for protein gelation in a solution or slurry containing 1.0 wt.% or more protein by the action of a new transglutaminase isolated from sea squirt (*Halocynthia roretzi*). It is also mentioned that said transglutaminase can be used for gelling foods such as cheese.

Comments to prior art

In conventional processes for making cheese it is a drawback that a considerable amount of protein is lost into the whey, as protein is a valuable component in the cheese product. None of the above mentioned prior art documents solve this problem, as the aim of the preparation methods disclosed in said documents is to stabilize and emulsify milk or milk-like products resulting in a physically improved product. When using one of

these disclosed techniques for producing cheese a considerable amount of protein will be lost into the whey, when the whey is separated from the cheese material.

Therefore, it would be desirable to be able to maintain at least some of this above mentioned protein, lost into the whey, in the cheese material when making cheese.

SUMMARY OF THE INVENTION

The object of the present invention is to overcome the above mentioned problem by providing an improved process for making cheese.

The present inventors have surprisingly found that it is possible to make cheese from cheesemilk that has been pretreated with an enzyme capable of maintaining proteins in the cheese material during the cheese-making process. It was found that cheese can be produced in increased yields using this process.

Accordingly, the first aspect of the invention relates to a process for making cheese, comprising:

a) adding to cheesemilk a transglutaminase, incubating this mixture for a suitable period,
b) incubating the resulting product with a rennet so as to cause clotting and formation of a coagulate,
c) separating whey from the coagulate, and
d) processing the coagulate into cheese.

In another aspect the invention relates to a cheese product produced according to the process of the invention.

Finally, the invention also relates to the use of transglutaninases for maintaining proteins in the cheese material during a cheese-making process.

DETAILED DESCRIPTION OF THE INVENTION

As mentioned above a considerable amount of proteins is lost into the whey when producing cheese using conventional cheese-making processes.

The present inventors have surprisingly found that this loss can be reduced by:

- pre-treating raw materials comprising proteins used in the production of cheese with a transglutaminase, and
- performing a cheese-making process known per se on the pre-treated raw materials.

The "cheese material" is the substances, which after being subjected to the cheese-making process of the invention will constitute the cheese product.

Thus, according to the present invention, there are no particular restrictions on the properties and composition of the raw materials to be used for the production of cheese, and thus, conventional methods of cheese production (beyond the present pre-treating step) may be followed.

Accordingly, the first aspect of the invention is to provide a process for making cheese, comprising:

a) adding to cheesemilk a transglutaminase, incubating this mixture for a suitable period,
b) incubating the resulting product with a rennet so as to cause clotting and formation of a coagulate,
c) separating whey from the coagulate, and
d) processing the coagulate into cheese.

Transglutaminases are protein-maintaining enzymes capable of increasing the amount of protein left in the coagulated cheese material after incubation with rennet in step b) and further

after the separation of whey from the coagulate in step c), in comparison to a corresponding process where the cheesemilk has not been treated with a such enzyme.

Enzymes' capability to maintain an increased amount of protein in the cheesemilk during the cheese-making process can be assayed as described in the Materials and Methods section below.

"Cheesemilk" is the term used for the milk material used for cheese-making.

Cheesemilk may according to the invention originate from ruminants such as cows, sheep, goats, buffalos or camels. Cheesemilk used as the raw material according to the invention can be whole milk, reconstituted milk, concentrated whole milk, low fat milk, cream or a milk product with a fat content from 0% to 50%. In general cheesemilk comprises between 1% and 6% wt.% protein.

The choice of cheesemilk will normally be dependent on the type of cheese to be made. Most types of cheese can advantageously be prepared by the process of the invention.

If desired, the cheesemilk may be un-pasteurised. However, in most cases the cheesemilk has been pasteurised to improve the quality of the milk. The pasteurization inactivates lipases present in the milk, which is often an advantage, as the presence of lipases will result in a cheese product having a harsh taste. Further, pasteurization kills *e.g.* coliform bacteria, which may inflict an unpleasant taste upon the cheese and lead to an uncontrolled generation of gas.

According to the present invention, the treatment with a protein-maintaining enzyme involves specifically adding such an enzyme to the raw materials prior to their undergoing conventional cheese-making procedures, and reacting the enzyme with

the proteins in the raw material (*i.e.* cheesemilk).

As mentioned above the protein-maintaining enzyme of the invention is a transglutaminase.

The "transglutaminase" to be used according to the invention can be any transglutaminase, which includes both calcium-dependent and calcium-independent transglutaminases or mixtures of transglutaminases. Transglutaminases are protein-glutamine γ-glutamyltransferases, and have been classified as enzymes having the number E.C. 2.3.2.13 according to Enzyme Nomenclature, Academic Press, Inc., 1992.

Transglutaminases are enzymes capable of catalyzing an acyl transfer reaction, in which a gamma-carboxyamide group of a peptide-bound glutamine residue is the acyl donor. Primary amino groups in a variety of compounds may function as acyl acceptors with the subsequent formation of monosubstituted gamma-amides of peptide-bound glutamic acid. When the epsilon-amino group of a lysine residue in a peptide-chain serves as the acyl acceptor, the transglutaminases form intramolecular or intermolecular gamma-glutamyl-epsilon-lysyl cross-links.

Even though the protein-maintaining action of transglutaminase in cheese-making processes is not completely understood, it is believed that it is a result of the formation of a network between the milk protein molecules.

A wide array of transglutaminases has been identified and isolated from a number of animals and a few plant species. The most widely used animal derived transglutaminase, Factor XIIIa, is a multi-subunit enzyme.

Transglutaminases may, according to the invention, be of *e.g.* mammalian origin, such as of human or bovine origin, of marine origin, such as derived from sea squirt (*Halocynthia roretzi*),

or of microbial origin, such as of bacterial, yeast of filamentous fungus origin, or variants thereof.

In an embodiment of the invention the transglutaminase is Factor XIIIa of human origin.

In another embodiment the transglutaminase is a microbial transglutaminase derived from *Streptomyces lydicus* (former *Streptomyces libani*), or variants thereof. Said microbial transglutaminase is available from Novo Nordisk A/S.

Other suitable microbial transglutaminases have been described, including a transglutaminase from *Physarum polycephalum* (Klein et al., Journal of Bacteriology, Vol. 174, pages 2599-2605), as well as transglutaminases from *Streptoverticillium mobaraense*, *Streptoverticillium cinnamoneum*, and *Streptoverticillium griseocarneum* (Motoki et al., US patent no. 5,156,956), and from *Streptomyces lavendulae* (Andou et al., US patent no. 5,252,469).

Further the transglutaminases described in EP 481 504-A1 (Amano Pharmaceutical Co. LTD.) and WO 96/06931 (Novo Nordisk A/S) are contemplated, which are hereby incorporated by references.

Also transglutaminases derived from the class of fungi-like organisms Oomycetes, preferably from the genus *Phytophthora*, are contemplated. Other relevant Oomycetes transglutaminases are described in PCT/DK96/00031 (Novo Nordisk A/S), which are hereby incorporated by reference.

The amount of transglutaminase to be added is the amount which produces the protein-maintaining effect in the cheese product. It is usually between 0.1-10 mg active enzyme protein per gram of substrate protein, preferably 1-6 mg active enzyme protein per gram of substrate protein.

As cheesemilk in general has a protein content of 1% to 6% proteins, the amount of transglutaminase to be added ranges from about 0.1 g per liter cheesemilk to 60 g per liter cheesemilk, preferably 1 g per liter cheesemilk to 36 g per liter cheesemilk.

It goes without saying, if the transglutaninase is calcium-dependent, the concentration of Ca^{++} is supposed to be of such value that Ca^{++} is able to activate both the transglutaminase and the rennet.

In order to exhibit the enzymatic effect of the protein-maintaining enzyme (added in step a)) the raw materials are incubated with the enzyme for a "suitable period". A suitable period lies within the range of between 10 minutes and 4 hours.

In the specific case of the protein-maintaining enzyme being a transglutaninase the raw material is kept between 10 minutes and 4 hours, preferably between 10 minutes and 3 hours, especially between 10 minutes and 2 hours under conditions which are optimal for transglutaminase, which is at a pH value between 6-7 and at a temperature in the range of 5-60°C, preferably about 40-55°C. In this manner the enzyme reaction may be sufficiently carried out to achieve the desired protein-maintaining effect.

After the pre-treatment with transglutaminase, the transglutaminase may be inactivated by any conventional method which is not harmful to the product, for example by heating the raw materials till about 80°C for a period of time sufficient to inactivate the transglutaminase. After the eventual inactivation of the transglutaminase the raw materials are treated as described earlier by conventional methods for making cheese.

Before carrying out the enzyme treatment in step a) the milk

may be concentrated in various ways such as by evaporation or spray drying, but is preferably concentrated by membrane filtration, *i.e.* ultrafiltration, in which molecules with a molecular weight of up to 20,000 Dalton are allowed to pass the membrane, optionally with diafiltration before or after ultrafiltration, in which molecules of a molecular weight of up to 500 Dalton are allowed to pass the membrane. For a more detailed description of the ultrafiltration process, see for instance Quist et al., Beretning fra Statens Mejeriforsøg, 1986. (Report from the Danish Government's Dairy Test Institution).

A starter culture may be added to the cheesemilk before or simultaneously with the addition of the coagulation inducing enzyme (step b)). The starter culture is a culture of lactic acid bacteria in conventional cheese-making. The culture is added to ferment the lactose present in the cheesemilk and to cause further decomposition of the clotted casein into smaller peptides and free amino acids. This is a result of the starter culture's production of proteases and peptidases. The starter culture may be added in amounts which are conventional for the present purpose, *i.e.* typically amounts of about 1*E4 to 1*E5 bacteria/g of cheesemilk, and may be added in the form of freeze-dried, frozen or liquid cultures. When the milk employed in the process of the invention is concentrated milk, it is preferred to add the starter culture after concentrating the milk, although this is not an absolute requirement, as the starter culture bacteria will be retained during filtration.

After adding the enzyme which causes clotting in step b) of the process of the invention, *e.g.* further salting, pressing, and ripening of the curd, may be conducted in the traditional way of producing cheese, *e.g.* as described by R. Scott, Cheese-making in Practice, 2nd Ed., Elsevier, London, 1986.

In a preferred embodiment of the process of the invention the

rennet is Rennilase®, and the rennet is used in an amount of between 1 and 30 renneting units/ml activity units/ml of milk or milk-like product.

Another aspect of the invention is to provide a cheese product which has been prepared by the process of the invention.

A final object of the invention relates to the use of transglutaminases for maintaining proteins in the cheesemilk during a cheese-making process. Raw materials encompassed by the term "cheesemilk" are defined above.

Further, transglutaminases which can be used according to this aspect of the invention are described above.

Other features of the invention will become apparent in the following example, which is given to illustrate the invention.

METHODS AND MATERIALS

Enzymes:
Transglutaminase, Factor XIIIa, 8 mg enzyme protein per gram purified enzyme product (available from Novo Nordisk A/S)

Rennilase® 50 L XL (available from Novo Nordisk DK)

Enzyme activity
Rennilase® is characterized in the Novo Nordisk product sheet "Cheese-making with Rennilase®" B250g-GB 2500 Oct. 1990 PBz, and the Novo rennet unit is defined in IB 67/3-e. Both these publications are available on request from Novo Nordisk A/S, Novo Allé, DK-2880 Bagsvaerd, Denmark.

Milk
Pasteurized skim milk (available from Mejeriet Enigheden,

Lygten, Copenhagen, Denmark)

Protein-maintaining assay

The capability of an enzyme to maintain an increased amount of proteins in the cheesemilk during cheese-making, can be assayed by:

a) treating skim milk with a suitable amount of the enzyme in question,
b) incubation for a fixed period of time (*e.g.* 45 minutes),
c) adding the rennet,
d) letting the cheesemilk coagulate,
e) to cut and filter the formed coagulum,
f) separating the whey from the coagulate,
g) collecting the separated whey, and
h) determining the protein content in the whey.

Step a) to h) is repeated except that no enzyme is added in step a).

The capability of the "protein-maintaining enzyme" can then be confirmed or denied by comparing the protein content in the whey of the test using an enzyme and the "blind test.

EXAMPLES

Example 1

Pasteurized skim milk is heated to 32°C and distributed in beakers with 150 ml in each.

0.4 g transglutaminase enzyme protein per 100 g milk protein is added, and either 0 or 0.1 g $CaCl_2$ per liter. After incubation for 45 minutes, the rennet Rennilase® 50 L XL, is added in the amount of 0.1 g per liter skim milk.

After clotting the coagulum is cut and the whey is collected

and filtered through a Whatman CF/C. The content of proteins in the whey is determined as Kjeldahl N*6,28.

The result of the test compared with a "blind test" (*i.e.* without transglutaminase treatment) is displayed in the table below.

Sample No.	Transglutaminase g/100g milk protein	$CaCl_2$ (g/liter cheesemilk)	Protein content in the whey (%)
1 (blind)	-	0.0	1.001
2 (blind)	-	0.1	0.954
3	0.4	0.0	0.928
4	0.4	0.1	0.909

As can be seen from the table a significant amount of protein has been maintained in the cheese material by using transglutaminase.

As will be apparent to those skilled in the art, in the light of the foregoing disclosure, many alterations and modifications are possible in the practice of this invention without departing from the spirit or scope thereof. Accordingly, the scope of the invention is to be construed in accordance with the substance defined by the following claims.

PATENT CLAIMS

1. A process for making cheese, comprising:
   a) adding to cheesemilk a transglutaninase, incubating this mixture for a suitable period, and
   b) incubating the resulting product with a rennet so as to cause clotting and formation of a coagulate,
   c) separating whey from the coagulate, and
   d) processing the coagulate into cheese.

2. The process according to claims 1, wherein the transglutaminase is of mammalian origin, or variants thereof.

3. The process according to claim 2, wherein said mammalian transglutaminase is of human or bovine origin.

4. The process according to claim 3, wherein the transglutaminase is Factor XIIIa of human origin.

5. The process according to claim 1, wherein the transglutaminase is of marine origin, or variants thereof.

6. The process according to claim 5, wherein the transglutaminase is derived from sea squirt (*Halocynthia roretzi*), or variants thereof.

7. The process according to claim 1, wherein the transglutaminase is of microbial origin, or variants thereof.

8. The process according to claim 7, wherein said microbial enzyme is a transglutaminase of bacterial origin.

9. The process according to claim 8, wherein said bacterial transglutaminase is derived from *Streptomyces lydicus*.

10. The process according to claim 7, wherein said microbial enzyme is a transglutaminase of fungal origin, preferably

derived from an *Oomycetes*, especially preferred of a strain of *Phytoftera*.

11. The process according to claims 1 to 10, wherein the amount of added transglutaminase ranges between 0.1-10 mg active enzyme protein per grams of substrate protein, preferably 1-6 mg active enzyme protein per grams of substrate protein.

12. The process according to any of claims 1 to 11, wherein the incubation period is from 10 minutes to 4 hours, preferably from 10 minutes to 3 hours, especially from 10 minutes to 2 hours.

13. The process according to any of claims 1 to 12, wherein the incubation in step a) takes place at a pH of 5 to 8, preferably of pH 6 to 7.

14. The process according to any of claims 1 to 13, wherein the incubation in step a) takes place at a temperature in the range of 5-60°C, preferably about 40 to 55°C.

15. The process according to any of claims 1 to 14, wherein the rennet is Rennilase®.

16. A cheese product comprising milk proteins, where the cheese is produced according to a process of any of claims 1 to 15.

17. Use of transglutaminase for maintaining proteins in the cheese material during a cheese-making process.

18. The use according to claim 17, wherein the cheese-making process is the process according to any of claims 1 to 15.

19. The use according to any of claims 16 to 18, wherein the transglutaminase is of mammalian origin, or variants thereof, such as human or bovine origin.

20. The use according to claim 19, wherein the transglutaminase is Factor XIIIa of human origin.

21. The use according to claims 16 and 16a, wherein the transglutaminase is of marine origin, or variants thereof, preferably derived from sea squirt (*Halocynthia roretzi*), or variants thereof.

22. The use according to claims 16 and 16a, wherein the transglutaminase is of microbial origin, or variants thereof, prefably of fungal, such as filamentous fungus or yeast origin, or bacterial origin.

23. The use according to claim 19, wherein said transglutaminase is derived from a bacteria of the genus *Streptomyces*, especially *S. lydicus*.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/DK 96/00279

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: A23C 19/032
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)

IPC6: A23C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI, CLAIMS/US PATENTS, JAPIO, EPODOC, DIALINDEX(FOODSCI)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	WO 9421130 A1 (NOVO NORDISK A/S ET AL.), 29 Sept 1994 (29.09.94), claims 1-3,5,7 --	1-3,11,15-19
P,X	EP 0711504 A1 (AJINOMOTO CO., INC.), 15 May 1996 (15.05.96), claim 1 --	1,17
A	WO 9322930 A1 (NOVO NORDISK A/S ET AL.), 25 November 1993 (25.11.93), claims 1-8 --	1-5,7-8, 16-20

☐ Further documents are listed in the continuation of Box C. ☒ See patent family 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" erlier 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

Date of the actual completion of the international search	Date of mailing of the international search report
27 August 1996	03 -10- 1996
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer INGA-KARIN PETERSSON Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1992)

INTERNATIONAL SEARCH REPORT

Information on patent family members

31/07/96

International application No.
PCT/DK 96/00279

Patent document cited in search report	Publication date	Patent family member(s)		Publication date
WO-A1- 9421130	29/09/94	AU-B-	670370	11/07/96
		AU-A-	6374394	11/10/94
		EP-A-	0689384	03/01/96
EP-A1- 0711504	15/05/96	NONE		
WO-A1- 9322930	25/11/93	AU-B-	662422	31/08/95
		AU-A-	4060893	13/12/93
		CA-A-	2132302	25/11/93
		EP-A-	0649284	26/04/95
		JP-T-	7506490	20/07/95
		NZ-A-	252106	28/08/95

Form PCT/ISA/210 (patent family annex) (July 1992)

Electronic Acknowledgement Receipt

EFS ID:	28049005
Application Number:	14796970
International Application Number:	
Confirmation Number:	8501
Title of Invention:	METHODS AND COMPOSITIONS FOR CONSUMABLES
First Named Inventor/Applicant Name:	Marija Vrljic
Customer Number:	26191
Filer:	M. Angela Parsons/Shannon Glaeser
Filer Authorized By:	M. Angela Parsons
Attorney Docket Number:	38767-0010001
Receipt Date:	12-JAN-2017
Filing Date:	10-JUL-2015
Time Stamp:	16:56:07
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	Foreign Reference	EP500132.pdf	619660 dc2b14dce1f35ea1e489ce5aa63cda44477efda8	no	10

Warnings:

Information:					
2	Foreign Reference	EP1529444.pdf	120066 49a25bc6e9bb4909e2cd5be826c6274ebfb e412a	no	7
Warnings:					
Information:					
3	Foreign Reference	JP2009171877A.pdf	3447405 8578ea2f1b80b91397acad419816d145f56 0447d	no	5
Warnings:					
Information:					
4	Foreign Reference	JP2011000073A.pdf	13747311 712147adfd86ba2636a21de77a0452c4703 5f702	no	23
Warnings:					
Information:					
5	Foreign Reference	JPS54122766_Abstract.pdf	759121 507e01e12571206f9e01e66d4ccd919525ff 6ab2	no	1
Warnings:					
Information:					
6	Foreign Reference	JPS5959151_Abstract.pdf	147867 ebe8f4a36af5ea482915064785816c611861 3a0d	no	1
Warnings:					
Information:					
7	Foreign Reference	WO1997001961A1.pdf	819650 4359ad5c0d2b35e1ee5eaff9329e13262710 dfdb	no	21
Warnings:					
Information:					
8	Non Patent Literature	Vice_2016.pdf	491419 949ab16405ef595e7bc966a6cd8f48b4816 4cf3c	no	3
Warnings:					
Information:					

9	Non Patent Literature	CBS_News_2016.pdf	583797 4c900d81add1e143434902 5ff6fc672499ff92bf	no	4
Warnings:					
Information:					
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17	Non Patent Literature	Calkins_2007.pdf	4226241 db2a7181e1c660d68d01c46df714549840197b49	no	18
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19	Non Patent Literature	Chaudhari_Roper_2010.pdf	297703 21c8696805cccee3a9ce23610193702ec6e7a32d	no	1
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23	Non Patent Literature	DOnfro_Impossible_Burgers_Taste_Test.pdf	4009062 ecf98c848dd6cf94ea3ed1929c9d923e77fa7b51	no	14
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26	Non Patent Literature	Etienne_2016.pdf	923714 0ccdbe148b79af672f27e9201be8c86f575ed638	no	9
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27	Non Patent Literature	ESR_147377667_2016_07_15.pdf	1237543 8d3df6bdf2ff41e2fabc3cb5b98b05074bda31de	no	11
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29	Non Patent Literature	CNOA_2012800417131_2016_11_11.pdf	749892 0e4b56819fa08b1bdfa8ccc319b4ca60513cdd18	no	18
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32	Non Patent Literature	Grobart_Making_a_Steak_Without_.pdf	202747 80a7067febe4d8355fb15e412b0a9f67f7728580	no	2
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34	Non Patent Literature	Hannah_2009.pdf	289478 ffbced13cb4a25c68fc2898f72eb5f3183a29934	no	2
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35	Non Patent Literature	Hoshaw_Silicon_Valleys_Bloody_Plant.pdf	1938513 3cf75a61da2b0c7d1639c0203d07866ddec55ba2	no	8
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36	Non Patent Literature	Hui_Meat_and_Processing.pdf	1687170 67c8aabb3856e5a6db0feb33e37f712d9702a8c5	no	3
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38	Non Patent Literature	Karahadian_1989.pdf	13080104 975489e96404bd7747cfe5a5c4767f9770c51ed6	no	7
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45	Non Patent Literature	Marshall_2016_We_Tried_the_Bleeding.pdf	10202579 37b5822b2f1f97f5819d606e09d3af4fac0dc813	no	10
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47	Non Patent Literature	McGorrin_2_2011.pdf	867248 61301246df451d25c5d4541d55706f8eba200ad2	no	56
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51	Non Patent Literature	Mottram_1998.pdf	2487710 8cbef13bcc6957f9c7a9b65bf33a0d2d43debb7b	no	10
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52	Non Patent Literature	Mottram_2002.pdf	13253612 cdad16590978522d24b6377a2a80a3067910e44d	no	20
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58	Non Patent Literature	Rowe_2005_Flavours_Fragrances_Part1.pdf	10253452 a715cdf9bf1deea78491bc8038542685a8218082	no	22
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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.

Attorney Docket No.: 38767-0010001 / Client Ref: M2CON-Track 1

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

First Named Inventor	:	Marija Vrljic	Art Unit	:	1791
Serial No.	:	14/796,970	Examiner	:	Elizabeth A. Gwartney
Filed	:	July 10, 2015	Conf. No.	:	8501
Title	:	METHODS AND COMPOSITIONS FOR CONSUMABLES			

Mail Stop Amendment
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

REPLY TO ACTION OF JULY 12, 2016

In response to the Office Action mailed July 12, 2016, please consider the following reply.

Amendments to the claims

This listing of claims replaces all prior versions and listings of claims in the application:

1. (Currently Amended) A method for imparting a beef-like flavor to a consumable product, wherein the consumable product ~~is~~ comprises a meat replica matrix that contains no animal products and comprises one or more plant proteins, comprising ~~obtaining an isolated heme-containing protein; and~~

~~adding, to~~ incorporating into the meat replica matrix of the consumable product[[,]] 0.01%-5% (by weight of the consumable) of ~~the~~ an isolated heme-containing protein,

wherein, after cooking, a beef-like flavor is imparted to the consumable product.

2. (Original) The method of claim 1, wherein the heme-containing protein has an amino acid sequence with at least 70% homology to the amino acid sequence set forth in SEQ ID NO: 1.

3. (Original) The method of claim 1, wherein the heme-containing protein has a UV-VIS spectrum that is substantially similar to that of myoglobin from an animal.

4. (Original) The method of claim 1, wherein the heme-containing protein is selected from the group consisting of an androglobin, a cytoglobin, a globin E, a globin X, a globin Y, a hemoglobin, a leghemoglobin, a flavohemoglobin, Hell's gate globin I, a myoglobin, an erythrocruorin, a beta hemoglobin, an alpha hemoglobin, a protoglobin, a cyanoglobin, a cytoglobin, a histoglobin, a neuroglobins, a chlorocruorin, a truncated hemoglobin, a truncated 2/2 globin, a hemoglobin 3, a cytochrome, and a peroxidase.

5. (Currently Amended) The method of claim 1, comprising ~~adding, to~~ incorporating into the meat replica matrix of the consumable product[[,]] 0.4%-1% (by weight of the consumable) of the isolated heme-containing protein.

6. (Canceled)

7. (Currently Amended) A method for making a meat replica composition having a beef flavor and aroma, wherein the meat replica composition comprises a meat replica matrix that contains no animal products and comprises one or more plant proteins, the method comprising obtaining an isolated heme-containing protein; and ~~adding~~ incorporating 0.01%-5% (by weight of the consumable) of the isolated heme-containing protein ~~to~~ into the meat replica matrix of the meat replica composition.

8. (Original) The method of claim 7, wherein the heme-containing protein has an amino acid sequence with at least 70% homology to the amino acid sequence set forth in SEQ ID NO: 1.

9. (Original) The method of claim 7, wherein the heme-containing protein has a UV-VIS spectrum that is substantially similar to that of myoglobin from an animal.

10. (Canceled)

11. (Original) The method of claim 7, wherein the heme-containing protein is selected from the group consisting of an androglobin, a cytoglobin, a globin E, a globin X, a globin Y, a hemoglobin, a leghemoglobin, a flavohemoglobin, Hell's gate globin I, a myoglobin, an erythrocruorin, a beta hemoglobin, an alpha hemoglobin, a protoglobin, a cyanoglobin, a cytoglobin, a histoglobin, a neuroglobins, a chlorocruorin, a truncated hemoglobin, a truncated 2/2 globin, a hemoglobin 3, a cytochrome, and a peroxidase.

12. (Currently Amended) The method of claim 7, comprising ~~adding~~ incorporating 0.4-1% (by weight of the composition) of the isolated heme-containing protein into the meat replica matrix of to the meat replica composition.

13 - 31. (Canceled)

32. (Previously Presented) The method of claim 1, wherein the isolated heme-containing protein is purified.

33. (Previously Presented) The method of claim 1, wherein at least one of the one or more plant proteins is isolated.

34. (Currently Amended) The method of claim [[1]]33, wherein at least one of the one or more isolated plant proteins is purified.

35. (Previously Presented) The method of claim 1, wherein the one or more plant proteins are selected from the group consisting of rubisco, pea proteins, lentil proteins, and other legume proteins.

36. (Previously Presented) The method of claim 35, wherein the pea proteins comprise pea albumin proteins.

37. (Previously Presented) The method of claim 1, wherein the one or more plant proteins are present in the consumable product in an amount of between 1% and 30% (by weight of the consumable).

38. (Previously Presented) The method of claim 1, wherein the one or more plant proteins has a solubility in an aqueous solution of at least 25 g/L at a temperature of between 2°C and 32°C, wherein the aqueous solution has a pH between 3 and 8 and a sodium chloride content of 0 to 300 mM.

39. (Previously Presented) The method of claim 7, wherein at least one of the one or more plant proteins is isolated.

40. (Currently Amended) The method of claim [[7]]39, wherein at least one of the one or more isolated plant proteins is purified.

41. (Previously Presented) The method of claim 7, wherein the one or more plant proteins are selected from the group consisting of rubisco, pea proteins, lentil proteins, and other legume proteins.

42. (Previously Presented) The method of claim 41, wherein the pea proteins comprise pea albumin proteins.

43. (Previously Presented) The method of claim 7, wherein the one or more plant proteins are present in the meat replica composition in an amount of between 1% and 30% (by weight of the composition).

44. (Canceled)

45. (Previously Presented) The method of claim 7, wherein the isolated heme-containing protein is purified.

46. (Previously Presented) The method of claim 7, wherein the one or more plant proteins has a solubility in an aqueous solution of at least 25 g/L at a temperature of between 2°C and 32°C, wherein the aqueous solution has a pH between 3 and 8 and a sodium chloride content of 0 to 300 mM.

47. (Currently Amended) A method for making a meat replica composition having a beef flavor and aroma, wherein the meat replica composition comprises a meat replica matrix that contains no animal products and comprises one or more plant proteins, the method comprising ~~isolating a heme-containing protein; and adding~~ incorporating 0.01%-5% (by weight of the composition) of ~~the~~ an isolated heme-containing protein ~~to~~ into the meat replica matrix of the meat replica composition.

48. (Previously Presented) The method of claim 47, wherein the heme-containing protein has an amino acid sequence with at least 70% homology to the amino acid sequence set forth in SEQ ID NO: 1.

49. (Previously Presented) The method of claim 47, wherein the heme-containing protein has a UV-VIS spectrum that is substantially similar to that of myoglobin from an animal.

50. (Previously Presented) The method of claim 47, wherein the heme-containing protein is selected from the group consisting of an androglobin, a cytoglobin, a globin E, a globin X, a globin Y, a hemoglobin, a leghemoglobin, a flavohemoglobin, Hell's gate globin I, a myoglobin, an erythrocruorin, a beta hemoglobin, an alpha hemoglobin, a protoglobin, a cyanoglobin, a cytoglobin, a histoglobin, a neuroglobins, a chlorocruorin, a truncated hemoglobin, a truncated 2/2 globin, a hemoglobin 3, a cytochrome, and a peroxidase.

51. (Previously Presented) The method of claim 47, comprising ~~adding~~ incorporating 0.4%-1% (by weight of the composition) of the isolated heme-containing protein ~~to~~ into the meat replica matrix of the meat replica composition.

52. (Previously Presented) The method of claim 47, wherein the one or more plant proteins are selected from the group consisting of rubisco, pea proteins, lentil proteins, and other legume proteins.

53. (New) The method of claim 1, further comprising incorporating into the meat replica matrix of the consumable product, a sugar, sugar alcohol, sugar acid or sugar derivative; and at least one sulfur compound.

54. (New) The method of claim 53, wherein the sugar, sugar alcohol, sugar acid or sugar derivative is selected from the group consisting of glucose, fructose, galactose, mannose, arabinose, xylose, ribose, sucrose, lactose, melibiose, trehalose, cellobiose, maltose, arabitol,

mannitol, dulcitol, sorbitol, galacturonate, glucuronate, gluconate and N- acetylglucosamine, and mixtures of two or more thereof.

55. (New) The method of claim 54, wherein the at least one sulfur compound is selected from the group consisting of cysteine, thiamine and methionine, and mixtures of two or more thereof..

REMARKS

Upon entry of the above amendment, claims 1-5, 7-9, 11-12, 32-43, 45-55 will be pending. Claims 6, 10, 13-31 and 44 were previously canceled. Claims 1, 5, 7, 12, 34, 40, 47, 51 and 53 have been amended, and new claims 53-55 have been added. Support for the amendments to independent claims 1, 7 and 47 and for new claims 53-55 can be found, for example, in the originally filed claims and throughout the specification.

No new matter has been introduced by these amendments. Reconsideration and allowance of the claims are respectfully requested in view of the above amendments and the following remarks.

Claim Rejections - 35 USC § 103

Claims 1-5, 7-9, 11, 12, 32-43 and 45-52 are rejected under pre-AIA 35 U.S.C. 103(a) as alleged being unpatentable over Hseih et al. (US 2012/0093994)("Hseih") in view of Proulx et al. ("Iron Bioavailability of Hemoglobin from Soy Root Nodules Using a Caco-2 Cell Culture Model" - J. Agric. Food Chem." 2006, p. 1518-1522)("Proulx"). According to the Office:

> Given Proulx et al. teach that iron deficiency is a major nutritional problem and that fortification of foods with iron has been a successful strategy from improving iron content, since Proulx et al. teach that bioavailability is higher from heme iron sources including, leghemoglobin from soy root nodules, it would have been obvious to one of ordinary skill in the art to have fortified the structured plant protein product of Hseih et al. comprising no animal protein, with leghemoglobin from soy root nodules, to obtain a product with improved nutritional status, i.e. bioavailable source of iron.

(OA at pg. 4) Applicants respectfully traverse this rejection with respect to the pending claims.

A *prima facie* case of obviousness is established when three basic criteria have been met. First, there must be some suggestion or motivation, either in the prior art cited by the Office or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine the references being relied upon to reject the claimed invention. Second, there must be a reasonable expectation of success. Third, the prior art reference or combination of references must teach or suggest all of the requirements of the claimed invention. Thus, "one must have a motivation to combine accompanied by a reasonable expectation of achieving what is claimed." (*Intelligent Biosystems, Inc. v. Ilumina Ltd.*, page 12, Appeal No. 2015-1693 (Fed Cir 2016)). In

the present case, the prior art, when considered as a whole, does not provide the requisite motivation to combine the cited references, nor a reasonable expectation of success in making the proposed combination. Thus, a *prima facie* case of obviousness cannot be established by the instant combination of the references.

The suggestion or motivation to modify the prior art reference or combine the prior art references being relied upon to reject the claimed invention must be found either in the prior art or in the knowledge generally available to one of ordinary skill in the art; it cannot be based on hindsight benefiting from the disclosure of the claimed invention. It is the Examiner's burden to demonstrate *both* that "a skilled artisan would have been motivated to combine the teachings of the prior art references to achieve the claimed invention, *and* that the skilled artisan would have had a reasonable expectation of success in doing so." *Intelligent Biosystems, Inc. v. Ilumina Ltd.*, page 13 (citations omitted; emphasis added).

I. The Office has not met its *prima facie* burden to provide some articulated reasoning with a rational underpinning to support that a person of ordinary skill would have combined Hsieh with Proulx.

The Office has not shown that a person of ordinary skill would have had a reasonable motivation to make the combination.

> [P]roper analysis under § 103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success.

Par Pharm., Inc. v. TWI Pharms., Inc., 773 F.3d 1186, 1196 (Fed. Cir. 2014) (quoting *Medichem, S.A. v. Rolabo, S.L.*, 437 F.3d 1157, 1164 (Fed. Cir. 2006)).

Although obviousness does not require absolute predictability, *In re Merck & Co.*, 800 F.2d 1091, 1097 (Fed. Cir. 1986), there must be "some articulated reasoning with a rational underpinning to support the legal conclusion of obviousness," *KSR International Co. v. Teleflex Inc.,*, 550 U.S. at 418 (quoting *In re Kahn*, 441 F.3d 977, 988 (Fed. Cir. 2006)). An explicit teaching of a motivation to combine is not required, however, as a tribunal "can take account of

the inferences and creative steps that a person of ordinary skill in the art would employ." *Id.* Nonetheless, "[t]o the extent an art is unpredictable . . . *KSR*'s focus on these 'identified, predictable solutions' may present a difficult hurdle because potential solutions are less likely to be genuinely predictable." *Eisai Co. v. Dr. Reddy's Labs., Ltd.*, 533 F.3d 1353, 1359 (Fed. Cir. 2008).

The Office has not met its *prima facie* burden to provide any evidence that a person of ordinary skill would have had a rational reason to combine Hsieh and Proulx. A skilled artisan would not have had a reason to modify the meat analog of Hsieh with the leghemoglobin of Proulx because:

A. Hsieh provides no reason to modify its meat analogs to include iron or iron in the form of a heme protein for any reason, let alone to improve meat flavor;

B. Proulx provides no reason to fortify a meat analog or any other type of meat alternative with iron; and

C. The prior art does not recognize there is a problem of iron deficiency in of meat analogs or other meat alternatives.

A. Hsieh provides no reason to modify its meat analogs to include iron or iron in the form of a heme protein for any reason, let alone to improve meat flavor.

The Office acknowledged that Hsieh is "silent with respect to a heme-containing protein from a non-animal source.[1]" (OA at pg. 4). In fact, Hsieh is silent with respect to the inclusion of any heme-containing protein.

Moreover, Hsieh is silent as to modifying its meat analogs to include iron. Specifically with respect to the inclusion of vitamins and minerals, Hsieh discloses that the "meat analog compositions may further comprise a nutrient such as a vitamin and/or a mineral. Suitable vitamins include Vitamins A, C, and E. Examples of minerals that may be added include the salts of aluminum, ammonium, calcium, magnesium, and potassium" (paragraph [0092]). Notably, Hsieh does not include in these lists iron in any form, let alone in the form of a heme-

[1] Applicant notes that the claims does not require that the heme-containing protein be "from a non-animal source." Rather, the claims require that the "the consumable product comprises a meat replica matrix that contains no animal products."

containing protein. In fact, a person of ordinary skill in the art would have understood why Hsieh does not add iron to the Hsieh's meat analog, because it was known in the art that iron can cause deleterious off-odor consequences (e.g., oxidation and rancidity) in foods and especially meat products. See, for example, Calkins et. al. ((2007, "A fresh look at meat flavor," Meat Sci., 77:63-80, see the paragraph bridging pages 70-71) and Yancey et al. (2006, "Effects of total iron, myoglobin, hemoglobin, and lipid oxidation of uncooked muscles on livery flavor development and volatiles of cooked beef steaks," Meat Sci., 73:680-6) see page 686), which are submitted herewith.

In fact, even the Proulx Thesis, which is a later reference by the same author as the primary Proulx reference used by the Office, states that:

> [f]ortification [with] *iron has a potential negative effect on organoleptic quality* of maize products, in that soluble forms of *iron can cause oxidative rancidity*

(Proulx, 2007, Diversified strategies for improving iron bioavailability of maize, Retrospective Theses and Dissertations, Iowa State University, Paper 15852, page 20, emphasis added; hereinafter the "Proulx Thesis").

In stark contrast to its silence with respect to adding iron or a heme-contain protein for any reason, Hsieh affirmatively teaches the inclusion of animal meat to improve the animal flavor of its meat analogs. See, for example, paragraphs [0033] and [0079] – [0081]. In fact, Hseih directly correlates the degree of animal flavor in the meat analog with the amount of animal meat present. See, for example, paragraph [0084], which states that:

> when a significantly vegetarian composition that has a relatively small degree of animal flavor is desired, the concentration of animal meat in a meat analog composition may be about 45%, about 40%, about 35%, about 30%, about 25%, about 20%, about 15%, about 10%, about 5%, about 2%, or 0% by weight. Alternatively, when a meat analog composition have a relatively high degree of **animal meat flavor** is desired, the concentration of animal meat may be about 50%, about 55%, about 60%, about 65%, about 70% or about 75%, by weight.

In making the rejection, the Office states:

> Hseih et al. disclose wherein the structured plant protein product may comprises colorants wherein the concentration of colorants is adjusted to match the color of the animal meat to be simulated and **a flavoring agent such as an animal meat flavor** ([0090]).

> Given Hseih et al. disclose a structured plant protein product comprising a flavoring agent including **animal meat flavor**, it follows that the structured plant protein product would exhibit, upon cooking, meaty flavor notes.

(OA at pg. 4, emphasis added) It is not clear, however, what is meant by "animal meat flavor." Stated another way, other than animal meat, Hseih does not teach or suggest what composition or agent that could be added to its meat analog which would exhibit, upon cooking, an animal meat flavor. The skilled artisan would not understand what is meant by the term "animal meat flavor" or whether the "animal meat flavor" contains animal products or not. And, taking into consideration the express teaching at paragraph [0084], stating that the addition of animal meat imparts an "animal meat flavor," Hseih at least suggests that animal meat is the "animal meat flavor" flavoring agent described at paragraph [0090]. Accordingly, Applicant respectfully submits that the Office has not met its burden of identifying a meat replica product that "contains no animal products" and which would exhibit, upon cooking, a beef-like flavor.

In sum, the teachings of Hsieh do not support the Office's assertion that it would be obvious to modify the meat analog of Hsieh to include the non-animal leghemoglobin of Proulx. The Office has pointed to nothing in Hsieh to reasonably support that a person of ordinary skill in the art would have a reason to modify Hsieh's meat analog by incorporating a heme-containing protein into the meat analog. Indeed, as shown above, the conventional wisdom was not to add additional iron (in any form) because it was expected to result in off-odor consequences and a bad taste. Hsieh provides no motivation for the skilled artisan to buck the conventional wisdom. Instead, Hsieh teaches to those skilled in the art that in order to improve meat taste of meat analog, one would ***add meat*** to the meat analog.

B. Proulx provides no reason to fortify a meat analog or any other type of meat alternative with iron.

In making the rejection, the Office alleges that Proulx provides the requisite motivation to combine Hsieh and Proulx, stating:

> Here, the motivation to combine the references comes from Proulx et al. Proulx et al. teach that iron deficiency is a major nutritional problem and fortification of foods with iron has been a successful strategy for improving iron content of foods (p. 1518/Introduction). Proulx et al. teach that iron bioavailability is higher from heme iron sources because of lack of inhibition from chelating compounds (p. 1518/Introduction). Proulx et al. teach that heme iron in the human diet is almost