Planet Depos
We Make It Happen™

Transcript of Philip Krause, M.D.

Date: August 14, 2024
Case: BioNTech SE and Pfizer, Inc. -v- Moderna TX, Inc. (PTAB)

Planet Depos
Phone: 888.433.3767
Email: transcripts@planetdepos.com
www.planetdepos.com

WORLDWIDE COURT REPORTING & LITIGATION TECHNOLOGY

UNITED STATES PATENT AND TRADEMARK OFFICE

_____

BEFORE THE PATENT TRIAL AND APPEAL BOARD

_____

BIONTECH SE AND PFIZER INC.

Petitioner

v.

MODERNATX, INC.

Patent Owner

_____

Case IPR2023-01358

Patent 10,702,600

and

Case IPR2023-01359

Patent 10,933,127

_____

Deposition of Philip Krause, M.D.
Boston, Massachusetts
Wednesday, August 14, 2024
9:08 a.m.

Job No.: 547018
Pages: 1 - 121
Reported By: Alan H. Brock, RDR, CRR

A P P E A R A N C E S

ON BEHALF OF PETITIONER BIONTECH SE:

PAUL HASTINGS LLP
RYAN MEUTH, ESQ.
MetLife Building
200 Park Avenue
New York, New York 10166
212.318.6000
ryanmeuth@paulhastings.com

ON BEHALF OF PETITIONER PFIZER INC.:

WILLIAMS & CONNOLLY LLP
STANLEY E. FISHER, ESQ.
MICHAEL J. MESTITZ, ESQ.
ROBERT S. HARTSMITH, ESQ.
680 Maine Avenue SW
Washington, D.C. 20024
202.434.5000
sfisher@wc.com
mmestitz@wc.com
rhartsmith@wc.com

ON BEHALF OF PATENT OWNER:

WILMER CUTLER PICKERING HALE AND DORR LLP
KEVIN S. PRUSSIA, ESQ.
ANNALEIGH E. CURTIS, ESQ.
ANNA WONG, ESQ.
60 State Street
Boston, Massachusetts 02109
617.526.6000
kevin.prussia@wilmerhale.com
annaleigh.curtis@wilmerhale.com
anna.wong@wilmerhale.com

ALSO PRESENT:

Jacob Moore, Esq., ModernaTX, Inc.
Kelli Powell, ModernaTX, Inc.
Raymond S. Parker, III, Ph.D., Esq.,
BioNTech US Inc.

C O N T E N T S

EXAMINATION OF PHILIP KRAUSE, M.D. PAGE
By Mr. Fisher 6
By Mr. Prussia 114
By Mr. Fisher 118

E X H I B I T S

(Attached to transcript.)

KRAUSE DEPOSITION EXHIBITS PAGE
Exhibit 1 Declaration of Philip Krause, M.D. 7
Exhibit 2 Patent Application US 2013/0266640 11
Exhibit 3 Patent Application WO 2012/006369 11
Exhibit 4 Patent Application WO 2005-118813 11
Exhibit 5 Excerpts from mRNA-1325 Pre-IND Background Document, MOD_001417294 - 1417297, 1417309, 1417480 - 1417483, 1417491, 1417492 44

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358

Exhibit 6	Document, MOD_000205848, 205849, 205865, 205866, 205867, and 205868	56
Exhibit 7	Document, MOD_000477491 - 477498, 477504, 477505	62
Exhibit 8	U.S. Patent No. 10,702,600	89
Exhibit 9	"MRNA vaccines - a new era in vaccinology"	97

August 14, 2024 9:08 a.m.

P R O C E E D I N G S

PHILIP KRAUSE, M.D.,

being first duly sworn or affirmed to testify to the truth, the whole truth, and nothing but the truth, was examined and testified as follows:

EXAMINATION

BY MR. FISHER:

Q. Good morning, Dr. Krause.

A. Good morning.

Q. I'm going to start by marking your declaration in the IRP. I see you have a copy in front of you; is that right?

A. That is correct.

Q. Are there any notes in that copy, or is it a clean copy?

A. To my knowledge there are no notes, but you're welcome to check it if you'd like.

Q. I'll take your word for it.

MR. FISHER: Why don't we mark that as Krause Exhibit 1, which is cross-referenced in the IRP as Moderna 2200.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 7 of 158

(Exhibit 1 marked for identification.)

Q. So you have in front of you the declaration of Philip Krause, M.D.; is that right, Doctor?

A. That is correct.

Q. The declaration lists two proceedings on the cover; right?

A. Yes, it does.

Q. The two proceedings are IPR2023-01358 and IPR2023-01359?

A. That is correct.

Q. You understand that IPR2023-01358 involves U.S. Patent No. 10,702,600?

A. That's correct.

Q. And IPR2023-01359 involves Patent No. 10,933,127?

A. Correct.

Q. I'll refer to the first patent, 10,702,600, as the '600 patent throughout the day. Is that all right?

A. Yes, it is.

Q. And I'll refer to 10,933,127 as the '127 patent. Okay?

A. Sounds good.

Q. Now, your declaration is identical for both proceedings. Let me strike that and ask it a different way.

You have one declaration as it relates to both proceedings; right?

A. That is correct.

Q. And you're here to testify today in both those proceedings that are pending before the Patent Office; right?

A. That's correct.

Q. And the testimony you're providing today will apply to both proceedings unless we indicate otherwise; right?

A. That's my understanding.

Q. Now, if you turn to Appendix B in your declaration, there's a materials-considered list.

A. Yes, there is.

Q. How did you go about assembling this materials-considered list?

A. Well, the materials-considered list obviously represents all of the materials that went into the

declaration. Some of these materials considered obviously came from the attorneys at WilmerHale. Some of them actually relate to the IRP itself. Some of these are references that I suggested as being relevant to some of the issues at hand. But of course, as I understand is customary for these kinds of declarations, it's the law firm that actually assembles the full list and maintains the references in proper order and makes sure indeed that the entire declaration has the formatting that it needs to have in order to meet the requirements.

Q. Do you remember, sitting here today, any particular references in that materials-considered list that you identified?

A. Sure. Well, I think there are a number of references, for instance, related to the FDA's guidance for industry in June 2020 that I pointed them to. That actually is a difficult one to find, because it has disappeared from the Internet except via the Wayback Machine. So that's an example.

I also pointed them to obviously FDA advisory committee meeting briefing documents. I

pointed them to the chapter in the Plotkin vaccines textbook that talks about regulatory -- well, Regulation of Vaccines by Marion Gruber and Valerie Marshall.

I pointed towards, well, the Summary Basis for Regulatory Action is an FDA document, No. 2154.

And a number of others of these I also identified, including some from the literature, although I can't right now tell you which ones I identified and which ones that they did.

Q. Okay. So you identified a number of FDA documents -- for example, the ones that you've identified. Right?

A. Well, these are not all FDA documents. But I identified documents in my specific field of expertise and based on my background that I thought were relevant to the declaration and to specific points that I wanted to make in the declaration.

Q. Did you do a literature search to find any of the papers that you mentioned?

A. Yes, I did, in fact, for some of them, using PubMed, and sometimes Google is easier to find these.

But, of course -- and some of these papers I was aware of beforehand as well.

Q. So I'm going to hand you three exhibits. We'll mark them as Krause Exhibit 2, Exhibit 3, and Exhibit 4. Krause Exhibit 2 corresponds to Exhibit 1009 from the IRP. Krause Exhibit 3 corresponds to Exhibit 1010. And Krause Exhibit 4 corresponds to Exhibit 1012.

(Exhibit 2 marked for identification.)

(Exhibit 3 marked for identification.)

(Exhibit 4 marked for identification.)

Q. Do you have those three exhibits in front of you, Dr. Krause?

A. Yes, I do.

Q. I'm just going to take them one at a time. In terms of Krause Exhibit 2, which is Exhibit 1009, I don't see a reference to it anywhere in your materials considered or in your report. Do you happen to know whether or not you cite Krause Exhibit 2 in your declaration?

A. I can review the declaration and double-check that. I know that -- and this is the so-called Schrum

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 12 of 158

patent -- that the materials in the Schrum patent isn't directly germane to the major points that I make in the declaration. But I can't tell you one way or the other right now whether or not that reference is glancingly referred to in the declaration, without going through line by line, which I'm happy to do now if you'd like me to.

Q. I don't know that it's worth the time to do that. But I'll represent to you that we've checked four or five different times. We can't find it cited in your declaration. We don't see it in the materials-considered list.

Will you accept my representation that it's not there?

A. I will accept your representation that it's not there.

Q. You don't have any particular opinion in your declaration that is based on Exhibit 1009, the Schrum reference; right?

A. The major opinions in the declaration, that's correct, are based on other references.

Q. Same set of questions for Exhibit 1010, which

is Krause Exhibit 3. Do you have that in front of you?

A. Yeah, and this is a patent by Andrew Geall, and it's the World Intellectual Property Organization. And I think it's correct: I'm not -- my declaration doesn't directly address material in this patent. But I can't rule out the possibility that it glancingly does.

Q. All right. Again, I'll represent to you that we checked a number of times. We don't see it cited anywhere. Okay?

A. Okay.

Q. But sitting here today, you can't think of a particular opinion that is based on Exhibit 1010?

A. That is in the declaration?

Q. That is in the declaration.

A. So I can't rule out the possibility that my understanding of any of these patents informed some of my opinions, because I certainly was aware of these documents. But I don't believe that any of the opinions in the declaration are based on these documents.

Q. Let's just move to Exhibit 1012, for completeness. That is Krause Exhibit 4. Do you have that in front of you?

A. I do indeed.

Q. And again, I'll represent that we searched a number of times. We don't see it cited in your declaration. Will you take that representation?

A. I accept that representation.

Q. Sitting here today, you can't identify any particular opinion in your declaration that is based on Exhibit 1012; correct?

A. That's correct -- with the same provisos that I made for the other references.

Q. You can put those aside.

Your declaration, Krause 1, you say in Paragraph 6 that "I was actively involved in leading the regulatory evaluation of COVID-19 vaccines, including Spikevax and Comirnaty."

A. That's correct.

Q. And then in Paragraph 10, you go on and say -- and this is on Page 7 -- you're talking about what you considered in preparing your declaration.

And about halfway through the paragraph you say, "I've also consulted my many years of experience, including in FDA and vaccine matters generally and the review of COVID-19 vaccines in particular." Do you see that?

A. Yes, I do.

Q. What, if any, information from the review of COVID-19 vaccines in particular did you use in forming your opinion?

A. Well, I provide opinions in the declaration on three main topics; right? One of them has to do with the significance and meaning of certain statements that are present in documents that were submitted to the FDA. And so, of course, my experience at FDA in reviewing these kinds of documents plays a substantial role in my thinking about how to interpret those statements. And, of course, I saw those statements in the context of review of COVID-19 vaccines.

I also opine on issues related to enhanced disease, in the context of COVID-19 vaccines, coronavirus vaccines in general. And I was actively involved in thinking about that as a major issue while

I was at the FDA, as well as in the context of consultations with other organizations, such as the WHO. And so I certainly bring that experience into my opinions and thinking about this.

And the fact is that in the context of being at the FDA it's not just a question of reading confidential regulatory documents, but it's -- what we do at the FDA, or what we did at the FDA while I was there, is you try to apply current cutting-edge science to regulatory decisions.

And so the specific scientific knowledge which goes into making the kinds of decisions that the FDA needed to make are informed by that scientific information. And the need to do these kinds of reviews, then, also dictates that one needs to obtain that scientific information.

And so by being directly involved in this, most people would say that I became an expert on various aspects of COVID-19 vaccines.

And so these are the kinds of things that my experience at the FDA helps to inform.

Q. Okay. So in terms of the COVID-19-related

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 17 of 158

experience, this is from work that you did at FDA in the post-January 2020 time frame and beyond; right?

A. So as far as COVID-19 vaccines specifically are concerned, I would say I would include work done in January of 2020. But very few people knew anything about COVID-19 specifically before that.

Q. Okay, so post-January 2020 work with respect to COVID-19 vaccines.

A. Post January 1st, 2020. I don't know if you mean February.

Q. But post January 1st, 2020 and beyond and afterward was the time frame in which you gained experience with COVID-19 vaccines; right?

A. That is correct.

Q. You mentioned in your testimony, I think you refer to confidential documents. Is there any confidential information that's not available to the public that you're relying on to express the opinions in your declaration?

A. No.

Q. Did you receive permission from FDA to testify in this matter?

A. No, I did not.
Q. Did you ask anyone for permission?
A. I did not request permission.
Q. Have you ever been an expert before in a patent case?
A. No, I have not.
Q. Were you familiar with patents prior to this case?
A. I have some experience with patents, but I'm certainly no patent attorney.
Q. Just generally speaking, how do you have experience with patents?
A. A number of years ago I prosecuted some patents as a pro se inventor, and some of them were awarded.
Q. Generally speaking, what scientific area was that in?
A. It was in the field of text processing -- yeah, text processing I think is -- and -- well, and presentation, I guess, also.
Q. Were any of those patents in relation to vaccine work?

A. No.
Q. Your brother is Thomas Krause?
A. Thomas Krause is my brother, yes.
Q. Mr. Krause is the Deputy General Counsel for intellectual property and law and a solicitor at the Patent Office; is that right?
A. I don't know of his current job title, but he does work for the USPTO.
Q. Have you talked to Mr. Krause about your testimony in this case?
A. No.
Q. Is he aware that you're appearing in this case?
A. I don't think so, no.
Q. During the -- I want to talk a little bit about the IND process at FDA. Do you follow me?
A. Yeah.
Q. During the IND process the FDA has an expectation of candor and truthfulness from the sponsor; correct?
A. Yes, absolutely.
Q. And FDA relies on a sponsor's statements in

the IND in making an assessment to allow a particular product to be used in humans in clinical trials; right?

A. Well, the FDA relies on candor, certainly, as one of the many things it relies on. The FDA isn't so naive as to rely only on the statements that are made by a regulated industry.

Q. The FDA expects a sponsor to be accurate and truthful in its representations to FDA; right?

A. The FDA does expect sponsors to be accurate and truthful.

Q. FDA relies on a sponsor's statements and citations in documents in assessing whether a product is likely to be safe and effective; right?

A. I guess I'm trying to understand what you mean there, because the IND process, while the end of the IND process is a biologics license application, during which the safety and efficacy of a product is assessed, the IND process represents a fairly lengthy process that ultimately gets the FDA to that point.

And so I don't think the statement as you made it is completely accurate as regards the IND

process, because that's not the goal of individual steps in the IND process.

Q. Fair enough. The FDA relies on a sponsor's statements and citations in documents in assessing whether to allow a product to move forward in clinical trials as part of the IND process; right?

A. The FDA certainly relies on those statements as well as other information in making those determinations.

Q. And there are penalties for making misstatements to FDA in submitting materials; is that right?

A. Yeah, I'm not an FDA lawyer, so I can't speak to what the penalties are for one or another thing. But I can tell you that there is -- I agree that there's an expectation that these statements are correct.

Q. And in terms of materials like investigator brochures that clinicians rely on to assess whether to provide the product to a patient, there's a medical ethics issue involved in including material in those brochures; right?

A. The -- I don't think of this as primarily a medical ethics issue. I just regard this as being part of good clinical practice, which is a requirement, to make sure that the investigators are adequately informed to be able to conduct clinical trials in a way that respects the rights of the participants in the trial.

Q. Okay. If at the time that a sponsor is submitting an IND the sponsor is aware of a particular risk associated with the product, the sponsor is required to identify that risk to FDA; right?

A. If the sponsor's aware of a risk, then -- and I think if the sponsor thinks that FDA doesn't know about the risk already, then I think that that would be a reasonable thing -- that's a reasonable expectation.

Q. Particularly where you're dealing with newer technology that the FDA doesn't have a lot of experience with, it's important to identify any particular risk that the sponsor's aware of associated with that product; right?

A. Again, I suspect that you're leading towards

this question of the degree to which a potential or theoretical risk of enhanced disease might need to be disclosed to the FDA specifically. And if, for example, the FDA has already requested that information from the company, the company would know that the FDA's already aware of that risk.

And so expecting the company then to go back and tell the FDA what it already knows may not be -- may not be so essential. I think you would understand.

Q. Uh-huh, sure. We'll talk a little bit more about the vaccine-enhanced disease a little bit later in the day.

But, you know, absent the FDA asking for information on a particular risk, it's important to bring to the attention of the FDA risks associated with the product; right?

A. You're saying that if the FDA doesn't ask for information, if the FDA's not already aware of that information, then yes, the company should let the FDA know about those risks.

Q. And in terms of a clinical investigator

that's receiving information on a product, the investigator will not have asked the sponsor for particular information; right?

A. The investigator might ask the sponsor for this particular information. But normally the information that the investigator needs will be present in documents that are provided to the investigator by the sponsor.

Q. Got it. In formulating your opinions in the declaration, did you speak to anyone at Moderna who was involved in preparing the materials for FDA?

A. I did not.

Q. And in formulating your opinions in your declaration, you're not relying on how anyone at FDA actually interpreted the materials back in 2020 or 2019 or 2018, are you?

MR. PRUSSIA: Object to the form of the question.

A. So I was at FDA then; right? And while I can't speak to exactly my reaction to specific language in some of these documents, I certainly am looking at this through the eyes of somebody at FDA

who would be reading this. And I have no doubt that my opinions would be similar to those of somebody at FDA who was looking at that.

Q. Fair enough. I guess let me be very specific: You don't have a recollection of reviewing these particular documents when they were submitted on whatever dates they were submitted -- 2020, 2018, 2019 -- and thinking to yourself, "Gosh, I remember reviewing this. I remember the meaning of this, and that's what I'm including in my declaration as the interpretation."

A. That's correct. I don't have a recollection of having looked at these specific documents at that time and bringing into my evaluation now an opinion that came from FDA back then.

Q. So in your declaration at Paragraph 22, you say, "Furthermore, a POSA" -- let me stop there. Do you understand a POSA is a person of ordinary skill in the art?

A. Yes, I do.

Q. "Furthermore, a POSA must have a reasonable expectation of success in achieving the claimed

invention based on the teachings of the prior art." You go on to say, "A reasonable expectation of success includes that a POSA would have expected the claimed combination to have its desirable properties." Do you see that?

A. Yes, that's exactly what it says.

Q. So you say that a reasonable expectation of success includes that a POSA would have expected the claimed combination to have its desirable properties. Right?

A. Yes.

Q. What else do you understand a reasonable expectation of success to include?

A. Well, so I guess -- that's a very broad question. Are you asking me this in the combination -- in the context of combinations of inventions, or are you asking me this question in the context of patentability on its own? Obviously there are lots of reasons -- and again, you're the expert on patent law; I'm not -- that the Patent Office might award a patent.

But it seems like there are lots of

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 27 of 158

settings in which that question could be answered.

Q. I'm asking in the context of the statement in Paragraph 22. You use the word "includes" in your statement. Right?

A. Well, so, right. So that sentence is obviously referring to a situation where there's combination, where there's -- and my understanding of this is that normally when inventors come up with novel ideas, they don't actually think about what are the possible combinations of previous inventions that might lead to a new invention. They come up with something that is novel and that they believe is novel, and then they submit this to a patent examiner or, in this particular case, ultimately a petitioner looks at it and says, "Well, we think that this invention was foreshadowed by some combination of prior art references."

And so this statement obviously is in the context of looking at combinations of prior art references in the context of that kind of a proceeding.

Q. You say that "a reasonable expectation of

success includes that a POSA would have expected the claimed combination to have its desirable properties." That's the way that you state it there; right?

A. That's correct.

Q. Does a reasonable expectation of success include that a POSA would have had reason to believe the claimed combination would have had its desirable properties?

A. No. I think it's my understanding that having some reason to believe isn't sufficient; there needs to be an expectation. But again, I'm not an expert on patent law. This is information and standards that were provided to me by the attorneys in this room that describe the legal standard that I used in looking at these materials.

Q. Does a reasonable expectation of success include that a POSA would think it plausible that the claimed combination would have its desirable properties?

A. Again, I'm not a lawyer, and so I can't tell you whether some lawyer somewhere or somebody somewhere might believe one or another thing.

What I'm telling you is that what is written here is the standard that I used in evaluating the issues that are raised -- are raised here.

Q. You refer to "desirable properties" in that paragraph. Do you see that? Paragraph 22.

A. Yes, I do.

Q. And in this matter the desirable properties of the '600 and '127 patents are expressing the spike protein and creating an immune response; right?

A. I don't think that's completely true; right? Because I'm also in -- my declaration also includes issues associated with the objective indicia of -- that are -- that provide some additional support for the idea that an invention is not obvious. And so those I think also represent desirable properties of an invention.

So I don't think that the term is intended to be restricted to something that's as narrow as what you are saying.

Q. I'm asking in the context of your statement about reasonable expectation of success, where you say that "a reasonable expectation of success includes

that a POSA would have expected the claimed combination to have its desirable properties." Are you with me so far?

A. Yes, okay.

Q. And so in that context, in terms of reasonable expectation of success, the desirable properties that you're assessing in this case are expression of the S protein and creating the immune response; right?

MR. PRUSSIA: Object to the form of the question, vague.

A. So I think that those are some of the desirable properties of COVID-19 vaccine but are not necessarily all of them.

Q. In assessing desirable properties, is it your belief that there needs to be a reasonable expectation of success that the vaccine would be proven to be safe and effective?

A. So I don't believe that is the standard, the full standard, that would be used. Certainly a vaccine that is shown to be safe and effective would have desirable properties, but that doesn't mean that

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 31 of 158

that's the only standard by which desirable properties could be measured.

Q. Let's look at Paragraph 69 of your declaration. Would you take a quick read of it and let me know when you're caught up.

A. Yes, I am.

Q. Why don't we skip to 97. I'll come back to that.

A. Okay.

Q. Have a look at 97. Do you see in the second sentence it says, "As I explained above, the vast majority of drugs (including vaccines) that enter clinical trials fail, either for safety or efficacy reasons, and investigators understand that information cited as part of the rationale for testing a new vaccine is no guarantee of success and does not indicate that the sponsor (or FDA) reasonably expects success." Do you see that?

A. Yes, I do see that.

Q. And in that statement, where you're talking about reasonably expecting success, you're talking about successfully showing that the new vaccine is

safe and effective following the clinical trials; right?

A. No, that's not at all what it says. It says for safety or efficacy reasons. So normally what happens is that it's not FDA that says that a sponsor should stop developing a vaccine, but the sponsor themselves decides to stop developing a vaccine for whatever reason. And normally when they initiate a program, they hope that they'll -- they've already done the market analysis and think that if the vaccine is successful, that it will be profitable. And so they initiate a development program.

Along the way, they may then decide that, based on the results that they get, that it's unlikely with further work to prove to be safe and effective as a result of, well, the pivotal efficacy trials that occur in Phase III, and then ultimately when the FDA evaluates the biologics license application, it will be safe and effective.

So when I say "safe and effective," I'm assuming that you mean safe and effective as determined by FDA; right? And so a vaccine could

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 33 of 158

fail, which means that the sponsor decides not to continue developing it, for safety or efficacy reasons. But that isn't necessarily because it's proven to be unsafe or proven not to work. It just is because the sponsor then thinks that as they gather data on it there are going to be some risks that it might be unsafe or some significant risk that it may not be as effective as they hope it will be in order to meet the market that they're attempting to meet with that particular product.

So these safety or efficacy reasons are very different from the safety and efficacy reasons I think that you were discussing before. It certainly has nothing to do with FDA approval. But in this context it really comes down to a failure as is defined by the sponsor, who then has to make the decision to invest more money in a subsequent trial and continue development of the product.

Q. So you say "no guarantee of success" in that statement. You also say "FDA reasonably expects success." Do you see those two phrases?

A. Yes, that's correct.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 34 of 158

Q. Success at what? What are you targeting for success in that statement? You said not FDA approval. I heard you say that in your last answer. What is success?

A. Well, from the sponsor's perspective, success is however they choose to define it; right? And FDA's there in parentheses. It can be defined however one wants.

The FDA is not looking to the question of downstream success when they evaluate products that are early in development, because they know, as the product enters Phase I, for instance, or early clinical trials, that it may well not lead to a licensed product.

So FDA's evaluation at any given stage is really in the context of whether or not the product will be able to reach the next stage of development.

But that's success as it's defined from the FDA perspective; right? That's not success from the perspective of the sponsor, who's really looking downstream at the likelihood that they will get a license. And I think that both of those standards are

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 35 of 158

likely very different from the standard that the Patent Office would apply and what the Patent Office would consider success to be, either, because these are all different settings, and with people who have different goals and different ways of looking at things.

Q. So when you talk about "the information cited as part of the rationale for testing a new vaccine" --

Do you see that phrase there, in the statement?

A. In that same paragraph?

Q. You say that "investigators understand that information cited as part of the rationale for testing a new vaccine is no guarantee of success."

A. Yes, I see it.

Q. And so you're saying that the information cited as part of the rationale is no guarantee of success. And I understand you to be saying that the success that you're focused on in that statement is moving to the next phase of development; is that right?

A. Well, so you wouldn't go through any stage of

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 36 of 158

development if the result were a foregone conclusion; right? So the reason we go through the stepwise process is to gradually develop -- obtain data and to determine -- and also to respect the rights of clinical trial participants, so as to make sure that they are part of an orderly and scientific process that doesn't put them at undue risk.

So entering any phase of development is no guarantee that the product is going to pass that phase and go to the next phase. And there are many reasons, obviously, why it might fail. The most likely of them are that the sponsor may have some concern about safety or efficacy, which might cause them to in essence pull the plug on that product.

But also what this means is that the people who enter the trials should not be under any illusion that there's a guarantee that the product will work, and the FDA is very careful to make sure that people who enter trials understand that there's -- that there's no such guarantee of success, and they understand that they're participating in clinical research, which is designed ultimately to

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 37 of 158

yield safe and effective products, without any guarantee that this specific product will prove ultimately to be safe and effective and licensable.

Q. So you're saying the information cited in the rationale for testing a new vaccine doesn't provide a reasonable expectation of success that the vaccine will turn out to be safe and effective following human clinical trials?

A. Well, that certainly is true. But it also doesn't provide -- and again -- well, it doesn't provide certainty, by any means, that the product will even make it to the next phase of development.

Q. And is the same true for the proof-of-concept-related citations, that the information cited in the proof-of-concept section of an IND doesn't provide a reasonable expectation of success that the vaccine will turn out to be safe and effective following human clinical trials?

A. Well, the information provided in that section of, say, an investigator brochure has no relevance to the question of whether or not the product will ultimately be proved safe and effective

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 38 of 158

after clinical trials. The purpose of providing that information, and in particular providing those references, is to make sure that the investigator has an understanding of the context for the clinical trial and can prepare themselves to answer questions about the clinical trial, what its purpose is. It ultimately can play a role in the IRB, the Institutional Review Board, evaluation of the trial, ultimately the ethics of proceeding with the trial as it's configured.

And so the purpose of that information has nothing to do with whether or not a -- there will ultimately be a reasonable expectation of success for that product.

Q. So I heard you to say that it's not relevant to whether there's a reasonable expectation of success for efficacy and safety of the product. But there is some relevance to including those documents and citations in that proof-of-concept section; right?

A. There is some relevance. Yes, there is.

Q. And clinical investigators and FDA review the documents and statements in the proof-of-concept

section; right?

A. Well, they review them, I suppose, but for very different reasons; right? The purpose from the perspective of the investigator is to make sure that the investigator has whatever information is available to provide some context for the trial. And the FDA is looking at this to make sure that these statements are not only accurate but also complete and that they'll provide an investigator with enough information that the investigator can understand the context for the trial.

Q. So your point is that the investigator reviews them, the FDA reviews them, and they're looking at these statements from different perspectives, but the expectation is that the statements are accurate and complete; right?

A. The expectation is that the statements are accurate and complete, recognizing, of course, that for any given clinical study it's not possible to include every relevant piece of data. So some decision has to be made about what might be relevant and what might not be relevant, and normally these

documents are not intended to be complete review articles that cite every other article or every other study that might have some relevance, but are supposed to provide a sufficient background for the investigator to understand and be able to explain the context of the study.

And I guess -- but I'm trying to understand the context of these questions, because it sounds like you're suggesting that the presence of this information in the investigator brochure somehow suggests that there's information that has weight in a determination in a Patent Office proceeding of whether or not there's a reasonable likelihood of success. And I'm just not following that. But is that the point that you're making?

Q. I really wasn't at this point talking about the Patent Office proceeding. Really, I'm just trying to talk about the statements that you make in paragraphs like 97 about the rationale sections. You talk about the proof-of-concept sections in other parts of your declaration. And really I'm just sort of tying it to your statements. But I can move on. I

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 41 of 158

can move on.

I guess what I heard you to say is that those sections -- the rationale section, the proof-of-concept section -- need to include relevant material; right?

A. Sufficient material, that's correct.

Q. And it's the sponsor that makes the choice to include the materials in those sections?

A. Well, again, this is then reviewed by the FDA. And it actually is also reviewed by the IRB. And so those entities also make a determination of whether or not the investigator brochure, for example, if that's what we're talking about, is sufficiently complete to provide that information.

And the investigator brochure in the context of the IRB is there to inform the IRB, but if the IRB feels as though it's lacking, they could then also go back and say, "We don't like this" or "We need more information."

Q. So what's cited in the proof-of-concept section is what the sponsor has determined is the most relevant to educate the FDA and the IRB; right?

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 42 of 158

A. Again, the purpose of this is not to educate the FDA. The purpose of this is to provide context to the investigator. And so the sponsor has looked at this and said, "We believe that an investigator who's doing this study would find this information to be useful."

Q. And it's the sponsor that makes the choice as to which information to include so that an investigator doing the study would have access to that information?

A. The sponsor makes the additional choice, but as pointed out, this information is then reviewed, and if the FDA believes that information is insufficient or irrelevant, the FDA may request the sponsor to change the investigator brochure, and the IRB might also have similar concerns about the investigator brochure if they thought that it was not adequate or complete.

So of course what this means, then, is that a sponsor is motivated to provide a reasonably fulsome background, because they don't want the FDA to say, "You're being irresponsible by leaving the

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 43 of 158

investigator without information that's potentially relevant during this kind of trial." And especially like a new entity, like a nucleic acid vaccine, especially an mRNA vaccine, which many investigators might not have an experience with, there aren't going to be a lot of relevant references.

And so the sponsor then would want to and would be expected to perhaps go even a little bit overboard in providing additional references in order to provide that full context, so that the investigator would understand how it is this product even fits into that concept -- into that context.

Let's not forget, although this is called proof of concept, this doesn't mean proof of concept that this product is ultimately going to be proved safe and effective. This is proof of concept that this is a reasonable study to do at the current stage of development. And so the concept of proof of concept, you know, could potentially even be taken out of context here. But the real purpose of this is in the context of a specific stage in development.

Q. So the FDA can review what's in the

proof-of-concept section and tell the sponsor that something's irrelevant and to take it out; right?

A. They can, although they generally don't do that. Usually what they would do is they would look in and say, "We don't think you've included information about A, B, or C that is important or relevant, and that should be added." I can't think of any -- while the FDA of course could say that, the FDA normally would err on the side of being more complete and wouldn't normally say, "We think that things ought to be taken out of this."

But the sponsor themselves might err on the side of including more stuff because they don't want to be in a position where somebody says, "Oh, you didn't include enough."

MR. FISHER: We'll mark another document, as Exhibit 5. This is going to be PTAB Exhibit 2051.

(Exhibit 5 marked for identification.)

MR. PRUSSIA: Just because it's understood, can I get confirmation on the record that Mr. Parker signed that undertaking?

Just note that Dr. Parker, who is in

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 45 of 158

house, has signed the undertaking for the protective order.

Q. Do you have Exhibit 5, which corresponds to Moderna 2051, in front of you, Doctor?

A. I don't see where on it it says Moderna 2051. But I do have a document that says Exhibit 5 on it. Can we confirm that I have the right document?

MR. PRUSSIA: I just want you to read the litigation Bates number into the record. That's fine.

MR. FISHER: The Bates number is MOD_001417294 to 492. This may be excerpted.

Q. Do you have that document?

A. Yes, I do. It appears that I have pages -- well -- I see, there are different Bates numbers here on each page. I see. So I have 94, 95, 96, 97, and then 309.

Q. Yeah.

A. Then it goes to 479, 480, 481, 482, 483. And then it jumps to 491. And the last page is 492.

Q. Right. My understanding is that's Exhibit 2051. If it's not, we'll deal with it on a break.

A. Okay.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 46 of 158

Q. Do you recognize this document, Doctor? You may want to reference the second page of the exhibit.

A. The second page. The title?

This looks like a document that I reviewed, but I can't, based on what is here, be 100 percent certain.

Q. It says on the second page, "Moderna Therapeutics, Inc. Pre-IND Meeting Background Document." Do you see that?

A. Yes, I do.

Q. "mRNA 1325 (Zika Vaccine)"?

A. Yes.

Q. It's dated 27 May 2016?

A. Yes, that's how it's dated.

Q. And if you turn to page ending in 309.

A. Yes.

Q. You see Section 9.1.3, Proof of Concept Studies with mRNA-Based Vaccines?

A. Yes.

Q. The second paragraph says, [redacted]

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 47 of 158

[redacted] Do you see that?

A. Yes.

Q. And then the next paragraph refers to two different papers that you discuss in your declaration, one by Petsch et al., 2012, and one by Callen et al., 2013. Do you see those?

A. I see those, yes.

Q. Do you recall that those are studies that discuss an mRNA vaccine using a protamine adjuvant? Does this ring a bell?

A. Well, I would say complex with protamine. The protamine probably serves other functions besides being an adjuvant.

Q. One of the distinctions you draw between Moderna's proposed Zika vaccine and the vaccine in Petsch and Callen is the complexation with the protamine adjuvant; is that right?

A. Again, I'm not referring to protamine as an adjuvant in this context, but I talk about complexation with protamine.

Q. One of the distinctions you draw between Moderna's proposed mRNA vaccine for Zika and the

vaccine that was tested in Petsch and Callen is that the vaccine in Petsch and Callen was complexed with protamine?

A. That is correct.

Q. The sponsor of Moderna's vaccine study reflected in Exhibit 5, which is 2051, relied at least in part on these pre-2015 Petsch and Callen mRNA vaccine studies as proof of concept for its mRNA-based vaccines; right?

MR. PRUSSIA: Object to the form of the question.

A. So the -- can you actually repeat the question precisely? I'm sorry -- because the wording is important.

Q. Sure. So this section is 9.1.3, titled Proof of Concept Studies with mRNA-Based Vaccines; right?

A. Yes, it is.

Q. And Petsch and Callen are cited in that section; right?

A. Yes, they're cited in that section.

Q. So the sponsor of the proposed study determined that these two studies were relevant to the

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358

proof of concept with RNA-based vaccines; right?

A. They determined that they were relevant, yes, in the context of proof of concept for a pre-IND document.

Q. And FDA, to your knowledge, didn't tell the sponsor of this proposed study to take out the references to Petsch and Callen; right?

A. That's correct. And as stated, the FDA almost never would say to take information like this out. Normally they would ask a company to add more information. So the companies tend to be conservative and cite more information to provide this context.

Q. Petsch and Callen are the only two publications referenced in the section titled Proof of Concept Studies with mRNA-Based Vaccines; right?

A. That is correct, those are the only published studies that were cited. However, the sponsor also cites information that they have developed on

[redacted]

[redacted]

So what Moderna has done here is, while they've cited those two articles, they've provided information on products that are considerably more advanced than those that are discussed in those articles, that also provide proof of concept.

Q. Moderna could have left out Petsch and Callen; right?

A. They could have. It's quite possible, though, that FDA might have said, "Well, you're only presenting your own data, and you're not providing a broader context," and might have wanted more information to be added.

It's also -- and I can't put myself into the mind of Moderna here. But I think that providing broader context, including the fact that other people were working in this field, does -- might provide important context for an investigator to understand that Moderna is not the only one who's working in this

field to try to determine whether mRNA can be used to induce protective immune responses.

Q. Moderna thought that they were relevant and included them; right?

MR. PRUSSIA: Object to the form.

A. Moderna thought that they were relevant in the context of the specific goals that I've laid out in my answers to other questions.

Q. Petsch and Callen provide some reason to think that an LNP-encapsulated mRNA vaccine would be safe and effective; right?

MR. PRUSSIA: Object to the form of the question.

A. I wouldn't -- your question is so ambiguous that I'm not sure how to answer it. I don't know what you mean by "some reason." And of course, Petsch and Callen did not use, nor did anybody contemplate using, an LNP-formulated RNA vaccine at that time. In fact, Petsch and Callen used a completely different way of formulating their vaccine and believed -- the authors believed that other ways of formulating the vaccine would likely be more useful, which is why they made

that choice.

I'll point out -- and of course, it's listed here -- that the mRNA vaccines cited here were vaccines being developed by Moderna's competitor, CureVac, and they obviously took a very different approach to mRNA vaccines than the one that Moderna took.

Q. Now, Moderna didn't say in this proof-of-concept section that its mRNA-based vaccine and lipid nanoparticles wouldn't work based on what was in Petsch and Callen; right?

A. Well, this is a four-paragraph proof-of-concept section out of a document that is 219 pages long. So what they didn't say in these four paragraphs doesn't -- I guess I didn't even catch what you said that they didn't say. I got hung up on "they didn't say" and thought, well, what would you expect them to say in that context here?

Q. I guess what I'm getting at is: In reporting on Petsch and Callen in this section, there isn't a statement to the effect of, "Petsch and Callen didn't succeed with their mRNA vaccine"; right?

A. Well, Petsch and Callen presented the data that they presented, which at this point was animal data. Moderna had much more relevant data of their own, of their own animal data, and a greater variety of animal species, as well as information that they had vaccines using the same technology as their Zika vaccine [redacted].

And so I think it would be -- I'm trying to imagine an investigator brochure that says -- that throws shade on what a competitor is doing. That's just not the purpose of an investigator brochure, to fight out these kinds of things and say, "Well, we're much better than everybody else." The purpose is to provide the investigator with background information that could be valuable in understanding the context of the clinical trial.

Q. So we go back to Paragraph 69. I told you I'd take you back there.

A. Sure.

Q. Are you there?

A. Yes, I am.

Q. You say in the last sentence of the paragraph, [redacted] Do you see that?

A. Yes, that's correct.

Q. And that statement's true, correct?

A. Yes, in the context of the experiments that were done.

Q. And those CureVac studies were the Petsch and Callen references that we were just discussing; right?

A. So I'm looking at this section of the declaration, and it looks to me like this section of the declaration is referring just to this 2051.

Q. And if you jump up to Paragraph 66.

A. Right. And so it does appear that without remembering exactly what I had in mind, and recognizing that I reviewed multiple different

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 55 of 158

documents, that that statement is referring to the references in this specific document.

Q. So in terms of the CureVac studies, that's Petsch and Callen, indicate that [redacted] Is that right?

A. So, of course, that sentence is quoted from the document, and I'm not right here seeing on the pages that you've provided where that quotation is.

Oh, it's on Page 309, it says. Let me just turn to 309. It's on this page, it says.

Right. In fact, it's that first paragraph of the proof of concept that sets the context for what follows. [redacted]

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 56 of 158

[redacted]

[redacted]

MR. FISHER: Why don't we take a break.

(Recess taken.)

MR. FISHER: I'm going to mark Exhibit 6, which I understand it to correspond to Exhibit 2056 in the IRP proceeding.

(Exhibit 6 marked for identification.)

Q. Do you have what's been marked as Exhibit 6, Dr. Krause?

A. I do.

Q. And the Bates numbers -- and I'm just going to read them into the record -- it is MOD_000205848, 849, 865, 866, 867, and 868.

A. Yes, that's what I have.

Q. I understand to be Exhibit 2056. It's just not stamped as such.

Do you see on Page 868 there is a statement in the second-to-last paragraph that says,

[redacted]

[redacted]

[redacted] Do you see the statement there?

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 57 of 158

A. Oh, I'm sorry. It's the last sentence in the paragraph. That's why I was not finding it.

Q. I'm sorry.

A. Yes, I've got it.

Q. So the statement, just for the record, is, [redacted] Do you see that?

A. Yes.

Q. And before that statement, in the same paragraph, there are -- there's a discussion about midway through that says, [redacted] Do you see that?

A. Yes, I see.

Q. And it says after that, [redacted] Do you

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 58 of 158

see that?
A. Yes.
Q. This was one of the documents that you discuss in your declaration; is that right, sir?
A. I believe that to be true, and I'll accept your representation on that. It's tough to say, based on just --
Q. On the excerpt.
A. -- yeah, the excerpt and the limited number of pages. But this looks like it could have been.
Q. Okay.
A. And if you'd like, maybe you could point me to the paragraph in my declaration.
Q. Sure. I think it spans a number of paragraphs, but the one in particular is Paragraph 74.
A. Okay.
Q. And in Paragraph 74 you refer to Exhibit 2056. Do you see that?
A. Yes, I do.
Q. And then you quote, essentially, the paragraph that we were just looking at.
A. That's a different paragraph, I think. The

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 59 of 158

quoted paragraph is the one on 865, if I'm not mistaken.

Q. So if you look at 868 of Exhibit 6, you can see the second-to-last paragraph begins [redacted]?

A. Oh, no, you're right. It is that one.

Q. Okay. And about halfway through is the several statements that I read into the record from that exhibit. Do you see that?

A. Yes, that is correct. You have read it.

Q. And if you need confirmation, on the very next page you cite to Exhibit 2056 at Bates ending Page 868.

So in terms of the statements in this paragraph, and in particular the one referencing [redacted] -- are you with me again? Do you see that statement?

A. Yes.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 60 of 158

Q. That statement is included in support of the conclusion that [redacted]; right?

A. So -- well, right. It says [redacted]

Q. And one of the studies cited in support of that statement are these preclinical studies using DNA to express the coronavirus spike protein; right?

MR. PRUSSIA: Object to the form.

A. So one of the cited studies, although they're not directly cited here -- but nonetheless the paragraph refers to DNA delivery platforms that involved S protein or -- well, demonstrating that coronavirus --

So the sentence is a little bit difficult to unpack, as I read this; right? Because it says, [redacted]

[redacted]

So I'm not sure if they're including these other DNA vaccines and mRNA vaccines in the category of S protein-based vaccines. It appears that they are, but it says "including those."

So it is implying that DNA vaccines that are based on S protein are protective in animals.

Q. And that statement, including those DNA studies, is cited in support of the ultimate conclusion that [redacted] right?

MR. PRUSSIA: Object to the form.

A. Well, I guess, but not in sole support; right? They --

Q. Agreed. It's not the only study that is cited in support of that conclusion. It is one set of studies cited in support. Correct?

A. Right, because the -- it is cited in support of that conclusion in the context of this document, yes.

MR. FISHER: I'm going to mark as Exhibit

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 62 of 158

7 what I understand to be Exhibit 2054 from the IRP.

(Exhibit 7 marked for identification.)

Q. Do you have Exhibit 7 in front of you, Dr. Krause?

A. Yes, I do.

Q. And Exhibit 7 actually does have a stamp on it. It says Moderna 2054. Do you see that?

A. I do, yes.

Q. And if you look at Paragraph 116 of your declaration, you reference Exhibit 2054 in the section on DMID protocols. Let me help you.

A. I'm right here.

Q. It's eight or nine lines down in Paragraph 116, you cite to Exhibit 2054.

A. Yes.

Q. And then in Paragraph 122, on Page 63 -- on Page 63 you quote from Exhibit 2054. Do you see that?

A. Yes.

Q. So in your declaration you refer to Exhibit 2054.

A. That's correct.

Q. If you look at the page ending in Bates

number 505, the very last page. Are you with me? The very last page of that exhibit.

A. 505? Yeah, got it.

Q. There are two paragraphs at the bottom I want to focus on. The first one begins with the word "there." Are you with me?

A. Right, yes.

Q. "There's some clinical experience with vaccines targeting coronavirus S proteins." Do you see that?

A. Yes.

Q. It goes on to discuss a study conducted in 2004 and 2005 involving a DNA vaccine expressing SARS S protein; right?

A. Yes.

Q. And it cites a paper by Martin et al. from 2008; is that right?

A. That's correct, it does.

Q. Moderna's indicating that this pre-2015 DNA vaccine study found that the vaccine expressed SARS S protein and was immunogenic; right?

A. I don't think that's correct.

MR. PRUSSIA: Objection.

A. This protocol was written by DMID, not by Moderna. In the early development of these vaccines, the DMID, which is a part of NIH and NIAID, wrote this first protocol, it would appear. And you can see it's a DMID protocol number.

So I think that all of the language in this protocol likely comes from DMID. It's unlikely that they would have interspersed language from Moderna into things that they were saying. And, of course, the fact that they as independent people thought that this would be a promising approach was important; but also they felt a need to, just as we've seen in the other documents, to cite broadly anything that might be relevant. So here you see a reference to a vaccine for a completely different virus.

I see the date on here is February 14th, 2020. I suspect that's not the day that this document was drafted, but that's probably the day that this document was finalized.

And if I look at the report from Dr. Corbett, which I cite the picture of on Page 99 of

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 65 of 158

my declaration, it looks to me like Moderna confirmed the immunogenicity of their SARS-CoV-2 vaccine in mice on February 18th, 2020.

And so I would guess that on the day that this document was drafted, which would surely have been more than a couple of days before this date of February 20th, there might not yet have been data available for whoever was drafting this document, probably someone at NIH, to include the Moderna data in it.

Q. This protocol involves mRNA-1273; right?

A. That is correct, yes.

Q. And that's a Moderna product; right?

A. Yes, it is.

Q. And the authors of this protocol found that this Martin study was relevant to the study; right?

MR. PRUSSIA: Object to the form of the question.

A. Well, the authors of the protocol chose to cite this, for the same reasons that -- in these kinds of documents there's a tendency to cite broadly where there isn't a lot of previously existing information.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 66 of 158

And so here -- here not only are they citing information from a different modality, DNA vaccines, but they're citing information from a totally different virus, because this is early in the pandemic and, although Moderna was the first to come up with this kind of information about an mRNA vaccine, this is all the data that existed at this time.

And, of course, what you can see is that in that graph from Dr. Corbett's paper on Page, whatever it was, 98 in my declaration, demonstrating that this vaccine actually expressed the protein was on the critical path; right? So this protocol was written in anticipation that that kind of data would be available, but it was actually written before that data was available, and yet it's not a surprise that NIAID cast very widely in trying to find information to include in this protocol to provide to especially the investigators, again, who were going to conduct the protocol all possibly relevant information that would provide the context for conducting the clinical trial.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 67 of 158

Q. Are you suggesting that DMID was wrong to include the Martin reference discussing the DNA?

A. No, they were absolutely right to include it, because that's what's typically done in these kinds of documents.

Q. The protocol goes on at the bottom of the page to discuss a candidate DNA vaccine expressing MERS. Do you see that?

A. Yes, that's right. It's another completely different virus and a completely different modality.

Q. I mean, do you think that the fact that MERS is a completely different virus somehow impacts whether someone might predict that a vaccine for COVID-19 might be safe and effective?

MR. PRUSSIA: Object to the form of the question.

A. No, I don't think that that's the case. I think that all of this information is relevant, and it's relevant in the context of the purpose of this document.

And so I -- just as I think it is very reasonable for NIAID to include information about the

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 68 of 158

Martin SARS vaccine, I also think it was very reasonable for them to include the information about the Modjarrad MERS vaccine.

And yet the safety and efficacy of the vaccine is not what is being demonstrated in this section of the document, as I previously explained.

And so I would say that this is relevant information in the context of this document, but I would go further and say that obviously if a vaccine were shown to be useful in one or another way, as is the case that we see in these -- in the Moderna patent applications, and indeed in the issued patents, the information about MERS, which is a betacoronavirus, is in fact also very relevant to other betacoronaviruses.

Q. There's nothing in either of those paragraphs that reports on any enhanced disease that the study authors found with either the prior DNA SARS S protein vaccine or the MERS S vaccine; right?

A. Well, enhanced disease can only be evaluated after somebody's been vaccinated and then later infected with the virus. So given the way in which these studies were designed and conducted, there would

be no way in which these studies could have directly addressed the likelihood of enhanced disease.

Q. If you could turn to Paragraph 119 -- of your declaration; I should be clear.

A. Okay, I'm here.

Q. You talk about the rationale for proposed clinical study and background and rationale sections in that paragraph; right?

A. That is correct.

Q. You say in the sentence, second sentence, "It is intended to provide a plausible rationale for why it is worth investigating the safety and efficacy of the drug, and to make sure the investigator understands enough about the technology to appropriately evaluate and document adverse events." Do you see that?

A. Yes.

Q. And that statement's true and accurate?

A. Yes, of course, it is.

Q. The information that is cited in this DMID protocol on these DNA vaccines provides a plausible rationale for why Moderna's vaccine would be safe and

effective; right?

A. I mean, to quote Ronald Reagan, there you go again. Safe and effective is not what is in question in the context of these documents. The purpose of the document is to provide a basis for determining whether it's worth investigating the safety and efficacy of the drug, not a rationale of why the drug will be safe and effective.

Q. So the DNA studies included in Exhibit 2054 at Bates page ending in 505, the SARS S protein DNA vaccine study, the MERS S study, are included because they provide a plausible rationale for why it's worth investigating the safety and efficacy of the Moderna vaccine?

A. That's correct. This is a Phase I protocol. In fact, it's interesting. It says on the top of the page, Version 1.0, 14th of February 2020. On the front it says -- oh, it still says 14th of February. Okay. I got the dates mixed up.

But yes, this is very early in the pandemic; right? This is within -- according to Dr. Corbett's account, the sequences were published on

January 10th, and the GMP vaccine production was initiated on January 14th. And the animal studies had their readout on February 18th, actually after this protocol was published. I had that wrong before.

And so these data from other vaccines were at that time viewed as relevant to whether it was worth initiating this first-in-human Phase I study to begin to evaluate the safety of this Moderna vaccine.

Q. You can put that aside.

Can you turn to Page 79 of your declaration -- I'm sorry, Paragraph 79. Are you with me?

A. Yes. I'm there.

Q. In the third sentence you begin, "While DNA studies, along with other information, may help to generally suggest that exogenously delivered nucleic acid encoding an S protein may be immunogenic and may not be unsafe, the rationale for Moderna's proposed clinical studies," and you go on and say as a whole doesn't provide a reasonable expectation of success. Are you with me?

A. Yes, I see that.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 72 of 158

Q. I want to focus on the way that you characterize the DNA studies. You say, "While the DNA studies, along with other information, may help to generally suggest that exogenously delivered nucleic acid encoding an S protein may be immunogenic and may not be unsafe" -- are you with me?

A. Yes.

Q. Can you explain what you meant when you wrote that statement? How is it that the DNA studies support that?

A. Well, the DNA studies involved plasma DNA that were intended to express in the encoded S protein-related sequences, and there was evidence of an immune response. And there were other DNA vaccine studies as well as those cited here that suggest that giving plasma DNA vaccine to people wouldn't be unsafe -- or would be safe, wouldn't be unsafe.

And so I think that the -- this statement is supported by the references that are being cited by Moderna in 2020.

Q. So DNA studies can suggest that an exogenously delivered nucleic acid encoding an S

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 73 of 158

protein can be immunogenic; right?

MR. PRUSSIA: Objection, mischaracterizes.

MR. FISHER: I think I just read his statement.

Q. But go ahead, answer if you can.

A. So the DNA studies suggest that an exogenously delivered nucleic acid encoding the S protein may be immunogenic, that is correct.

Q. And the DNA studies suggest that exogenously delivered nucleic acid may not be unsafe; right?

A. That's correct, that's what the statement says here. But, of course, it goes on to point out that the rationale for Moderna's proposed clinical study includes much more than that.

Q. So if you turn to Paragraph 118 in your declaration. Are you with me?

A. Yes.

Q. You say, "Although FDA carefully evaluates and approves the protocols, they are written for and addressed to the investigators who will ultimately carry them out." Do you see that?

A. Yes, that is correct.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 74 of 158

Q. "As discussed above with respect to the Investigator's Brochures, the investigator is a clinician with generally no background in mRNA vaccines." Do you see that?

A. Yes. And of course, that's especially true early in the pandemic, when only a relatively small number of studies with mRNA vaccines had been performed.

Q. So clinicians generally had no background with mRNA vaccines; right?

A. Well, in the context of this DMID protocol in 2020, while Moderna cites -- and in fact even in the context of the 2016 Zika protocol cited -- [redacted], but by that time there were not many clinicians or clinical trialists who would have had experience with mRNA vaccines, certainly not the way they would have had experience with other vaccines.

So that's again a reason why when writing this proposal NIAID DMID decided to include whatever information they could that might have some relevance to this general topic.

Q. And the clinician who is reading this investigator brochure is evaluating the risk/benefit of providing the proposed vaccine candidate to a study participant; right?

A. Well, they're looking at the investigator brochure in the context of all of the information that's provided to them, including the protocol, including the informed-consent documents, including all of the other information that they've been provided.

So the investigator brochure -- you said investigator brochure, but in this paragraph I think we're talking about the protocol. But nonetheless, an investigator will use this information to decide whether I guess to sign up as an investigator on the trial, and, of course, the IRB will use this perhaps more to look at benefit and risk and make sure that the risks are fairly described to the study participants.

But, of course, that's not the primary purpose of the protocol. The primary purpose of the protocol is to actually describe the actions and

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358

activities that need to take place in order to faithfully execute the protocol such that the right people are enrolled in the trial, they receive the right vaccines, and that the evaluations that need to be performed on these people are performed the way that they need to be performed in order to have an informative trial result.

Q. Let me direct your attention to Paragraph 120 and come at this a different way. Are you with me?

A. Yeah, I'm here.

Q. It says, "As with the Investigator's Brochures, the clinical study protocols are part of the clinical decision to enter clinical trials -- in other words, they are referencing materials to establish that the investigator can be comfortable moving forward to test the drug's safety and potential clinical effect and that the safety will be adequately evaluated in those trials." Do you see that?

A. Yes, and that's correct: They're part of the decision to enter trials, yes.

Q. FDA expects that clinicians may rely on the information that the sponsor provides in its

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 77 of 158

investigator brochure; right?

A. Yes, FDA expects that investigators can rely on that.

Q. And if the clinician's not familiar with mRNA vaccines, it's important to explain the rationale for the proposed clinical study; right?

A. I would say regardless of whether or not the investigator is familiar with mRNA vaccines, it is important to explain the rationale for the clinical study.

Q. And in this instance, in the investigator brochure or the clinical study protocol, Moderna didn't suggest that the DNA vaccine evidence cited was dissimilar to the proposed RNA vaccine; right?

MR. PRUSSIA: We're talking about -- I want to know which document we're talking about.

MR. FISHER: I'm just generally talking about --

MR. PRUSSIA: Object to form.

A. First off, Moderna didn't write the protocol that you provided me with. But it would be in these documents unusual to pare it down, especially where

the total amount of background that is supplied is fairly thin in the first place. A lot of the data, of course, regarding the likely safety of this vaccine comes from Moderna's own experience with other related vaccines for SARS-CoV-2. NIAID was looking at this. But NIAID did have to scour the literature for some rationale in the literature of why it is that this is a reasonable antigen to use.

So it's not surprising that on doing that kind of literature search -- and other parts of NIAID had indeed done some of the studies that were cited, although that wouldn't have been DMID -- that they would have found literature references where S protein had been used and would have cited those.

But also, I think it would be very unusual were NIAID, in the context of the evolution of Operation Warp Speed, which was occurring at the time -- it would be very unusual -- where NIAID then was taking over at least some aspects of the development of these products and writing this initial protocol in order to move it towards the clinic --

Put yourself in the shoes of Moderna. It

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 79 of 158

would be very unlikely that they would say, "Well, there's information in this protocol that we think shouldn't be there" and then delay the initiation of trial, delay the approval of the protocol, by getting into an argument about whether investigators are being provided data that is broader than needs to be provided.

Q. And the DNA studies ended up in the protocols; right?

A. Well, NIAID put it in the protocol here, that's correct, as you provided to me, yes.

Q. And there's no discussion about that DNA study being dissimilar to the mRNA studies being proposed; right?

A. But that is not the point of this document. The point of the document is to provide a breadth of confidence that the relevant literature has been reviewed and that whatever potentially relevant information that supports the idea of proceeding with this first-in-human trial has been reviewed and included.

And so once somebody -- I think regardless

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 80 of 158

of the relevance of this information to an expectation of success, for example, in a patent proceeding, it would have been irresponsible to exclude it in the context of this type of a protocol.

Q. Okay. You can put that aside.

A. But maybe I can just add something to that, if I'm all right with you.

Q. I'm not sure there's a question pending. Your counsel can ask questions at the end.

A. Okay.

Q. But we're going to go all day if we just --

A. All right --

Q. If you keep giving narrative long answers.

A. I'm just trying to give complete answers.

Q. Understood. I appreciate it.

If you pick back up what is Exhibit 5 to your deposition.

A. Yes.

Q. And this is the document that's titled mRNA 1325 Pre-IND Background Document.

A. Yes.

Q. And if you flip to Page 2, just to reorient

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 81 of 158

you: This is the pre-IND meeting background document that Moderna provided for its Zika vaccine. Do you see that?

A. I do.

Q. If you go to the last page, Bates ending 492, of the document.

A. Yes.

Q. You can see that there's -- the second full paragraph, beginning "recently."

A. Yes.

Q. [redacted] Do you see that?

A. Yes, I do.

Q. And one of the studies cited there was by Geall et al. 2012. Do you see that?

A. I do see that, yes.

Q. And that was included in Section 2.4, Proof of Concept with mRNA-Based Vaccines?

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 82 of 158

A. Yes, I see that.

Q. So if you look at Paragraph 103 of your declaration, Page 53.

A. Okay.

Q. There you discuss the FDA -- you say, [redacted] Do you see that?

A. Yes.

Q. And I want to direct you to the last sentence. [redacted]

A. Yes.

Q. Do you see that? [redacted]

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358

[redacted]

A. Yes.

Q. You can put that aside.

MR. PRUSSIA: Are you done?

A. Well, so you made a statement, but did you have a question for me?

Q. It was the statement. I'm going to move on. If your counsel wants to clarify something at the end, he can do that.

A. Okay. I understood you to be making a statement, not asking a question.

Q. Go back to Paragraph 12 of your declaration.

A. Yes.

Q. You talk about the legal standards. You say, "I am not a lawyer and I do not have formal training in patent law." Do you see that?

A. That's correct.

Q. "Counsel has provided me with the legal standards laid out here."

A. Yes.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 84 of 158

Q. And then you say in Paragraph 20 -- this is into the section on asserted objective indicia. Are you with me?

A. Yes.

Q. "I understand that if the asserted objective indicia are tied to a specific product and that product embodies the claimed features, and are coextensive with them, then a nexus is presumed." Do you see that?

A. Yes.

Q. And you go on further and say, "Nexus can also be shown" -- this is the next sentence -- "if the objective indicia of non-obviousness are commensurate in scope with the claims the evidence is offered to support." Do you see that?

A. Yes.

Q. "Or if the objective indicia of non-obviousness are the direct result of the unique characteristics of the claimed invention." Do you see that?

A. Yes.

Q. And so in that sentence mentioning

commensurate in scope, do you have an understanding of what that language means, beyond what's written here?

A. So, yes, I do.

Q. What's your understanding?

A. So my understanding of what this means is that these specific indicia of non-obviousness need to be related to the specific claims of the invention. And so if the indicia -- the indicia of non-obviousness are related to things that have nothing to do with the invention, then it wouldn't count in this context. But if they're related to the claimed features of the invention, then they do count.

Q. So "direct result" in that sentence means that the objective indicia of non-obviousness have to be because of the unique characteristics of the claimed invention; right?

A. No. Again, I'm not a lawyer, but I'm just reading this. But that's not how I interpret this paragraph. It says nexus can also be shown if it's the direct result of the characteristics. So this is, of course, legal language which was provided to me by the lawyers, and I'm interpreting this as a nonlawyer,

as I've stated in the other paragraph. And yet my understanding is that there are a number of different ways in which nexus can be shown.

But the way you phrased the question I think was that it could only be shown that way, and that clearly is not what the paragraph says.

Q. If the objective indicia are the result of something other than the unique characteristics of the claimed invention, that does not support a nexus; right?

A. So if the indicia are -- you see, I'm struggling with that in the context of other language which is present here, because it talks about commensurate in scope. And so I'm not sure what you mean by "does not support the nexus." I certainly wouldn't take "does not support the nexus" to be synonymous with "fail to support the nexus."

But I think that this is language that you and the WilmerHale attorneys are better off, or perhaps some Court are better off, working out exactly what it means. I know that there are lots of court cases regarding the exact meaning of this language,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 87 of 158

and it may be that this is -- the exact state of the law may even be in flux here.

But I'm not here to opine on the law. I'm here to talk about the relatedness of the objective indicia of non-obviousness to the claimed features of the invention.

Q. All right, if you look at Paragraph 163, in the Section X, Objective Indicia Support Nonobviousness.

A. Yes.

Q. You say in 163, "These objective indicia are tied to real-world betacoronavirus vaccines that embody the claimed inventions and are commensurate in scope with the claimed inventions." Do you see that?

A. Yes.

Q. "They therefore have a nexus to the claims."

A. Yes, that's exactly what I said.

Q. And as I understand your opinion reflected in this declaration, it's that both Spikevax and Comirnaty embody the patent claims and that the evidence of objective indicia is commensurate in scope with the challenged claims of the '600 and '127

patents; right?

A. As I understand it, all of the claims have been challenged. Is that right? Again, I don't know exactly which claims have been challenged, but I believe that they're commensurate in scope with the claimed inventions.

Q. If you look at Paragraph 172, at Page 97.

A. Yes, I'm there.

Q. You say, "Furthermore, as the '600 and '127 patents explain, the invention is not limited to the specific betacoronaviruses mentioned in the specification, or any particular strain of the MERS-CoV and SARS-CoV viruses that are exemplified." Do you see that?

A. Yes.

Q. Do you know how many betacoronaviruses are known today?

A. It's a very large number, if you include human and animal betacoronaviruses.

Q. How many betacoronaviruses might emerge in the future?

A. I cannot predict, but, of course, there's

concern that new betacoronaviruses may emerge as human pathogens in the future.

Q. So what I understand you to be saying in Paragraph 172 is that the '600 and '127 patents aren't limited to just MERS-CoV and SARS-CoV; right?

A. That is -- that is my understanding, that is correct.

Q. And so, for example, they cover COVID-19, the vaccines that were sold during the pandemic; right?

A. That's correct. If you -- maybe we should look at the specific claims and see how they read on that.

Q. Okay, we can do that.

MR. FISHER: We'll mark this as Exhibit 8.

(Exhibit 8 marked for identification.)

Q. Do you have Exhibit 8 in front of you?

A. I do, yes.

Q. And Exhibit 8 is intended to correspond to Exhibit 1001 of the IRP proceeding. It's the '600 patent. Do you have that?

A. Yes, I do.

Q. And we can look at claim 1. Do you have

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 90 of 158

claim 1 in front of you?
A. Yes.
Q. It's in column 737?
A. Yes.
Q. And it talks about an open reading frame encoding a betacoronavirus. Do you see that?
A. Yes.
Q. Does this refresh your memory that the claims are not limited to a particular betacoronavirus?
A. That's correct, claims are not limited to a particular betacoronavirus.
Q. Claims cover more than just the two commercial vaccines that -- Spikevax and Comirnaty; right?
A. Yes, they do.
Q. Claims cover any betacoronavirus vaccine, whether known or unknown; right?
A. No, that's not true. They cover betacoronavirus vaccines that meet the limitations of the claim, which include betacoronavirus vaccines that are messenger ribonucleic acid comprising an open reading frame encoding a betacoronavirus S protein or

S protein formulating a lipid nanoparticle.

So they cover a very specific subset of betacoronavirus vaccines.

Q. Fair enough. But in terms of the betacoronavirus component, it doesn't matter what virus the vaccine uses so long as it is a betacoronavirus; right?

A. Well, so this is a question of patent law. But my understanding is that, for instance, in the '600 patent this is a patent to a composition of matter, and that composition of matter does need to have some utility.

So I don't know -- and this would be up to patent lawyers to figure out -- whether this would cover a vaccine against a betacoronavirus that -- where that vaccine had no utility. But as I understand it, if it is a vaccine that has utility, as a matter of how these patents are interpreted -- again, speaking not as a patent lawyer -- that this would cover mRNA vaccines that express the specified open reading frames formulated in lipid nanoparticles against additional betacoronaviruses to the extent

that those had the required utility.

Q. In Paragraph 172 of your declaration, just to redirect you there, it says, "The invention is not limited to the specific betacoronaviruses mentioned in the specification or any particular strain of the MERS-CoV and SARS-CoV viruses that are exemplified."

A. That's correct, it does say that.

Q. And that's a correct statement; right?

A. Yes.

Q. So in terms of your opinions with respect to alleged objective indicia, you focus on the two COVID-19 vaccines that were marketed and sold during the pandemic and afterwards; right?

A. Right, because that of course is the circumstance under which it's feasible to evaluate those objective indicia.

Q. In offering your opinions on objective indicia, you didn't discuss any vaccines for MERS or SARS-CoV-1 that may have been in development prior to COVID-19; right?

A. I think I do, at least in Paragraph 172. For example, I point out that the work Moderna had done on

the prototype MERS vaccine enabled the rapid development of, for instance, the COVID-19 vaccine.

So I think the statement as you read it to me or as you stated it to me is not completely correct. I do refer to other vaccines besides the two COVID-19 vaccines.

Q. But in terms of your opinions about solving long-felt unmet need, satisfying skeptical audiences, what you point to are the two marketed COVID-19 vaccines; right?

A. Well, yeah, because that's where the strength of the evidence is greatest. And yet certainly it would be hard to argue that finding a MERS-CoV vaccine, for instance, didn't satisfy a long-felt unmet need or that the results with the MERS-CoV vaccine -- it would be hard to argue that that was not an unexpected result.

And so while that vaccine wasn't ultimately commercialized, I think some of these indicia actually are satisfied by at least the MERS vaccine that Moderna developed and described in the patent.

Q. I mean, you pointed this out in your last answer: The MERS vaccine that Moderna was developing never came to market; right?

A. Well, there was never a market for it; right? The number of people who are at risk of exposure to dromedary camels around the world is not high. There may be a market for such a vaccine in Saudi Arabia and a few countries, and yet in the end, of course, a company like Moderna has to decide which vaccines they're going to develop and market.

So the fact that the market conditions did not exist globally to support the development of that vaccine doesn't track from the fact that this vaccine satisfied an unmet need, because in this context unmet need isn't only the availability of a MERS vaccine, but it's a demonstration that a coronavirus vaccine, a new kind of coronavirus vaccine, is feasible.

I can tell you, for instance, that the global public health community was very worried about coronaviruses since SARS; right? And so in spite of the fact that SARS was completely eradicated, there was a lot of interest in developing SARS vaccines even

after that happened -- not because anybody thought that they needed to prevent future SARS infections, but because they were worried that something similar would happen again in the future, as indeed happened with MERS, although it was a little bit different, but it was a related virus. And, of course, the work done on SARS and MERS then ultimately supported where we ended up with COVID-19.

So I would argue that the unmet need wasn't necessarily just a need for a vaccine against a specific virus, but it was a need for a vaccine that could help the world be prepared for a global pandemic. And that's what these patents provided. That was one of the unmet needs that was satisfied.

Q. And that unmet need that you're referring to began after the original SARS pandemic in 2002-2003?

A. It actually existed even before that, because for people who were worried about global pandemics, coronaviruses were -- even before that were on the list of viruses that had the potential to cause these kinds of rapidly spreading and dangerous diseases. And, of course, that became even more urgent after

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 96 of 158

SARS and even more urgent after MERS. And so the pressure, the degree of that unmet need that existed even before COVID-19 I think was very substantial.

The WHO actually maintains lists of viruses of pandemic potential that are worth doing research on priority pathogens, and both MERS and SARS were on that list around these times.

So in spite of the fact that SARS had disappeared as a public health threat, it was still considered a priority pathogen for this exact reason.

MR. FISHER: Why don't we take a break.

(Recess for lunch.)

Q. Welcome back, Doctor.

A. Thank you. Same to you.

Q. Thank you. If you could turn to Paragraph 179 in your declaration, Page 103.

A. Yes.

Q. And this is a section where -- it's in the Failure of Others and Skepticism section, in Section 1, "MRNA was not viewed as a promising platform for vaccines." Are you with me? Right?

A. Yes.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 97 of 158

Q. In Paragraph 179, the second sentence says, "Although researchers understood the potential of vaccines based on nucleic acids, which could be tailored to an emerging viral strain by changing the sequence of the genetic material, they initially focused on DNA vaccines, which were more stable and easier to manufacture." Do you see that?

A. Yes, I do.

Q. And you cite to Exhibit 2027, an article by Norbert Pardi et al. Do you see that?

A. Yes.

Q. I'm going to mark as Exhibit 9 to your deposition the Pardi paper, which corresponds to Exhibit 2027.

(Exhibit 9 marked for identification.)

Q. Let me know when you have the paper, Doctor.

A. Got it.

Q. So in that Paragraph 179, in the very next sentence, you quote from the Pardi paper. Do you see that?

A. So you said in the very next sentence? Which sentence?

Q. It says, "Although very early experiments in the 1990s showed that mRNA encoding a reporter protein or the peptide hormone vasopressin could be expressed in vivo, those early results," and then you quote from the Pardi paper. Do you see that?

A. Yes.

Q. And just to orient you, right? In the Pardi paper, Exhibit 9, which is Moderna 2027, it's the first column, all the way at the bottom of the page, I think, where you're quoting from.

A. That's correct, yes. I see that.

Q. And what you quote is "did not lead to substantial investment in developing mRNA therapeutics, largely owing to concerns associated with mRNA instability, high innate immunogenicity and inefficient in vivo delivery. Instead, the field pursued DNA-based and protein-based therapeutic approaches."

A. Yes, I see that.

Q. So Pardi continues in the next sentence at the top of the second column: "Over the past decade, major technological innovation and research investment

have enabled mRNA to become a promising therapeutic tool in the fields of vaccine development and protein replacement therapy." Do you see that?

A. Yes.

Q. And so this paper was published, it looks like, April 2018? Do I have that right?

A. It says it was published online 12th of January 2018.

Q. Okay. Where are you reading from on that?

A. On the very last line in the very first unfull column, just above Nature Reviews. So it was in the April edition of Nature Reviews, but it looks like it was published online a little earlier.

Q. So the decade that they're referring to in the sentence "over the past decade" is roughly 2008 to 2018; is that right?

A. Well, I mean, "over the last decade" would of course include anytime during that decade, including between, say, 2015 and 2018. But yes.

Q. Sure. I'm not sure what we're arguing about. But it's anytime in the ten years preceding the publication of the paper.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 100 of 158

A. Right, and normally, if you use the word "decade" the same way I do, it's not meant to be a precise term. Nobody's looking at 3,650 days plus leap years. But they're talking in general about a vague amount of time.

Q. All right. So in that general period of time, past decade, there was major technological innovation and research investment in mRNA; right?

A. Yes.

Q. So Pardi then goes on and reports, a little lower down in that paragraph -- this is maybe 15 lines down. There's a sentence that says, "The inherent immunogenicity of the mRNA can be down-modulated to further increase the safety profile." Do you see that?

A. Yes, I see it, yes.

Q. And there are three references cited after that sentence -- 9, 12, and 13?

A. Correct, yes.

Q. And if you were to look at the end of the paper, in the reference section, 9 is a reference by Kariko, dated in 2008?

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 101 of 158

A. Well, not just by Kariko. Drew Weissman is also a co-author of that paper.

Q. Fair enough. 9 is a paper authored by Kariko et al. from 2008?

A. Yes, I see that.

Q. 12, I'll represent to you, was published in September of 2015, this paper by Thess. Do you see that?

A. Yes, I see that.

Q. And then 13 is another paper by Kariko et al., published in 2011. Do you see that?

A. Yes, I do -- and, of course, it also has Drew Weissman as a co-author.

Q. Fair enough. So in terms of the information that the Pardi authors are relying on for this statement about the increased safety profile of mRNA, all of that information was pulled for prior to the 2015 priority date; right?

A. Well, yes, if you accept that Drew Weissman, who's the senior author on the Pardi paper, would have necessarily completely unbiased interest in citing all of the relevant literature to this topic; right?

Surely by 2018 he would have been aware of the advances that Moderna had made, and it's puzzling that he wouldn't have cited those as well, because that would have occurred within the last decade.

But of course there's a tendency -- and I'll admit to this myself, so I'm not blaming Drew for this -- is to cite one's own work; right? So he just happens to be citing work that he was involved with, primarily. And he of course has an interest in making it look like the advances that he was a part of are important in this field.

So the fact that he chose to cite his own references to me doesn't really mean that this is a fair representation of the foundation of the field of mRNA vaccines.

Q. So you've cited the Pardi paper --

A. Yes.

Q. -- in Paragraph 179; right?

A. Yes.

Q. I just want to be clear on that.

A. And, of course, it was cited for the comments that were cited. But that doesn't mean that

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 103 of 158

everything in the Pardi paper is necessary complete and correct.

Q. So you take the parts that you like and you explain away the ones you don't like?

A. Well, it's not a question of explaining away. It's a question of just looking and saying, well, what -- especially for someone like -- right? If Drew Weissman is pointing out that this wasn't considered a promising approach, then I think one could take that probably at face value.

Q. All right. The paper goes on -- and this is right below what we were just looking at. It says, "Second, efficacy: Various modifications make mRNA more stable and highly translatable." Do you see that?

A. I'm sorry, still on the first page?

Q. Still on the first page.

A. Yes, correct.

Q. And it cites the same papers; right?

A. That's correct, yes.

Q. 9, 12, and 13 are the citations?

A. Yes.

Q. So again, the authors of this paper are saying that they're drawing on data that was pre priority date and making the statement that these modifications make mRNA more stable and highly translatable; right?

A. Right. Of course, they're relying on citing their specific work.

And I think, as I understand it, Reference 12 doesn't talk about modified RNA, although for some reason they're citing it for that, because it actually says -- the title of 12 is "Sequence engineered mRNA without chemical nucleoside protein therapy in large animals."

So it's clear that Reference 12 is also talking about therapy, and it clearly is talking about some RNA without nucleoside modifications, although I haven't reviewed that paper.

So I don't think I would cite Reference 12 for a statement about modifications making mRNA more stable or highly translatable, because it seems like the title says that it actually doesn't have anything to do with that -- although maybe there's something in

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 105 of 158

the article that does.

But then the other two references, 9 and 13, are the ones from Drew Weissman himself.

Q. And 9, the title is "Incorporation of pseudouridine into mRNA yields superior immunogenic vector" --

A. Nonimmunogenic.

Q. Excuse me.

-- "nonimmunogenic vector, with increased translational capacity and biological stability." Right?

A. Right. And of course, what that paper is emphasizing is the fact that when you incorporate this pseudouridine modification in mRNA, you actually get fewer immune responses -- right? -- which would suggest maybe that that wouldn't be exactly what you would want to do in order to make a vaccine.

Q. So in Paragraph 192 -- you can put that aside. Are you with me, Paragraph 192?

A. Yes, I am, yes.

Q. You say that, "Furthermore, specifically with respect to mRNA vaccines, there was concern that the

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 106 of 158

spike protein was too large to express well and field properly, because it was much larger than previous proteins successfully expressed in vivo from exogenously delivered mRNA." Do you see that?

A. Yes.

Q. Did you go and look for examples of expressed proteins to see whether any were larger than the spike protein that you cite there?

A. As of 2015?

Q. Yes.

A. I recall doing at least some search. But, of course, it's very difficult to do that kind of a search completely, because you can't search based on the size of the protein that is being expressed.

But I was not able to find any when I did that search. But I can't vouch for that search having been 100 percent complete.

Q. What did you do? Go to the literature? How did you do it?

A. Yeah, I looked for mRNA expressed proteins.

Q. Okay. Did you look for patents or patent applications with them?

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 107 of 158

A. I did not search the patent database when I looked.

But what I'll point out is that it's certainly well known that mRNA is inherently unstable, and it's unstable because it's susceptible to cleavage by various cellular enzymes, and the larger an mRNA is, the more possible target locations for these cellular enzymes for degradation of the RNA that you have.

And so this inherent instability on a per-nucleotide basis might not be so concerning, but as the RNA gets bigger, the likelihood that it might have a location in it which then is cleaved increases commensurate with the size of the mRNA.

And so based on general knowledge about mRNA, I think it's also fair to conclude that there's a greater risk of instability for larger mRNAs.

Q. So in 2023 the Nobel Prize in physiology or medicine was awarded to Dr. Kariko and Dr. Weissman for their discoveries concerning nucleoside-based modifications that enabled the development of effective mRNAs with respect to COVID-19; right?

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 108 of 158

A. I don't know the exact citation. If you're reading it exactly to me, I'll take your word for it, that that's the exact citation for their Nobel Prize. But I don't have that in front of me.

Q. Fair enough. You understand that they did win a Nobel Prize; right?

A. I understand that they won a Nobel Prize.

Q. And it was generally in relation to modified mRNA; right?

A. That's correct.

MR. FISHER: Let's take a break.

(Recess taken.)

Q. Doctor, I have just a couple more questions.

On this Exhibit 9 that we were looking at, the Pardi 2018 review article.

A. Yes.

Q. It looks like there are 222 citations in the review article. Can you confirm that?

A. There are 222 citations, I agree.

Q. You're not suggesting that Dr. Weissman only cited his own work in this paper; right?

A. No. But you pointed to specific statements,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 109 of 158

and -- on which it seemed like he relied only, essentially only on his own work for those specific statements. Obviously this is a broader article that has a lot of additional information in it. And what I pointed out to you was that, although it seemed clear that the work that Moderna did actually had done quite a bit to advance this field, for whatever reason he chose not to cite that work.

So I can't explain why it is that in an article with 222 citations he didn't cite other seminal work that played an important role in this, in the development of mRNA vaccines. But it seems clear that he didn't.

Q. Have you confirmed that none of these citations are Moderna's work?

A. Well, he didn't cite Moderna's work in the specific statements that you -- that you included. And if I look at at least this paragraph that we were talking about, he refers to safety, modifications to make mRNA more stable and translatable, which is an area to which he contributed fairly substantially; and third, production, the potential for rapid,

inexpensive, and scalable manufacturing.

But he doesn't talk about the findings that actually led to mRNA vaccines becoming immunogenic, and those specifically are the claimed findings in the two Moderna patents that we were talking about today.

And so at least in this paragraph he foreshadows that he's ignoring the work that turned mRNA vaccines into a useful invention.

Q. All right, so you're talking about the two Moderna patents. You think he should have cited those patents in this paragraph?

A. That's not what I said. But the work that is described in these patents surely was known to him and surely played a role in where the world stood with mRNA vaccines in January 2018. [redacted] And their specific strategy surely would have been known to him.

And yet the features of those vaccines that led to them being -- to their being tested by that point are for whatever reason not summarized in

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 111 of 158

this paragraph. And it is true, to answer your question directly, I have not looked at all 222 references to determine that none of them are Moderna references.

And yet in the context of the questions you're asking me, it seems as though the Moderna contributions to this field are being ignored.

Q. Okay. Or they came before the citations that he included; right?

A. Well, that's not how review articles work. The question is what information was available at the time the review article was written, not what is the earliest article I can find that describes a -- describes some contribution towards a particular outcome.

And so, just to be clear, because you asked me whether I was aware that Drew Weissman and Katalin Kariko had received a Nobel Prize: They did, and I believe they were fully deserving of it. They made seminal and critically important discoveries about modified RNAs -- right? -- which -- and how it is that one could make modified RNAs in such a way

that translation could be increased and innate immune responses to those RNAs could be avoided.

But that by itself doesn't make an mRNA vaccine. An mRNA vaccine is also made by taking that kind of increased translation and attracting enough immune effector cells that you actually get an immune response to that, which is the exact opposite of what you want in the therapeutic setting, that actually the articles that are being cited by him here would want, because in a therapeutic setting you're not trying to get an immune response. And likewise, you're not going to have an effective vaccine unless you figure out what the right antigen is.

So Moderna was the one who put -- who created a vaccine out of mRNA that took advantage of nucleoside modifications that went beyond those that Weissman and Kariko made to yield even better improvements in translation of the gene that was being presented, plus then also figured out how to make that immunogenic and sufficiently immunogenic, as they describe in their working example, to provide high levels of protection in what at that time was probably

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 113 of 158

the best and most useful animal model against MERS. And then they also showed that they had an antigen that could do that.

And in the same patent, although they didn't do this for the coronavirus, they showed that, using their specific formulation for metapneumovirus, they actually avoided the kinds of immune response that were likely to lead to enhanced disease.

And so it was really Moderna, by putting this together, that took their own findings and certainly built upon findings that Weissman and Kariko deservedly get great credit for. But they're the ones who turned this into an mRNA vaccine.

So that's my understanding of what happened.

Q. Okay.

MR. FISHER: Move to strike, nonresponsive.

I have nothing further at this point.

We're going to take a break and come back.

(Recess taken.)

EXAMINATION

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 114 of 158

BY MR. PRUSSIA:

Q. Dr. Krause, is it okay if I ask you a couple of questions on redirect?

A. Yes, it is.

Q. You were handed Exhibit 7, which is identified as Moderna 2054 in the IRPs. Would you pull that document out?

A. Yes, I have it.

Q. And this is one of the DMID protocols; correct?

A. Yes, this is, obviously excerpted.

Q. And if you could turn to the page -- it's internal Page 7, and it's on the Bates that ends in 497.

A. Yes, I'm on that page.

Q. And I'm focusing specifically on Section 1.1, Synopsis. Do you see that?

A. Yes, I do.

Q. And specifically, there's a subheader in bold and underlined entitled Rationale for Proposed Clinical Study. Do you see that?

A. Yes.

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 115 of 158

Q. And you provided some testimony about that second paragraph there, that starts with "ModernaTX, Inc. has developed a rapid response, proprietary messenger RNA (mRNA)-based vaccine platform." Right?

A. Yes.

Q. In the middle of that paragraph there's a sentence that starts, "Prior preclinical studies have demonstrated that coronavirus spike (S) proteins are immunogenic and S protein based vaccines, including deoxyribonucleic acid (DNA) and mRNA delivery platforms, are protective in animals." Do you see that?

A. I do.

Q. And do you remember being asked questions about that sentence and that paragraph by counsel for petitioners?

A. Yes, I do.

Q. Now, this document has a date on it of February 2020; right?

A. Correct, yes.

Q. Prior to February of 2020, what prior preclinical work had Moderna done with an mRNA

betacoronavirus vaccine?

A. Well, of course, prior to that date, and presumably encompassed by this statement in the protocol, was all of the preclinical work that is described in these two patent applications and ultimately issued patents.

And so that would include all of the data regarding the S protein-based mRNA vaccine that they themselves had started working on for MERS and were developing for MERS.

And so those statements of course apply very specifically to data that is present in the patent specification and the working examples that are provided there.

Their vaccine expressed coronavirus S protein, and they certainly showed that the MERS vaccine was immunogenic. It led even to very high neutralizing responses. And they showed that it was very protective in animals, including in the rabbit lung model, which was considered at that time the best and most useful model for MERS infection and for this kind of preclinical vaccine study. And of course,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 117 of 158

this was an mRNA delivery platform.

So I do interpret that statement as relying most heavily on the data that Moderna itself had generated, because that also was the data that was most relevant to the conduct of this protocol, because the mRNA vaccine used in that study had the over -- was closest to the one that they were developing for SARS-CoV-2, including having a full- length S protein open reading frame and including being coformulated with a lipid nanoparticle.

Q. So just to be clear: In your opinion, what is the relevance of that prior preclinical work that Moderna had done to the rationale for investigating an mRNA vaccine for SARS-CoV-2?

A. So in my view, if that work had not been done, it's unlikely that the Moderna vaccine would have -- may even have been selected for inclusion in Operation Warp Speed. That information was so important to show the proof of concept for an mRNA vaccine against a coronavirus that that provided, well, NIAID, and other government officials with a basis for believing that this vaccine had a chance to

work.

MR. PRUSSIA: I have nothing further. I pass.

FURTHER EXAMINATION

BY MR. FISHER:

Q. Now, Doctor, Moderna didn't do work with DNA vaccines; correct?

A. Moderna, to my knowledge, didn't directly do work -- we didn't report on our work with DNA vaccines in these patents or in the materials that I've reviewed.

Q. And this paragraph does reference prior work with DNA vaccines in the rationale for the proposed clinical study; correct?

A. Absolutely. And again, here's one sentence that is describing the past preclinical work that has any relevance to the vaccine that's being studied here at all.

And so I think that it's very reasonable to include DNA vaccine work in that sentence because it was done and is part of the overall rationale. But I am expressing the opinion that the work that they

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 119 of 158

did with their own mRNA vaccine was by far the most critical for providing a rationale for this specific clinical study -- you know, for the reasons that I stated.

MR. FISHER: Nothing further.

MR. PRUSSIA: I think we'll just need to mark the transcript -- I'll mark the whole, entire transcript under the protective order.

(The deposition concluded at 1:15 p.m., after 2 hours and 55 minutes on the record.)

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 120 of 158

CERTIFICATE OF SHORTHAND REPORTER - NOTARY PUBLIC

I, Alan H. Brock, Certified Reporter and Notary Public within and for the Commonwealth of Massachusetts, do hereby certify:

That Philip Krause, M.D., the witness whose deposition is hereinbefore set forth, was duly sworn by me before the commencement of such deposition and that such deposition was taken before me and is a true record of the testimony given by such witness.

I further certify that the adverse party, ModernaTX, Inc., was represented by counsel at the deposition.

I further certify that the deposition of PHILIP KRAUSE, M.D. occurred at the offices of Wilmer Cutler Pickering Hale and Dorr LLP on Wednesday, August 14, 2024,commencing at 9:08 a.m. to 1:15 p.m.

I further certify that I am not related to any of the parties to this action by blood or marriage, I am not employed by or an attorney to any of the parties to this action, and that I am in no

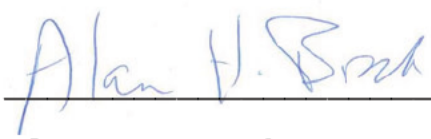
BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 121 of 158

way interested, financially or otherwise, in the outcome of this matter.

IN WITNESS WHEREOF, I have hereunto set my hand this 14th day of August, 2024.

My commission expires:

March 25, 2027



Alan H. Brock, RDR, CRR

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 122 of 158

A

able
22:5, 34:17, 40:5, 106:15
about
8:19, 10:2, 14:21, 15:1, 15:16, 15:22, 16:4, 17:6, 19:9, 19:16, 22:14, 23:12, 23:21, 27:9, 29:21, 31:21, 31:22, 35:7, 36:12, 38:5, 39:21, 40:16, 40:18, 40:19, 40:20, 41:13, 42:16, 44:6, 47:19, 57:11, 59:7, 66:6, 67:22, 68:2, 68:13, 69:6, 69:14, 75:13, 77:15, 77:16, 77:18, 79:5, 79:12, 83:16, 86:13, 87:4, 90:5, 93:7, 94:19, 95:18, 99:20, 100:4, 101:16, 104:9, 104:15, 104:19, 107:15, 109:19, 110:2, 110:6, 110:10, 111:21, 115:1, 115:15
above
31:11, 74:1, 99:11
absent
23:14
absolutely
19:21, 67:3, 118:15
accept
12:13, 12:15, 14:8, 58:5, 101:19
access
42:9
according
70:21
account
70:22
accurate
20:8, 20:10, 20:22, 39:8, 39:16, 39:18, 69:18
achieving
25:22
acid
43:3, 57:15, 59:19, 60:22, 71:17, 72:5, 72:22, 73:7, 73:10, 82:17, 83:1, 90:21, 115:10
acids
97:3
action
10:6, 120:20, 120:22
actions
75:22
actively
14:16, 15:21
activities
76:1
actually
9:3, 9:7, 9:18, 24:15, 27:9, 41:10, 48:12, 62:6, 66:12, 66:15, 71:3, 75:22, 93:20, 95:17, 96:4, 104:10, 104:21, 105:14, 109:6, 110:3, 112:6, 112:8, 113:7
add
49:10, 80:6
added
44:7, 50:16
additional
29:13, 42:11, 43:9, 91:22, 109:4
address
13:6
addressed
69:2, 73:20
adequate
42:17
adequately
22:5, 76:17
adjuvant
47:9, 47:13, 47:17, 47:19
admit
102:6
advance
109:7
advanced
49:22, 50:8
advances
102:2, 102:10
advantage
112:15
adverse
69:15, 120:11
advisory
9:22
affirmed
6:4
african
49:21
after
38:1, 57:19, 68:20, 71:3, 95:1, 95:16, 95:22, 96:1, 100:17, 119:10
afterward
17:12
afterwards
92:13
again
13:9, 14:5, 22:22, 26:19, 28:11, 28:20, 37:10, 41:9, 42:1, 47:18, 55:21, 59:21, 66:19, 70:3, 74:19, 85:17, 88:3, 91:19, 95:4, 104:1, 118:15
against
46:21, 50:1, 91:15, 91:22, 95:10, 113:1, 117:20
ago
18:13
agree
21:15, 108:19
agreed
61:16
ahead
73:5
aim
50:1
al
47:5, 63:16, 81:19, 97:10, 101:4, 101:11
alan
1:26, 120:3, 121:11
all
7:18, 8:22, 10:14, 13:9, 30:14, 32:3, 35:4, 64:7, 66:7, 66:20, 67:18, 75:6, 75:9, 80:7, 80:11, 80:12, 87:7, 88:2, 98:9, 100:6, 101:17, 101:21, 103:11, 110:10, 111:2, 116:4, 116:7, 118:18
alleged
92:11

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 123 of 158

allow
20:1, 21:5
almost
49:9
along
32:13, 71:15, 72:3
already
22:14, 23:4, 23:6, 23:8, 23:19, 32:9, 53:7
also
3:13, 9:21, 10:7, 15:2, 15:19, 16:15, 18:20, 29:11, 29:15, 33:20, 36:4, 36:15, 37:9, 39:8, 41:10, 41:11, 41:18, 42:16, 49:17, 50:9, 50:17, 64:13, 68:1, 68:14, 78:15, 84:12, 85:19, 101:2, 101:12, 104:14, 107:16, 112:4, 112:19, 113:2, 117:4
although
10:9, 43:13, 44:3, 60:12, 66:5, 73:18, 78:12, 95:5, 97:2, 98:1, 104:9, 104:16, 104:22, 109:5, 113:4
ambiguous
51:14
amount
78:1, 100:5
analysis
32:10
andrew
13:3
animal
47:1, 49:20, 53:2, 53:4, 53:5, 71:2, 88:19, 113:1
animals
57:16, 59:20, 61:1, 61:7, 104:13, 115:11, 116:19
anna
3:5, 3:11
annaleigh
3:4, 3:10
another
21:14, 28:22, 44:16, 67:9, 68:10, 101:10
answer
34:3, 38:5, 51:15, 73:5, 94:2, 111:1
answered
27:1
answers
51:8, 80:13, 80:14
anticipated
56:20, 57:6, 60:2, 60:5, 61:10
anticipation
66:14
antigen
55:18, 78:8, 112:13, 113:2
antigen-specific
54:7, 55:7
antigens
54:6, 55:7
any
6:15, 9:12, 10:19, 12:17, 13:18, 13:20, 14:9, 15:6, 17:16, 18:21, 22:19, 34:15, 35:22, 36:8, 36:16, 37:1, 37:11, 39:19, 44:8, 68:16, 88:12, 90:16, 92:5, 92:18, 106:7, 106:15, 118:17, 120:20, 120:22
anybody
51:17, 95:1
anyone
18:2, 24:10, 24:14
anything
17:5, 64:14, 104:21
anytime
99:18, 99:21
anywhere
11:17, 13:11
appeal
1:3
appear
54:20, 64:5
appearing
19:12
appears
45:13, 61:4
appendix
8:16
application
4:14, 4:16, 4:17, 20:17, 32:18
applications
68:12, 106:22, 116:5
apply
8:13, 16:9, 35:2, 116:11
appreciate
80:15
approach
52:6, 64:12, 103:9
approaches
98:18
appropriately
69:15
approval
33:14, 34:2, 79:4
approves
73:19
april
99:6, 99:12
arabia
94:7
area
18:16, 109:21
aren't
43:5, 89:4
argue
93:13, 93:16, 95:9
arguing
99:20
argument
79:5
around
94:6, 96:7
art
25:19, 26:1, 27:17, 27:19
article
40:2, 97:9, 105:1, 108:15, 108:18, 109:3, 109:10, 111:12, 111:13
articles
40:2, 50:6, 50:9, 82:15, 82:21, 111:10, 112:9
aside
14:14, 71:9, 80:5, 83:5, 105:19
asked
24:2, 111:17, 115:14
asking
23:14, 26:15, 26:17, 27:2, 29:20, 83:13, 111:6

aspects
16:19, 78:19
assembles
9:8
assembling
8:19
asserted
84:2, 84:5
assess
21:19
assessed
20:19
assessing
20:13, 21:4,
30:7, 30:15
assessment
20:1
associated
22:10, 22:20,
23:16, 29:12,
98:14
assuming
32:21
attached
4:10
attempting
33:9
attention
23:16, 76:8
attorney
18:10, 120:21
attorneys
9:2, 28:13,
86:19
attracting
112:5
audiences
93:8
august
1:22, 6:1,
120:17, 121:5
author
101:20
authored
101:3
authors
51:20, 65:15,
65:19, 68:17,
101:15, 104:1
availability
94:15
available
17:17, 39:5,
65:8, 66:15,
66:16, 111:11
avenue
2:6, 2:16
avoided
112:2, 113:7
award
26:21
awarded
18:15, 107:19
aware
11:1, 13:19,
19:12, 22:9,
22:12, 22:20,
23:6, 23:19,
102:1, 111:17
away
103:4, 103:5

B

back
23:8, 24:15,
25:15, 31:7,
41:18, 53:18,
53:19, 80:16,
83:14, 96:13,
113:20
background
4:19, 10:16,
40:4, 42:21,
46:8, 53:15,
69:7, 74:3,
74:9, 78:1,
80:20, 81:1
based
10:16, 12:18,
12:21, 13:14,
13:21, 14:10,
26:1, 32:14,
46:5, 52:10,
58:6, 61:7,
97:3, 106:13,
107:15, 115:9
basic
54:2
basis
10:5, 70:5,
107:11, 117:22
bates
45:9, 45:10,
45:14, 56:12,
59:12, 62:22,
70:10, 81:5,
114:13
became
16:18, 95:22
because
9:18, 13:19,
20:16, 21:1,
29:11, 33:3,
33:5, 34:11,
35:3, 40:8,
42:21, 44:13,
44:19, 48:13,
55:20, 55:21,
55:22, 60:18,
61:19, 66:4,
67:4, 70:11,
85:15, 86:13,
92:14, 93:11,
94:14, 95:1,
95:3, 95:17,
102:3, 104:10,
104:20, 106:2,
106:13, 107:5,
111:16, 112:10,
117:4, 117:5,
118:20
become
99:1
becoming
110:3
been
18:4, 46:22,
56:9, 58:10,
65:6, 65:7,
68:20, 74:7,
74:14, 75:9,
78:12, 78:14,
79:17, 79:20,
80:3, 81:11,
88:3, 88:4,
92:19, 102:1,
106:17, 110:19,
117:15, 117:17
before
1:3, 8:9, 17:6,
18:4, 33:13,
57:10, 65:6,
66:15, 71:4,
95:17, 95:19,
96:3, 111:8,
120:8, 120:9
beforehand
11:2
began
95:16
begin
71:8, 71:14
beginning
81:9
begins
59:4, 63:5
behalf
2:2, 2:11, 3:1
being
6:4, 9:4, 16:6,
16:17, 22:2,
42:22, 44:9,
47:13, 52:4,
68:5, 72:19,
79:5, 79:13,
106:14, 110:21,
111:7, 112:9,
112:18, 115:14,
117:9, 118:17
belief
30:16
believe
13:20, 27:12,
28:6, 28:10,
28:22, 30:19,
42:4, 58:5,
88:5, 111:19
believed
51:20, 51:21
believes
42:13
believing
117:22

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 125 of 158

bell
47:10
below
103:12
benefit
75:2, 75:17
besides
47:12, 93:5
best
113:1, 116:20
betacoronavirus
68:13, 87:12, 90:6, 90:9, 90:11, 90:16, 90:19, 90:20, 90:22, 91:3, 91:5, 91:7, 91:15, 116:1
betacoronaviruses
68:14, 88:11, 88:16, 88:19, 88:20, 89:1, 91:22, 92:4
better
53:14, 86:19, 86:20, 112:17
between
47:14, 47:21, 99:19
beyond
17:2, 17:11, 85:2, 112:16
bigger
107:12
biologic
82:9
biological
105:10
biologics
20:17, 32:18
biontech
1:5, 2:2, 3:17
bit
19:15, 23:11, 23:12, 43:8, 60:17, 95:5, 109:7
blaming
102:6
blood
120:20
board
1:3, 38:8
bold
114:19
boston
1:21, 3:7
both
8:2, 8:6, 8:8, 8:13, 34:22, 87:19, 96:6
bottom
63:4, 67:6, 98:9
breadth
79:16
break
45:21, 56:3, 96:11, 108:11, 113:20
briefing
9:22
bring
16:3, 23:16
bringing
25:14
broad
26:14
broader
50:15, 50:19, 79:6, 109:3
broadly
64:14, 65:21
brochure
37:20, 40:10, 41:12, 41:15, 42:15, 42:17, 53:10, 53:12, 75:2, 75:6, 75:11, 75:12, 77:1, 77:12
brochures
21:19, 21:22, 74:2, 76:12
brock
1:26, 120:3, 121:11
brother
19:2, 19:3
building
2:5
built
113:11

C

called
43:13
callen
47:5, 47:16, 48:1, 48:2, 48:7, 48:18, 49:7, 49:13, 50:11, 51:9, 51:17, 51:19, 52:11, 52:20, 52:21, 53:1, 54:15, 55:4
came
9:2, 25:15, 94:3, 111:8
camels
94:6
can't
10:9, 12:3, 12:10, 13:7, 13:13, 13:17, 14:9, 21:13, 24:20, 28:20, 44:7, 46:5, 50:17, 106:13, 106:16, 109:9
candidate
67:7, 75:3
candor
19:19, 20:4
cannot
88:22
capacity
105:10
careful
36:18
carefully
73:18
carry
73:21
case
1:11, 1:14, 18:5, 18:8, 19:10, 19:13, 27:14, 30:7, 67:17, 68:11
cases
86:22
cast
66:17
catch
52:15
category
61:3
cationic
81:13
caught
31:5
cause
36:13, 95:20
cells
112:6
cellular
107:6, 107:8
certain
15:11, 46:6
certainly
13:19, 16:3, 18:10, 20:4, 21:7, 24:21, 30:20, 33:13, 37:9, 74:17, 86:15, 93:12, 107:4, 113:11, 116:16
certainty
37:11
certificate
120:1
certified
120:3
certify
120:5, 120:11, 120:14, 120:19
challenged
87:22, 88:3, 88:4
chance
117:22

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 126 of 158

change
42:15
changing
97:4
chapter
10:1
characteristics
84:19, 85:15, 85:20, 86:8
characterize
72:2
check
6:18
checked
12:9, 13:10
chemical
104:12
chikungunya
49:19
choice
41:7, 42:7, 42:11, 52:1
choose
34:6
chose
65:19, 102:12, 109:8
circumstance
92:15
citation
108:1, 108:3
citations
20:13, 21:4, 37:14, 38:19, 103:21, 108:17, 108:19, 109:10, 109:15, 111:8
cite
11:19, 40:2, 49:12, 55:20, 59:12, 62:14, 64:14, 64:22, 65:20, 65:21, 97:9, 102:7, 102:12, 104:18, 106:8, 109:8, 109:10, 109:16
cited
12:10, 13:10, 14:6, 31:15, 35:7, 35:13, 35:17, 37:4, 37:14, 41:20, 48:18, 48:20, 49:17, 50:6, 52:3, 60:8, 60:12, 60:13, 61:9, 61:17, 61:18, 61:19, 69:20, 72:15, 72:19, 74:13, 77:13, 78:11, 78:14, 81:18, 82:15, 82:21, 100:17, 102:3, 102:16, 102:21, 102:22, 108:21, 110:11, 112:9
cites
49:18, 63:16, 74:12, 103:19
citing
66:2, 66:3, 101:21, 102:8, 104:6, 104:10
claim
89:22, 90:1, 90:20
claimed
25:22, 26:3, 26:9, 28:2, 28:7, 28:18, 30:1, 84:7, 84:19, 85:12, 85:16, 86:9, 87:5, 87:13, 87:14, 88:6, 110:4
claims
84:14, 85:7, 87:16, 87:20, 87:22, 88:2, 88:4, 89:11, 90:8, 90:10, 90:12, 90:16
clarify
83:10
clean
6:16
clear
69:4, 102:20, 104:14, 109:5, 109:12, 111:16, 117:11
clearly
86:6, 104:15
cleavage
107:5
cleaved
107:13
clinic
78:21
clinical
20:2, 21:5, 22:3, 22:5, 23:22, 31:13, 32:1, 34:13, 36:5, 36:22, 37:8, 37:18, 38:1, 38:4, 38:6, 38:21, 39:19, 50:3, 53:7, 53:17, 57:19, 63:8, 66:21, 69:7, 71:19, 73:13, 74:16, 76:12, 76:13, 76:17, 77:6, 77:9, 77:12, 114:21, 118:14, 119:3
clinician
74:3, 75:1
clinician's
77:4
clinicians
21:19, 74:9, 74:15, 76:21
closest
117:7
co-author
101:2, 101:13
coextensive
84:8
coformulated
117:9
column
90:3, 98:9, 98:21, 99:11
com
2:9, 2:19, 2:20, 2:21, 3:9, 3:10, 3:11
combination
26:4, 26:9, 26:16, 27:7, 27:16, 28:2, 28:7, 28:18, 30:2
combinations
26:16, 27:10, 27:19
come
27:8, 27:11, 31:7, 66:5, 76:9, 113:20
comes
33:15, 64:8, 78:4
comfortable
76:15
comirnaty
14:18, 87:20, 90:13
commenced
110:17
commencement
120:8
commencing
120:17
commensurate
84:13, 85:1, 86:14, 87:13, 87:21, 88:5, 107:14
comments
102:21
commercial
90:13
commercialized
93:19
commission
121:6
committee
9:22

commonwealth
120:4
community
94:19
companies
49:11
company
23:5, 23:7, 23:20, 49:10, 94:9
competitor
52:4, 53:11
complete
39:8, 39:16, 39:18, 40:1, 41:14, 42:18, 44:9, 80:14, 103:1, 106:17
completely
20:22, 29:10, 51:19, 64:16, 67:9, 67:10, 67:12, 93:4, 94:21, 101:21, 106:13
completeness
14:2
complex
47:11
complexation
47:16, 47:20
complexed
48:2
component
91:5
composition
91:10, 91:11
comprising
90:21
concept
43:12, 43:14, 43:16, 43:18, 43:19, 46:17, 46:20, 48:8, 48:16, 49:1, 49:3, 49:15, 50:9, 52:13, 55:15, 81:22, 117:19
concept-related
37:14
concern
36:12, 89:1, 105:22
concerned
17:4
concerning
107:11, 107:20
concerns
42:16, 98:14
conclude
107:16
concluded
119:9
conclusion
36:1, 60:2, 61:10, 61:17, 61:20
conditions
94:11
conduct
22:5, 66:19, 117:5
conducted
63:12, 68:22
conducting
66:21
confidence
79:17
confidential
16:7, 17:16, 17:17
configured
38:10
confirm
45:7, 108:18
confirmation
44:20, 59:11
confirmed
65:1, 109:14
connolly
2:12
conservative
49:11
consider
35:3
considerably
50:7
considered
9:1, 11:18, 14:22, 96:10, 103:8, 116:20
consultations
16:2
consulted
15:2
contemplate
51:17
context
15:17, 15:20, 16:1, 16:5, 26:16, 26:18, 27:2, 27:19, 27:20, 29:20, 30:5, 33:15, 34:16, 38:4, 39:6, 39:10, 40:6, 40:8, 41:16, 42:2, 43:10, 43:12, 43:20, 43:21, 47:19, 49:3, 49:12, 50:15, 50:19, 50:21, 51:7, 52:18, 53:16, 54:12, 55:15, 61:20, 66:21, 67:19, 68:8, 70:4, 74:11, 74:13, 75:6, 78:16, 80:4, 85:11, 86:12, 94:14, 111:5
continue
33:2, 33:18
continues
98:20
contributed
109:21
contribution
111:14
contributions
111:7
copy
6:12, 6:15, 6:16
corbett
64:22
corbett's
66:10, 70:22
coronavirus
15:21, 57:13, 59:17, 60:10, 60:16, 60:20, 63:9, 94:16, 94:17, 113:5, 115:8, 116:15, 117:20
coronaviruses
57:20, 94:20, 95:19
correct
6:14, 7:4, 7:10, 7:13, 7:16, 8:7, 8:11, 12:21, 13:5, 14:11, 14:12, 14:19, 17:14, 19:20, 21:17, 25:12, 28:4, 33:22, 41:6, 48:4, 49:8, 49:16, 54:10, 54:11, 59:10, 61:18, 62:21, 63:18, 63:22, 65:12, 69:9, 70:15, 73:8, 73:11, 73:22, 76:19, 79:11, 83:19, 89:7, 89:10, 90:10, 92:7, 92:8, 93:5, 98:11, 100:19, 103:2, 103:18, 103:20, 108:10, 114:10, 115:20, 118:7, 118:14
correspond
56:6, 89:18

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 128 of 158

corresponds
11:5, 11:6, 11:7, 45:3, 97:13
cotton
49:20, 81:16
could
27:1, 31:2, 32:22, 41:17, 43:19, 44:8, 50:10, 50:12, 53:16, 58:10, 58:12, 69:1, 69:3, 74:21, 86:5, 95:12, 96:15, 97:3, 98:3, 103:9, 111:22, 112:1, 112:2, 113:3, 114:12
counsel
19:4, 80:9, 83:10, 83:20, 115:15, 120:12
count
85:11, 85:12
countries
94:8
couple
65:6, 108:13, 114:2
course
9:6, 11:1, 15:13, 15:17, 39:18, 42:19, 44:8, 51:16, 52:2, 55:9, 64:11, 66:9, 69:19, 73:12, 74:5, 75:16, 75:20, 78:3, 85:21, 88:22, 92:14, 94:8, 95:6, 95:22, 99:18, 101:12, 102:5, 102:9, 102:21, 104:6, 105:12, 106:12, 116:2, 116:11, 116:22
court
86:20, 86:21
cover
7:6, 89:8, 90:12, 90:16, 90:18, 91:2, 91:15, 91:20
covid
14:17, 15:4, 15:7, 15:18, 15:20, 16:19, 17:3, 17:6, 17:8, 17:13, 30:13, 67:14, 89:8, 92:12, 93:2, 93:6, 93:9, 95:8, 96:3
covid-
92:20, 107:22
covid--related
16:22
create
82:18, 83:2
created
112:15
creating
29:9, 30:8
credit
113:12
critical
66:13, 119:2
critically
111:20
cross-referenced
6:21
crr
1:26, 121:11
curevac
52:5, 54:3, 54:14, 55:3
current
16:9, 19:7, 43:17
curtis
3:4
curtis@wilmerhale
3:10
customary
9:6
cutler
3:2, 120:16
cutting-edge
16:9
cynomolgus
49:21

D

dangerous
95:21
data
33:6, 36:3, 39:20, 50:14, 53:1, 53:3, 53:4, 65:7, 65:9, 66:7, 66:14, 66:16, 71:5, 78:2, 79:6, 104:2, 116:7, 116:12, 117:3, 117:4
database
107:1
date
64:17, 65:6, 101:18, 104:3, 115:18, 116:2
dated
46:13, 46:14, 100:22
dates
25:7, 70:19
day
7:18, 23:13, 64:18, 64:19, 65:4, 80:11, 121:5
days
65:6, 100:3
deal
45:21
dealing
22:17
decade
98:21, 99:14, 99:15, 99:17, 99:18, 100:2, 100:7, 102:4
decide
32:13, 75:14, 94:9
decided
74:20
decides
32:7, 33:1
decision
33:17, 39:21, 76:13, 76:20
decisions
16:10, 16:12
declaration
4:12, 6:12, 7:2, 7:5, 8:2, 8:5, 8:17, 9:1, 9:10, 10:17, 10:18, 11:20, 11:21, 12:3, 12:5, 12:11, 12:18, 12:20, 13:5, 13:15, 13:16, 13:21, 14:7, 14:10, 14:15, 14:22, 15:9, 17:19, 24:10, 24:14, 25:10, 25:16, 29:11, 31:4, 40:21, 47:4, 54:17, 54:18, 58:4, 58:13, 62:10, 62:19, 65:1, 66:11, 69:4, 71:11, 73:16, 82:3, 83:14, 87:19, 92:2, 96:16
declarations
9:7
define
34:6
defined
33:16, 34:7, 34:18
degradation
107:8

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 129 of 158

degree
23:1, 96:2
delay
79:3, 79:4
delivered
54:4, 55:5, 71:16, 72:4, 72:22, 73:7, 73:10, 106:4
delivery
57:16, 59:19, 60:14, 60:22, 98:16, 115:10, 117:1
demonstrated
55:22, 57:13, 57:21, 59:16, 60:19, 68:5, 115:8
demonstrating
60:15, 66:11
demonstration
94:16
deoxyribonucleic
57:15, 59:19, 60:21, 115:10
deposition
1:20, 4:11, 80:17, 97:13, 119:9, 120:7, 120:8, 120:9, 120:13, 120:14
deputy
19:4
describe
28:14, 75:22, 112:21
described
75:18, 93:21, 110:14, 116:5
describes
111:13, 111:14
describing
81:12, 118:16
deservedly
113:12
deserving
111:19
designed
36:22, 68:22
desirable
26:4, 26:9, 28:2, 28:7, 28:18, 29:4, 29:7, 29:15, 30:2, 30:6, 30:13, 30:15, 30:22, 31:1
determination
40:12, 41:11
determinations
21:9
determine
36:4, 51:1, 111:3
determined
32:22, 41:21, 48:22, 49:2
determining
70:5
develop
36:3, 94:10
developed
49:18, 52:4, 93:21, 115:3
developing
32:6, 32:7, 33:2, 94:2, 94:22, 98:13, 116:10, 117:7
development
32:12, 33:18, 34:11, 34:17, 35:20, 36:1, 36:8, 37:12, 43:18, 43:21, 64:3, 78:20, 92:19, 93:2, 94:12, 99:2, 107:21, 109:12
dictates
16:15
different
8:4, 12:10, 33:12, 35:1, 35:4, 35:5, 39:3, 39:14, 45:14, 47:4, 51:19, 52:5, 54:22, 58:22, 64:16, 66:2, 66:4, 67:10, 67:12, 76:9, 82:9, 86:2, 95:5
difficult
9:18, 60:17, 106:12
direct
76:8, 82:13, 84:18, 85:13, 85:20
directly
12:2, 13:6, 16:17, 60:13, 69:1, 111:2, 118:8
disappeared
9:19, 96:9
disclosed
23:3
discoveries
107:20, 111:20
discuss
47:4, 47:9, 58:4, 63:12, 67:7, 82:5, 92:18
discussed
50:8, 74:1
discussing
33:13, 54:15, 67:2
discussion
57:11, 79:12
disease
15:20, 23:2, 23:12, 68:16, 68:19, 69:2, 81:14, 113:8
diseases
95:21
dissimilar
77:14, 79:13
distinctions
47:14, 47:21
dmid
62:11, 64:2, 64:4, 64:6, 64:8, 67:1, 69:20, 74:11, 74:20, 78:12, 114:9
dna
57:15, 57:21, 59:19, 60:9, 60:14, 61:3, 61:6, 61:8, 63:13, 63:19, 66:2, 67:2, 67:7, 68:17, 69:21, 70:9, 70:10, 71:14, 72:2, 72:9, 72:11, 72:14, 72:16, 72:21, 73:6, 73:9, 77:13, 79:8, 79:12, 82:17, 83:2, 97:6, 115:10, 118:6, 118:9, 118:13, 118:20
dna-based
98:17
doctor
7:3, 45:4, 46:1, 96:13, 97:16, 108:13, 118:6
document
4:19, 5:1, 5:4, 10:6, 44:16, 45:6, 45:7, 45:12, 46:1, 46:4, 46:9, 49:4, 52:13, 55:2, 55:10, 61:20, 64:18, 64:20, 65:5, 65:8, 67:20, 68:6, 68:8, 69:15, 70:5, 77:16, 79:15,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 130 of 158

79:16, 80:19, 80:20, 81:1, 81:6, 82:6, 114:7, 115:18
documents 9:22, 10:12, 10:14, 10:15, 13:20, 13:22, 15:12, 15:15, 16:7, 17:16, 20:13, 21:4, 24:7, 24:21, 25:6, 25:13, 38:18, 38:22, 40:1, 55:1, 58:3, 64:14, 65:21, 67:5, 70:4, 75:8, 77:22
doing 42:5, 42:9, 53:11, 78:9, 96:5, 106:11
done 17:4, 32:10, 50:5, 54:13, 67:4, 78:11, 83:6, 92:22, 95:6, 109:6, 115:22, 117:13, 117:16, 118:21
dorr 3:2, 120:16
double-check 11:21
doubt 25:1
down 33:15, 62:13, 77:22, 100:11, 100:12
down-modulated 100:13
downstream 34:10, 34:21
dr 6:9, 11:13, 44:22, 56:10, 62:3, 64:22, 66:10, 70:22, 107:19, 108:20, 114:2
drafted 64:19, 65:5
drafting 65:8
draw 47:14, 47:21
drawing 104:2
drew 101:1, 101:12, 101:19, 102:6, 103:7, 105:3, 111:17
dromedary 94:6
drug 69:13, 70:7
drug's 76:16
drugs 31:12
duly 6:4, 120:7
during 19:15, 19:18, 20:18, 43:2, 89:9, 92:12, 99:18

E

each 45:15
earlier 99:13
earliest 111:13
early 34:11, 34:12, 64:3, 66:4, 70:20, 74:6, 98:1, 98:4
easier 10:22, 97:7
ebola 49:19
edition 99:12
educate 41:22, 42:1
effect 52:21, 76:17
effective 20:14, 30:18, 30:21, 32:1, 32:15, 32:19, 32:20, 32:21, 33:8, 37:1, 37:3, 37:7, 37:17, 37:22, 43:16, 51:11, 67:14, 70:1, 70:3, 70:8, 107:22, 112:12
effector 112:6
efficacy 20:18, 31:13, 32:4, 32:16, 33:2, 33:11, 33:12, 36:13, 38:17, 68:4, 69:12, 70:6, 70:13, 103:13
eight 62:13
either 31:13, 35:3, 68:15, 68:17, 81:13
else 26:12, 53:14
embodies 84:7
embody 87:13, 87:20
emerge 88:20, 89:1
emerging 97:4
emphasizing 105:13
employed 120:21
enabled 93:1, 99:1, 107:21
encoded 72:12
encoding 71:17, 72:5, 72:22, 73:7, 90:6, 90:22, 98:2
encompassed 116:3
end 20:16, 80:9, 83:10, 94:8, 100:20
ended 79:8, 95:8
ending 46:15, 59:12, 62:22, 70:10, 81:5
endogenous 54:5, 55:6
ends 114:13
engineered 104:11
enhanced 15:19, 23:2, 68:16, 68:19, 69:2, 113:8
enough 21:3, 25:4, 39:9, 44:15, 69:14, 91:4, 101:3, 101:14, 108:5, 112:5
enrolled 76:3
enter 31:12, 36:16, 36:19, 76:13, 76:20
entering 36:8
enters 34:12

entire
9:9, 119:7
entities
41:11
entitled
114:20
entity
43:3
enzymes
107:6, 107:8
era
5:7
eradicated
94:21
err
44:9, 44:12
especially
43:2, 43:4,
66:18, 74:5,
77:22, 103:7
esq
2:4, 2:13,
2:14, 2:15, 3:3,
3:4, 3:5, 3:14,
3:16
essence
36:14
essential
23:9
essentially
58:20, 109:2
establish
76:15
et
47:5, 63:16,
81:19, 97:10,
101:4, 101:10
ethics
21:21, 22:2,
38:9
europe
50:4
evaluate
34:10, 69:15,
71:8, 92:15
evaluated
68:19, 76:18
evaluates
32:18, 73:18
evaluating
29:2, 75:2
evaluation
14:17, 25:14,
34:15, 38:8
evaluations
76:4
even
37:12, 43:8,
43:11, 43:19,
52:15, 74:12,
87:2, 94:22,
95:17, 95:19,
95:22, 96:1,
96:3, 112:17,
116:17, 117:17
events
69:15
ever
18:4
every
39:20, 40:2
everybody
53:14
everything
103:1
evidence
72:13, 77:13,
84:14, 87:21,
93:12
evolution
78:16
exact
86:22, 87:1,
96:10, 108:1,
108:3, 112:7
exactly
24:20, 26:6,
54:21, 86:20,
87:17, 88:4,
105:16, 108:2
examination
4:3, 6:7,
113:22, 118:4
examined
6:6
examiner
27:13
example
9:20, 10:12,
23:4, 41:12,
80:2, 89:8,
92:22, 112:21
examples
106:6, 116:13
except
9:19
excerpt
58:8, 58:9
excerpted
45:11, 114:11
excerpts
4:18
exclude
80:3
excuse
105:8
execute
76:2
exemplified
88:13, 92:6
exhibit
4:12, 4:14,
4:16, 4:17,
4:18, 5:1, 5:4,
5:6, 5:7, 6:21,
7:1, 11:4, 11:5,
11:6, 11:7,
11:8, 11:9,
11:10, 11:11,
11:16, 11:19,
12:18, 12:22,
13:1, 13:14,
14:1, 14:2,
14:11, 44:17,
44:18, 45:3,
45:6, 45:20,
46:2, 48:6,
56:5, 56:6,
56:8, 56:9,
56:16, 58:17,
59:3, 59:9,
59:12, 61:22,
62:1, 62:2,
62:3, 62:6,
62:10, 62:14,
62:17, 62:19,
63:2, 70:9,
80:16, 89:14,
89:15, 89:16,
89:18, 89:19,
97:9, 97:12,
97:14, 97:15,
98:8, 108:14,
114:5
exhibits
4:11, 11:3,
11:12
exist
94:12
existed
66:7, 95:17,
96:2
existing
65:22
exogenously
54:4, 55:4,
71:16, 72:4,
72:22, 73:7,
73:9, 82:16,
83:1, 106:4
expect
20:10, 52:17
expectation
19:19, 21:16,
22:16, 25:22,
26:2, 26:7,
26:13, 27:22,
28:5, 28:11,
28:16, 29:21,
29:22, 30:6,
30:16, 37:6,
37:16, 38:13,
38:16, 39:15,
39:17, 71:20,
80:1
expected
26:3, 26:8,
28:1, 30:1, 43:8
expecting
23:7, 31:21
expects
20:8, 31:17,
33:20, 76:21,

77:2
experience
15:2, 15:14, 16:3, 16:21, 17:1, 17:13, 18:9, 18:12, 22:19, 43:5, 63:8, 74:16, 74:18, 78:4
experiments
54:12, 98:1
expert
16:18, 18:4, 26:19, 28:12
expertise
10:15
expires
121:6
explain
40:5, 72:8, 77:5, 77:9, 88:10, 103:4, 109:9
explained
31:11, 68:6
explaining
103:5
exposure
94:5
express
17:18, 60:10, 72:12, 91:20, 106:1
expressed
63:20, 66:12, 98:3, 106:3, 106:6, 106:14, 106:20, 116:15
expressing
29:8, 63:13, 67:7, 118:22
expression
30:8
extent
91:22
eyes
24:22

F

face
103:10
fact
10:21, 16:5, 50:19, 51:18, 55:14, 64:11, 67:11, 68:14, 70:16, 74:12, 94:11, 94:13, 94:21, 96:8, 102:12, 105:13
fail
31:13, 33:1, 36:11, 86:17
failure
33:15, 96:19
fair
21:3, 25:4, 91:4, 101:3, 101:14, 102:14, 107:16, 108:5
fairly
20:19, 75:18, 78:2, 109:21
faithfully
76:2
familiar
18:7, 77:4, 77:8
far
17:3, 30:3, 119:1
fda
9:21, 10:6, 10:11, 10:14, 15:3, 15:13, 15:14, 16:1, 16:6, 16:8, 16:13, 16:21, 17:1, 17:21, 19:16, 19:18, 19:22, 20:4, 20:5, 20:8, 20:9, 20:10, 20:12, 20:20, 21:3, 21:7, 21:11, 21:13, 22:11, 22:13, 22:18, 23:3, 23:4, 23:8, 23:14, 23:16, 23:18, 23:20, 24:11, 24:14, 24:19, 24:22, 25:3, 25:15, 31:17, 32:5, 32:17, 32:22, 33:14, 33:20, 34:2, 34:9, 34:19, 36:18, 38:21, 39:6, 39:13, 41:10, 41:22, 42:2, 42:13, 42:14, 42:21, 43:22, 44:8, 49:5, 49:8, 50:13, 73:18, 76:21, 77:2, 82:5, 82:6
fda's
9:16, 23:6, 23:19, 34:6, 34:15
feasible
92:15, 94:17
features
84:7, 85:12, 87:5, 110:20
february
17:10, 64:17, 65:3, 65:7, 70:17, 70:18, 71:3, 115:19, 115:21
feels
41:17
felt
64:13
ferrets
49:21, 81:15
few
17:5, 94:8
fewer
105:15
field
10:15, 18:18, 50:20, 51:1, 98:16, 102:11, 102:14, 106:1, 109:7, 111:7
fields
99:2
fight
53:13
figure
91:14, 112:12
figured
112:19
finalized
64:20
financially
121:1
find
9:18, 10:19, 10:22, 12:10, 42:5, 66:17, 106:15, 111:13
finding
57:2, 93:13
findings
110:2, 110:5, 113:10, 113:11
fine
45:9
firm
9:7
first
6:4, 7:17, 55:14, 63:5, 64:5, 66:5, 77:20, 78:2, 98:9, 99:10, 103:16, 103:17
first-in-human
71:7, 79:20
fisher
2:13, 4:4, 4:6, 6:8, 6:20, 44:16, 45:10, 56:3, 56:5, 61:22, 73:3, 77:17, 89:14, 96:11, 108:11, 113:17, 118:5, 119:5
fits
43:11

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358

five
12:10
flip
80:22
flux
87:2
focus
63:5, 72:1, 92:11
focused
35:19, 97:6
focusing
114:16
follow
19:16
following
32:1, 37:7, 37:18, 40:14
follows
6:6, 55:16
foregone
36:1
foreshadowed
27:16
foreshadows
110:8
forget
43:13
form
24:17, 30:10, 48:10, 51:5, 51:12, 60:11, 61:13, 65:17, 67:15, 77:19
formal
83:17
formatting
9:10
forming
15:7
formulated
81:13, 91:21
formulating
24:9, 24:13, 51:20, 51:21, 91:1
formulation
113:6
formulations
54:8
forth
120:7
forward
21:5, 76:16
found
54:9, 63:20, 65:15, 68:17, 78:13
foundation
102:14
four
12:10, 52:14
four-paragraph
52:12
frame
17:2, 17:12, 90:5, 90:22, 117:9
frames
91:21
front
6:13, 7:2, 11:12, 13:1, 14:3, 45:4, 62:3, 70:18, 89:16, 90:1, 108:4
full
9:8, 30:20, 43:10, 81:8, 117:8
fully
111:19
fulsome
42:21
functions
47:12
further
32:15, 68:9, 84:11, 100:14, 113:19, 118:2, 118:4, 119:5, 120:11, 120:14, 120:19
furthermore
25:17, 25:21, 88:9, 105:21
future
88:21, 89:2, 95:2, 95:4

G

gained
17:12
gather
33:5
geall
13:3, 81:19, 82:7, 82:20
gene
112:18
general
15:21, 19:4, 74:22, 82:16, 82:22, 100:4, 100:6, 107:15
generally
15:3, 18:11, 18:16, 44:3, 71:16, 72:4, 74:3, 74:9, 77:17, 108:8
generate
56:21, 57:7, 60:3, 60:6, 61:11
generated
117:4
genetic
97:5
germane
12:2
getting
52:19, 79:4
give
80:14, 82:16, 83:1
given
34:15, 39:19, 68:21, 120:10
giving
72:16, 80:13
glancingly
12:5, 13:7
global
94:19, 95:12, 95:18
globally
94:12
gmp
71:1
go
8:19, 14:20, 23:7, 26:2, 35:22, 36:2, 36:10, 41:18, 43:8, 53:18, 68:9, 70:2, 71:19, 73:5, 80:11, 81:5, 83:14, 84:11, 106:6, 106:18
goal
21:1
goals
35:5, 51:7
goes
16:12, 45:18, 63:12, 67:6, 73:12, 100:10, 103:11
going
6:11, 11:3, 11:15, 12:6, 33:6, 36:9, 43:5, 43:15, 44:17, 56:5, 56:12, 61:22, 66:19, 80:11, 83:9, 94:10, 97:12, 112:12, 113:20
good
6:9, 6:10, 8:1, 22:3
google
10:22
gosh
25:8
government
117:21
gradually
36:3

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 134 of 158

graph
66:10
great
113:12
greater
53:4, 107:17
greatest
93:12
green
49:21
gruber
10:3
guarantee
31:16, 33:19, 35:14, 35:17, 36:9, 36:17, 36:20, 37:2
guess
18:20, 20:15, 25:4, 26:14, 40:7, 41:2, 52:15, 52:19, 61:14, 65:4, 75:15
guidance
9:17

H

h7n9
50:2
hale
3:2, 120:16
halfway
15:1, 59:7
hand
9:5, 11:3, 121:5
handed
114:5
happen
11:18, 95:4
happened
95:1, 95:4, 113:15
happens
32:5, 102:8
happy
12:6
hard
93:13, 93:16
hartsmith
2:15
hastings
2:3
health
94:19, 96:9
heard
34:3, 38:15, 41:2
heavily
117:3
hekele's
82:8
help
62:11, 71:15, 72:3, 95:12
helps
16:21
here
8:8, 9:12, 13:13, 14:9, 29:2, 29:3, 43:20, 45:14, 46:5, 50:5, 50:18, 52:3, 52:18, 55:10, 60:13, 62:12, 64:15, 64:17, 66:1, 69:5, 72:15, 73:12, 76:10, 79:10, 83:21, 85:2, 86:13, 87:2, 87:3, 87:4, 112:9, 118:17
here's
118:15
hereby
120:5
hereinbefore
120:7
hereunto
121:4
high
94:6, 98:15, 112:21, 116:17
highly
103:14, 104:4, 104:20
himself
105:3
hn8
50:2
hope
32:9, 33:8
hormone
98:3
hours
119:10
house
45:1
however
34:6, 34:7, 49:17
human
37:7, 37:18, 88:19, 89:1
humans
20:2
hung
52:16

I

idea
29:14, 79:19, 82:16, 82:22
ideas
27:9
identical
8:2
identification
7:1, 11:9, 11:10, 11:11, 44:18, 56:8, 62:2, 89:15, 97:15
identified
9:14, 10:8, 10:10, 10:11, 10:13, 10:15, 55:19, 114:6
identify
14:9, 22:11, 22:19
ignored
111:7
ignoring
110:8
iii
3:16, 32:17
illusion
36:17
imagine
53:10
immune
29:9, 30:8, 51:2, 55:18, 56:21, 57:7, 60:3, 60:6, 61:11, 72:14, 82:18, 83:3, 105:15, 112:1, 112:6, 112:11, 113:7
immunity
54:7, 55:8, 56:2
immunogenic
57:14, 57:22, 59:17, 60:20, 63:21, 71:17, 72:5, 73:1, 73:8, 105:5, 110:4, 112:20, 115:9, 116:17
immunogenicity
65:2, 98:15, 100:13
impacts
67:12
implying
61:6
important
22:19, 23:15, 44:6, 48:14, 50:21, 55:20, 64:13, 77:5, 77:9, 102:11, 109:11, 111:20, 117:19
improvements
112:18

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 135 of 158

inc
1:5, 1:8, 2:11, 3:14, 3:15, 3:17, 46:8, 59:5, 115:3, 120:12
include
17:4, 26:13, 28:6, 28:17, 39:20, 41:4, 41:8, 42:8, 44:15, 65:9, 66:18, 67:2, 67:3, 67:22, 68:2, 74:20, 88:18, 90:20, 99:18, 116:7, 118:20
included
44:5, 51:4, 60:1, 70:9, 70:11, 79:21, 81:21, 109:17, 111:9
includes
26:3, 26:8, 27:3, 28:1, 29:11, 29:22, 73:14
including
10:8, 14:18, 15:2, 21:21, 25:10, 31:12, 38:18, 44:13, 50:19, 57:15, 59:18, 60:21, 61:2, 61:5, 61:8, 75:7, 75:8, 99:18, 115:9, 116:19, 117:8, 117:9
inclusion
117:17
incorporate
105:13
incorporation
105:4
increase
100:14
increased
101:16, 105:9, 112:1, 112:5
increases
107:13
ind
19:16, 19:18, 20:1, 20:16, 20:17, 20:19, 20:22, 21:2, 21:6, 22:9, 37:15
indeed
9:9, 14:4, 68:12, 78:11, 95:4
independent
64:11
indicate
8:13, 31:17, 54:4, 55:4
indicating
63:19
indicia
29:12, 84:2, 84:6, 84:13, 84:17, 85:6, 85:8, 85:14, 86:7, 86:11, 87:5, 87:8, 87:11, 87:21, 92:11, 92:16, 92:18, 93:20
individual
21:1
induce
51:2, 81:14, 82:18, 83:2
induced
55:18
induction
56:2
industry
9:17, 20:7
inefficient
98:16
inexpensive
110:1
infected
68:21
infection
46:22, 116:21
infections
50:2, 95:2
influenza
46:22, 49:19, 50:2, 74:14, 81:15, 110:18
inform
16:21, 41:16
information
15:6, 16:14, 16:16, 17:17, 21:8, 23:5, 23:15, 23:19, 23:20, 24:1, 24:3, 24:5, 24:6, 28:12, 31:14, 35:7, 35:13, 35:16, 37:4, 37:14, 37:19, 38:2, 38:11, 39:5, 39:9, 40:10, 40:11, 41:14, 41:19, 42:5, 42:8, 42:10, 42:12, 42:13, 43:1, 44:6, 49:9, 49:11, 49:12, 49:18, 50:7, 50:16, 53:5, 53:15, 54:3, 65:22, 66:2, 66:3, 66:6, 66:17, 66:20, 67:18, 67:22, 68:2, 68:8, 68:13, 69:20, 71:15, 72:3, 74:21, 75:6, 75:9, 75:14, 76:22, 79:2, 79:19, 80:1, 101:14, 101:17, 109:4, 111:11, 117:18
informative
76:7
informed
13:18, 16:13, 22:5
informed-consent
75:8
inherent
100:12, 107:10
inherently
107:4
initial
78:20
initially
97:5
initiate
32:8, 32:12
initiated
71:2, 74:14
initiating
71:7
initiation
79:3
innate
98:15, 112:1
innovation
98:22, 100:8
instability
98:15, 107:10, 107:17
instance
9:16, 34:12, 77:11, 91:9, 93:2, 93:14, 94:18
instead
98:16
institutional
38:8
insufficient
42:13
intact
54:6, 55:6, 55:18
intellectual
13:4, 19:5
intended
29:17, 40:1,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358

69:11, 72:12, 89:18
interest 94:22, 101:21, 102:9
interested 121:1
interesting 70:16
internal 114:13
internet 9:19
interpret 15:16, 85:18, 117:2
interpretation 25:11
interpreted 24:15, 91:18
interpreting 85:22
interspersed 64:9
introducing 54:8
invention 26:1, 27:11, 27:16, 29:14, 29:16, 84:19, 85:7, 85:10, 85:12, 85:16, 86:9, 87:6, 88:10, 92:3, 110:9
inventions 26:17, 27:10, 87:13, 87:14, 88:6
inventor 18:14
inventors 27:8
invest 33:17
investigate 82:10
investigating 69:12, 70:6, 70:13, 117:13
investigator 21:18, 23:22, 24:2, 24:4, 24:6, 24:8, 37:20, 38:3, 39:4, 39:5, 39:9, 39:10, 39:12, 40:5, 40:10, 41:12, 41:15, 42:3, 42:4, 42:9, 42:15, 42:16, 43:1, 43:10, 50:21, 53:10, 53:12, 53:15, 69:13, 74:2, 75:2, 75:5, 75:11, 75:12, 75:14, 75:15, 76:15, 77:1, 77:8, 77:11, 82:14
investigator's 74:2, 76:11
investigators 22:4, 31:14, 35:12, 38:21, 43:4, 66:19, 73:20, 77:2, 79:5, 82:6
investment 98:13, 98:22, 100:8
involved 14:16, 15:22, 16:17, 21:21, 24:11, 60:15, 72:11, 102:8
involves 7:11, 7:14, 65:11
involving 63:13
ipr 1:11, 1:14, 7:8, 7:9, 7:11, 7:14
irb 38:7, 41:10, 41:16, 41:17, 41:22, 42:15, 75:16
irp 6:12, 6:21, 9:3, 11:6, 56:7, 62:1, 89:19
irps 114:6
irrelevant 42:14, 44:2
irresponsible 42:22, 80:3
issue 15:22, 21:21, 22:2
issued 68:12, 116:6
issues 9:5, 15:19, 29:3, 29:12
itself 9:3, 112:3, 117:3

J

jacob 3:14
january 17:5, 17:9, 17:11, 71:1, 71:2, 99:8, 110:16
job 1:24, 19:7
jump 54:19
jumps 45:19
june 9:17

K

kariko 100:22, 101:1, 101:3, 101:10, 107:19, 111:18, 112:17, 113:11
katalin 111:18
keep 80:13
kelli 3:15
kevin 3:3, 3:9
kind 27:20, 43:2, 66:6, 66:14, 78:10, 94:17, 106:12, 112:5, 116:22
kinds 9:6, 15:14, 16:12, 16:14, 16:20, 53:13, 65:20, 67:4, 95:21, 113:7
knew 17:5
know 11:18, 11:22, 12:8, 17:9, 19:7, 22:13, 23:5, 23:14, 23:21, 31:5, 34:11, 43:19, 51:15, 77:16, 86:21, 88:3, 88:16, 91:13, 97:16, 108:1, 119:3
knowledge 6:17, 16:11, 49:5, 107:15, 118:8
known 88:17, 90:17, 107:4, 110:14, 110:19
knows 23:8
krause 1:20, 4:3,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 137 of 158

4:11, 4:12, 6:3, 6:9, 6:21, 7:3, 11:4, 11:5, 11:6, 11:7, 11:13, 11:16, 11:19, 13:1, 14:2, 14:15, 19:2, 19:3, 19:4, 19:9, 56:10, 62:4, 114:2, 120:6, 120:15

L

lacking 41:17
laid 51:7, 83:21
language 24:21, 64:7, 64:9, 85:2, 85:21, 86:12, 86:18, 86:22
large 88:18, 104:12, 106:1
largely 98:14
larger 106:2, 106:7, 107:6, 107:17
last 34:3, 45:19, 54:1, 57:1, 63:1, 63:2, 81:5, 82:13, 94:1, 99:10, 99:17, 102:4
later 23:12, 68:20
law 9:7, 19:5, 26:20, 28:12, 83:18, 87:2, 87:3, 91:8
lawyer 21:13, 28:20, 28:21, 83:17, 85:17, 91:19
lawyers 85:22, 91:14
lead 27:11, 34:13, 98:12, 113:8
leading 14:16, 22:22
leap 100:4
least 48:6, 54:8, 56:1, 78:19, 92:21, 93:20, 106:11, 109:18, 110:7
leaving 42:22
led 110:3, 110:21, 116:17
left 50:10
legal 28:14, 83:16, 83:20, 85:21
length 117:8
lengthy 20:19
let's 14:1, 31:3, 43:13, 108:11
level 54:2
levels 112:22
licensable 37:3
license 20:17, 32:18, 34:22
licensed 34:14
likelihood 34:21, 40:13, 69:2, 107:12
likely 20:14, 35:1, 36:11, 51:22, 64:8, 78:3, 113:8
likewise 112:11
limitations 90:19
limited 58:9, 88:10, 89:5, 90:9, 90:10, 92:4
line 12:6, 99:10
lines 62:13, 100:11
lipid 52:10, 91:1, 91:21, 117:10
list 8:17, 8:20, 8:21, 9:8, 9:14, 12:12, 95:20, 96:7
listed 52:3
lists 7:5, 96:4
literature 10:8, 10:19, 78:6, 78:7, 78:10, 78:13, 79:17, 101:22, 106:18
litigation 45:9
little 19:15, 23:11, 23:12, 43:8, 60:17, 95:5, 99:13, 100:10
llp 2:3, 2:12, 3:2, 120:16
lnp-encapsulated 51:10
lnp-formulated 51:18
lnps 81:13
location 107:13
locations 107:7
long 52:14, 80:13, 91:6
long-felt 93:8, 93:14
look 31:3, 31:10, 44:4, 59:3, 62:9, 62:22, 64:21, 75:17, 82:2, 87:7, 88:7, 89:11, 89:22, 100:20, 102:10, 106:6, 106:21, 109:18
looked 25:13, 42:3, 106:20, 107:2, 111:2
looking 24:22, 25:3, 27:19, 28:15, 34:9, 34:20, 35:5, 39:7, 39:14, 54:16, 58:21, 75:5, 78:5, 100:3, 103:6, 103:12, 108:14
looks 27:15, 46:4, 54:17, 58:10, 65:1, 99:5, 99:12, 108:17
lot 22:18, 43:6, 65:22, 78:2, 94:22, 109:4
lots 26:19, 26:22, 86:21
lower 100:11
lunch 96:12

lung
116:20

M

machine
9:20
made
14:13, 20:6, 20:22, 39:21, 51:22, 83:7, 102:2, 111:20, 112:4, 112:17
main
15:10
maine
2:16
maintains
9:8, 96:4
major
12:2, 12:20, 15:22, 98:22, 100:7
majority
31:12
make
10:18, 12:2, 16:13, 22:4, 33:16, 36:5, 36:18, 37:12, 38:3, 39:4, 39:7, 40:18, 41:11, 69:13, 75:17, 103:13, 104:4, 105:17, 109:20, 111:22, 112:3, 112:19
makes
9:9, 41:7, 42:7, 42:11
making
16:12, 20:1, 21:8, 21:10, 40:15, 83:12, 102:9, 104:3, 104:19
manufacture
97:7
manufacturing
110:1
many
15:2, 20:5, 36:10, 43:4, 74:15, 88:16, 88:20
march
121:7
marion
10:3
mark
6:20, 11:4, 44:16, 56:5, 61:22, 89:14, 97:12, 119:7
marked
7:1, 11:9, 11:10, 11:11, 44:18, 56:8, 56:9, 62:2, 89:15, 97:15
market
32:10, 33:9, 94:3, 94:4, 94:7, 94:10, 94:11
marketed
92:12, 93:9
marking
6:11
marriage
120:21
marshall
10:4
martin
63:16, 65:16, 67:2, 68:1
massachusetts
1:21, 3:7, 120:5
material
1:18, 13:6, 21:21, 41:5, 41:6, 97:5
materials
8:22, 9:1, 11:17, 12:1, 21:11, 21:18, 24:11, 24:15, 28:15, 41:8, 76:14, 118:10
materials-considered
8:17, 8:20, 8:21, 9:13, 12:12
matter
17:22, 29:7, 91:5, 91:11, 91:18, 121:2
matters
15:3
maybe
58:12, 80:6, 89:10, 100:11, 104:22, 105:16
mean
17:10, 20:16, 30:22, 32:21, 43:14, 51:16, 67:11, 70:2, 86:15, 94:1, 99:17, 102:13, 102:22
meaning
15:11, 25:9, 86:22
means
33:1, 36:15, 37:11, 42:19, 85:2, 85:5, 85:13, 86:21
meant
72:8, 82:15, 82:21, 100:2
measured
31:2
medical
21:20, 22:2
medicine
107:19
meet
9:11, 33:9, 90:19
meeting
9:22, 46:8, 81:1
memory
90:8
mentioned
10:20, 17:15, 88:11, 92:4
mentioning
84:22
mers
67:8, 67:11, 68:3, 68:13, 68:18, 70:11, 92:18, 93:1, 93:20, 94:2, 94:15, 95:5, 95:7, 96:1, 96:6, 113:1, 116:9, 116:10, 116:16, 116:21
mers-cov
88:13, 89:5, 92:6, 93:13, 93:15
messenger
90:21, 115:4
mestitz
2:14
metapneumovirus
113:6
metlife
2:5
meuth
2:4
mice
49:20, 65:2, 81:15
michael
2:14
middle
115:6
midway
57:12
might
23:2, 24:4, 26:20, 27:11, 28:22, 33:7, 36:11, 36:13, 39:21, 39:22, 40:3, 42:15,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 139 of 158

43:5, 44:12, 50:13, 50:15, 50:20, 64:15, 65:7, 67:13, 67:14, 74:21, 88:20, 107:11, 107:12
mind
50:18, 54:21
minutes
119:10
mischaracterizes
73:2
misstatements
21:11
mistaken
59:2
mixed
70:19
mmestitz@wc
2:20
mod
4:20, 5:1, 5:4, 45:11, 56:13
modality
66:2, 67:10
model
113:1, 116:20, 116:21
models
47:1
moderna
6:22, 24:10, 45:4, 45:5, 46:7, 50:5, 50:10, 50:18, 50:22, 51:3, 51:6, 52:6, 52:8, 53:3, 54:3, 55:16, 62:7, 64:3, 64:10, 65:1, 65:9, 65:13, 66:5, 68:11, 70:13, 71:8, 72:20, 74:12, 77:12, 77:20, 78:22, 81:2, 82:10, 92:22, 93:21, 94:2, 94:9, 98:8, 102:2, 109:6, 110:5, 110:11, 110:16, 111:3, 111:6, 112:14, 113:9, 114:6, 115:22, 117:3, 117:13, 117:16, 118:6, 118:8
moderna's
47:15, 47:22, 48:5, 52:4, 63:19, 69:22, 71:18, 73:13, 78:4, 82:7, 109:15, 109:16
modernatx
1:8, 3:14, 3:15, 59:4, 115:2, 120:12
modification
105:14
modifications
103:13, 104:4, 104:16, 104:19, 107:21, 109:19, 112:16
modified
104:9, 108:8, 111:21, 111:22
modjarrad
68:3
money
33:17
monkeys
49:21, 49:22
moore
3:14
more
23:11, 33:17, 41:19, 44:9, 44:13, 49:10, 49:12, 50:7, 50:15, 51:22, 53:3, 65:6, 73:14, 75:17, 90:12, 95:22, 96:1, 97:6, 103:14, 104:4, 104:19, 107:7, 108:13, 109:20
morning
6:9, 6:10
most
16:18, 36:11, 41:21, 49:22, 113:1, 116:21, 117:3, 117:5, 119:1
motivated
42:20
move
14:1, 21:5, 40:22, 41:1, 78:21, 83:9, 113:17
moving
35:20, 76:16
mrna
4:18, 5:7, 43:4, 46:11, 46:21, 47:9, 47:22, 48:7, 51:1, 51:10, 52:3, 52:6, 52:22, 54:4, 55:5, 55:21, 56:20, 57:6, 57:16, 59:19, 60:2, 60:6, 61:3, 61:10, 66:6, 74:3, 74:7, 74:10, 74:17, 77:4, 77:8, 79:13, 80:19, 81:12, 82:17, 83:1, 91:20, 96:20, 98:2, 98:13, 98:15, 99:1, 100:8, 100:13, 101:16, 102:15, 103:13, 104:4, 104:11, 104:19, 105:5, 105:14, 105:22, 106:4, 106:20, 107:4, 107:6, 107:14, 107:16, 108:9, 109:12, 109:20, 110:3, 110:9, 110:16, 112:3, 112:4, 112:15, 113:13, 115:10, 115:22, 116:8, 117:1, 117:6, 117:14, 117:19, 119:1
mrna)-based
115:4
mrna-
65:11
mrna-based
46:18, 48:8, 48:16, 49:15, 52:9, 57:22, 81:22
mrnas
82:8, 107:17, 107:22
much
53:3, 53:14, 73:14, 106:2
multiple
54:22
must
25:21
myself
50:17, 102:6

N

naive
20:6
nano-emulsion
81:13
nanoparticle
91:1, 117:10
nanoparticles
52:10, 91:21
narrative
80:13
narrow
29:18

nature
99:11, 99:12
necessarily
30:14, 33:3,
95:10, 101:21
necessary
103:1
need
16:14, 23:2,
41:4, 41:18,
59:11, 64:13,
76:1, 76:4,
76:6, 85:6,
91:11, 93:8,
93:15, 94:14,
94:15, 95:9,
95:10, 95:11,
95:15, 96:2,
119:6
needed
16:13, 95:2
needs
9:10, 16:15,
24:6, 28:11,
30:16, 79:6,
95:14
neutralizing
116:18
never
49:9, 94:3,
94:4
new
2:7, 5:7,
27:11, 31:15,
31:22, 35:8,
35:14, 37:5,
43:3, 82:9,
89:1, 94:17
newer
22:17
next
34:17, 35:20,
36:10, 37:12,
47:3, 59:12,
84:12, 97:18,
97:21, 98:20
nexus
84:8, 84:11,
85:19, 86:3,
86:9, 86:15,
86:16, 86:17,
87:16
niaid
64:4, 66:17,
67:22, 74:20,
78:5, 78:6,
78:10, 78:16,
78:18, 79:10,
117:21
nih
64:4, 65:9
nine
62:13
nobel
107:18, 108:3,
108:6, 108:7,
111:18
nobody's
100:3
non-obviousness
84:13, 84:18,
85:6, 85:9,
85:14, 87:5
none
109:14, 111:3
nonetheless
60:13, 75:13
nonimmunogenic
105:7, 105:9
nonlawyer
85:22
nonobviousness
87:9
nonresponsive
113:18
norbert
97:10
normally
24:5, 27:8,
32:4, 32:8,
39:22, 44:9,
44:10, 49:10,
100:1
notary
120:1, 120:4
note
44:22
notes
6:15, 6:17
nothing
6:5, 33:14,
38:12, 68:15,
85:10, 113:19,
118:2, 119:5
novel
27:9, 27:12,
27:13
nucleic
43:3, 59:19,
71:16, 72:4,
72:22, 73:7,
73:10, 82:17,
83:1, 97:3
nucleoside
104:12, 104:16,
112:16
nucleoside-based
107:20
number
9:15, 10:7,
10:11, 13:10,
14:6, 18:13,
45:9, 45:10,
58:9, 58:14,
63:1, 64:6,
74:7, 81:11,
86:2, 88:18,
94:5
numbers
45:14, 56:12

O

object
24:17, 30:10,
48:10, 51:5,
51:12, 60:11,
61:13, 65:17,
67:15, 77:19
objection
64:1, 73:2
objective
29:12, 84:2,
84:5, 84:13,
84:17, 85:14,
86:7, 87:4,
87:8, 87:11,
87:21, 92:11,
92:16, 92:17
obtain
16:15, 36:3
obvious
29:14
obviously
8:21, 9:2,
9:21, 26:18,
27:6, 27:18,
36:11, 52:5,
68:9, 109:3,
114:11
occur
32:17
occurred
102:4, 120:15
occurring
78:17
offered
84:14
offering
92:17
office
1:1, 8:10,
19:6, 26:20,
35:2, 40:12,
40:17
offices
120:15
officials
117:21
oh
44:14, 55:12,
57:1, 59:6,
70:18
okay
7:22, 10:11,
13:11, 13:12,
16:22, 17:7,
22:8, 30:4,
31:9, 45:22,
58:11, 58:16,
59:7, 69:5,
70:19, 80:5,
80:10, 82:4,
83:12, 89:13,

99:9, 106:21, 111:8, 113:16, 114:2
once
79:22
one
8:5, 9:18, 11:15, 12:3, 15:10, 16:15, 20:5, 21:14, 28:22, 34:7, 47:5, 47:14, 47:21, 50:22, 52:6, 58:3, 58:15, 59:1, 59:6, 59:15, 60:8, 60:12, 61:17, 63:5, 68:10, 81:18, 82:16, 82:20, 82:22, 95:14, 103:9, 111:22, 112:14, 114:9, 117:7, 118:15
one's
102:7
ones
10:9, 10:10, 10:12, 103:4, 105:3, 113:12
online
99:7, 99:13
only
20:6, 31:1, 39:8, 49:13, 49:16, 50:13, 50:22, 61:16, 66:1, 68:19, 74:6, 86:5, 94:15, 108:20, 109:1, 109:2
open
90:5, 90:21, 91:21, 117:9
operation
78:17, 117:18
opine
15:19, 87:3
opinion
12:17, 13:14, 14:10, 15:8, 25:14, 87:18, 117:11, 118:22
opinions
12:20, 13:19, 13:21, 15:9, 16:4, 17:18, 24:9, 24:13, 25:2, 92:10, 92:17, 93:7
opposite
112:7
order
1:18, 9:9, 9:11, 33:8, 43:9, 45:2, 76:1, 76:6, 78:21, 105:17, 119:8
orderly
36:6
ordinary
25:18
organization
13:4
organizations
16:2
orient
98:7
original
95:16
other
12:4, 12:21, 14:13, 16:2, 21:8, 40:2, 40:20, 47:12, 50:19, 51:8, 51:21, 57:21, 61:3, 64:14, 68:14, 71:5, 71:15, 72:3, 72:14, 74:18, 75:9, 76:14, 78:4, 78:10, 86:1, 86:8, 86:12, 93:5, 105:2, 109:10, 117:21
others
10:7, 49:19, 96:19
otherwise
8:14, 121:1
ought
44:10
out
13:7, 13:17, 37:7, 37:17, 42:12, 43:19, 44:2, 44:11, 49:6, 49:10, 50:10, 51:7, 52:2, 52:13, 53:13, 73:12, 73:21, 83:21, 86:20, 91:14, 92:22, 94:1, 103:8, 107:3, 109:5, 112:13, 112:15, 112:19, 114:7
outcome
111:15, 121:2
over
78:19, 98:21, 99:15, 99:17, 117:6
overall
118:21
overboard
43:9
owing
98:14
own
26:18, 50:14, 53:4, 78:4, 102:7, 102:12, 108:21, 109:2, 113:10, 119:1
owner
1:9, 3:1

P

page
4:3, 4:11, 14:21, 45:15, 45:19, 46:2, 46:3, 46:7, 46:15, 55:12, 55:13, 56:18, 59:12, 59:13, 62:16, 62:17, 62:22, 63:1, 63:2, 64:22, 66:10, 67:7, 70:10, 70:17, 71:10, 80:22, 81:5, 82:3, 88:7, 96:16, 98:9, 103:16, 103:17, 114:12, 114:13, 114:15
pages
1:25, 45:13, 52:13, 55:11, 58:10
pandemic
50:2, 66:5, 70:21, 74:6, 89:9, 92:13, 95:13, 95:16, 96:5
pandemics
95:18
paper
63:16, 66:10, 97:13, 97:16, 97:19, 98:5, 98:8, 99:5, 99:22, 100:21, 101:2, 101:3, 101:7, 101:10, 101:20, 102:16, 103:1, 103:11, 104:1, 104:17, 105:12, 108:21
papers
10:20, 11:1, 47:4, 103:19
paragraph
14:16, 14:20, 15:1, 25:16, 27:3, 29:5,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 142 of 158

31:3, 35:11, 46:20, 47:3, 53:18, 54:2, 54:19, 55:14, 56:19, 57:2, 57:11, 58:13, 58:15, 58:17, 58:21, 58:22, 59:1, 59:4, 59:15, 60:14, 62:9, 62:13, 62:16, 69:3, 69:8, 71:11, 73:15, 75:12, 76:8, 81:9, 82:2, 83:14, 84:1, 85:19, 86:1, 86:6, 87:7, 88:7, 89:4, 92:2, 92:21, 96:15, 97:1, 97:18, 100:11, 102:18, 105:18, 105:19, 109:18, 110:7, 110:12, 111:1, 115:2, 115:6, 115:15, 118:12
paragraphs
40:19, 52:15, 58:15, 63:4, 68:15
pardi
97:10, 97:13, 97:19, 98:5, 98:7, 98:20, 100:10, 101:15, 101:20, 102:16, 103:1, 108:15
pare
77:22
parentheses
34:7
park
2:6
parker
3:16, 44:21, 44:22
part
21:6, 22:3, 31:15, 35:8, 35:13, 35:17, 36:6, 48:7, 54:2, 64:4, 76:12, 76:19, 102:10, 118:21
participant
75:4
participants
22:7, 36:5, 75:19
participating
36:21
particles
81:14
particular
9:13, 12:17, 13:14, 14:10, 15:4, 15:7, 20:1, 22:9, 22:20, 23:15, 24:3, 24:5, 25:6, 27:14, 33:10, 38:2, 58:15, 59:15, 88:12, 90:9, 90:11, 92:5, 111:14
particularly
22:17
parties
120:20, 120:22
parts
40:21, 78:10, 103:3
party
120:12
pass
36:9, 118:3
past
98:21, 99:15, 100:7, 118:16
patent
1:1, 1:3, 1:9, 1:12, 1:15, 3:1, 4:14, 4:16, 4:17, 5:6, 7:12, 7:14, 7:17, 7:18, 7:22, 8:9, 12:1, 13:3, 13:6, 18:5, 18:10, 19:6, 26:20, 26:21, 27:13, 28:12, 35:2, 40:12, 40:17, 68:11, 80:2, 83:18, 87:20, 89:20, 91:8, 91:10, 91:14, 91:19, 93:22, 106:21, 107:1, 113:4, 116:5, 116:13
patentability
26:18
patents
13:18, 18:7, 18:9, 18:12, 18:14, 18:21, 29:8, 68:12, 88:1, 88:10, 89:4, 91:18, 95:13, 106:21, 110:5, 110:11, 110:12, 110:14, 116:6, 118:10
path
66:13
pathogen
96:10
pathogens
89:2, 96:6
patient
21:20
paul
2:3
penalties
21:10, 21:14
pending
8:9, 80:8
people
16:18, 17:5, 35:4, 36:16, 36:19, 50:19, 64:11, 72:16, 76:3, 76:5, 94:5, 95:18
peptide
98:3
per-nucleotide
107:11
percent
46:6, 106:17
performed
74:8, 76:5, 76:6
perhaps
43:8, 75:16, 86:20
period
100:6
permission
17:21, 18:2, 18:3
person
25:18
perspective
34:5, 34:19, 34:20, 39:4
perspectives
39:15
petitioner
1:6, 2:2, 2:11, 27:14
petitioners
115:16
petsch
47:5, 47:16, 48:1, 48:2, 48:7, 48:18, 49:7, 49:13, 50:10, 51:9, 51:16, 51:19, 52:11, 52:20, 52:21, 53:1, 54:14, 55:4
pfizer
1:5, 2:11
ph
3:16
phase
32:17, 34:12,

35:20, 36:8, 36:9, 36:10, 37:12, 50:3, 53:7, 70:15, 71:7, 74:14, 110:18
philip 1:20, 4:3, 4:12, 6:3, 7:3, 120:6, 120:15
phrase 35:9
phrased 86:4
phrases 33:21
physiology 107:18
pick 80:16
pickering 3:2, 120:16
picture 64:22
piece 39:20
pivotal 32:16
place 76:1, 78:2
plasma 72:11, 72:16
platform 96:20, 115:4, 117:1
platforms 57:16, 59:20, 60:14, 60:22, 115:11
plausible 28:17, 69:11, 69:21, 70:12
play 38:7
played 109:11, 110:15
plays 15:15
plotkin 10:1
plug 36:14
plus 100:3, 112:19
point 20:20, 39:12, 40:15, 40:16, 52:2, 53:2, 58:12, 73:12, 79:15, 79:16, 92:22, 93:9, 107:3, 110:22, 113:19
pointed 9:17, 9:21, 10:1, 10:5, 42:12, 94:1, 108:22, 109:5
pointing 103:8
points 10:17, 12:2
polymeric 81:14
posa 25:17, 25:18, 25:21, 26:3, 26:8, 28:1, 28:6, 28:17, 30:1
position 44:14
possibility 13:7, 13:17, 54:5, 55:5, 56:2
possible 27:10, 39:19, 50:12, 107:7
possibly 66:20
post 17:9, 17:11
post-january 17:2, 17:7
potential 23:1, 76:16, 95:20, 96:5, 97:2, 109:22
potentially 43:1, 43:19, 79:18
powell 3:15
practice 22:3
pre 48:7, 63:19, 104:2
pre-ind 4:18, 46:8, 49:3, 80:20, 81:1
preceding 99:21
precise 100:3
precisely 48:13
preclinical 57:12, 59:16, 60:9, 60:19, 115:7, 115:22, 116:4, 116:22, 117:12, 118:16
predict 67:13, 88:22
prepare 38:5
prepared 95:12
preparing 14:22, 24:11
presence 40:9
present 3:13, 15:12, 24:7, 86:13, 116:12
presentation 18:20
presented 53:1, 53:2, 112:19
presenting 50:14
pressure 96:2
presumably 116:3
presumed 84:8
prevent 95:2
previous 27:10, 106:2
previously 65:22, 68:6
primarily 22:1, 102:9
primary 75:20, 75:21
prior 18:7, 26:1, 27:17, 27:19, 57:12, 57:19, 59:16, 60:19, 68:17, 92:19, 101:17, 115:7, 115:21, 116:2, 117:12, 118:12
priority 96:6, 96:10, 101:18, 104:3
prize 107:18, 108:3, 108:6, 108:7, 111:18
pro 18:14
probably 47:12, 64:19, 65:9, 103:10, 112:22
proceeding 27:21, 38:9, 40:12, 40:17, 56:7, 79:19, 80:2, 89:19
proceedings 7:5, 7:8, 8:3, 8:6, 8:9, 8:13
process 19:16, 19:18,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 144 of 158

20:16, 20:17, 20:19, 20:20, 21:1, 21:2, 21:6, 36:3, 36:6
processing
18:18, 18:19
product
20:2, 20:13, 20:18, 21:5, 21:20, 22:10, 22:21, 23:17, 24:1, 33:10, 33:18, 34:12, 34:14, 34:16, 36:9, 36:14, 36:17, 37:2, 37:11, 37:22, 38:14, 38:17, 43:11, 43:15, 65:13, 84:6, 84:7
production
54:6, 55:6, 71:1, 109:22
products
34:10, 37:1, 50:7, 78:20, 82:9
profile
100:14, 101:16
profitable
32:11
program
32:9, 32:12
promising
64:12, 96:20, 99:1, 103:9
proof
43:14, 43:16, 43:18, 46:17, 46:20, 48:8, 48:15, 49:1, 49:3, 49:14, 50:9, 55:15, 81:21, 117:19
proof-of
37:13, 52:12
proof-of-concept
37:15, 38:19, 38:22, 40:20, 41:4, 41:20, 44:1, 52:9
proper
9:9
properly
106:2
properties
26:4, 26:9, 28:2, 28:8, 28:19, 29:4, 29:7, 29:15, 30:2, 30:7, 30:13, 30:15, 30:22, 31:1
property
13:4, 19:5
prophylactic
50:1
prophylaxis
46:21
proposal
74:20
proposed
47:15, 47:22, 48:21, 49:6, 69:6, 71:18, 73:13, 75:3, 77:6, 77:14, 79:14, 114:20, 118:13
proposing
82:10
proprietary
115:3
prosecuted
18:13
protamine
47:9, 47:11, 47:12, 47:17, 47:18, 47:20, 48:3
protection
50:1, 81:14, 112:22
protective
1:18, 45:1, 51:2, 57:16, 59:20, 60:22, 61:7, 115:11, 116:19, 119:8
protein
29:9, 30:8, 54:6, 55:6, 55:18, 56:22, 57:8, 57:14, 59:17, 60:4, 60:7, 60:10, 60:15, 61:7, 61:12, 63:14, 63:21, 66:12, 68:17, 70:10, 71:17, 72:5, 73:1, 73:8, 78:13, 82:18, 83:2, 90:22, 91:1, 98:2, 99:2, 104:12, 106:1, 106:8, 106:14, 115:9, 116:16, 117:8
protein-based
57:14, 59:18, 60:21, 61:4, 98:17, 116:8
protein-related
72:13
proteins
57:13, 59:17, 60:20, 63:9, 106:3, 106:7, 106:20, 115:8
protocol
64:2, 64:5, 64:6, 64:8, 65:11, 65:15, 65:19, 66:13, 66:18, 66:20, 67:6, 69:21, 70:15, 71:4, 74:11, 74:13, 75:7, 75:13, 75:21, 75:22, 76:2, 77:12, 77:20, 78:21, 79:2, 79:4, 79:10, 80:4, 116:4, 117:5
protocols
62:11, 73:19, 76:12, 79:9, 114:9
prototype
93:1
prove
32:15, 37:2, 55:21
proved
37:22, 43:15
proven
30:17, 33:4
provide
15:9, 21:20, 29:13, 37:5, 37:10, 37:11, 37:16, 39:6, 39:9, 40:4, 41:14, 42:2, 42:20, 43:10, 49:12, 50:1, 50:9, 50:20, 51:9, 53:15, 66:18, 66:21, 69:11, 70:5, 70:12, 71:20, 79:16, 112:21
provided
24:7, 28:13, 37:19, 50:6, 54:3, 55:11, 75:7, 75:10, 77:21, 79:6, 79:7, 79:11, 81:2, 83:20, 85:21, 95:13, 115:1, 116:14, 117:20
provides
69:21, 76:22
providing
8:12, 38:1, 38:2, 43:9, 50:14, 50:18, 75:3, 119:2

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 145 of 158

provisos
14:12
prussia
3:3, 4:5, 24:17, 30:10, 44:19, 45:8, 48:10, 51:5, 51:12, 60:11, 61:13, 64:1, 65:17, 67:15, 73:2, 77:15, 77:19, 83:6, 114:1, 118:2, 119:6
prussia@wilmerhale
3:9
pseudouridine
105:5, 105:14
ptab
44:17
public
17:18, 94:19, 96:9, 120:1, 120:4
publication
99:22
publications
49:14
published
49:16, 70:22, 71:4, 99:5, 99:7, 99:13, 101:6, 101:11
pubmed
10:22
pull
36:14, 114:7
pulled
101:17
purpose
38:1, 38:6, 38:11, 39:3, 42:1, 42:2, 43:20, 53:12, 53:14, 67:19, 70:4, 75:21
pursued
98:17
put
14:14, 36:7, 50:17, 71:9, 78:22, 79:10, 80:5, 83:5, 105:18, 112:14
putting
113:9
puzzling
102:2

Q

question
16:6, 23:1, 24:18, 26:15, 26:17, 27:1, 30:11, 34:9, 37:21, 48:11, 48:13, 51:13, 51:14, 65:18, 67:16, 70:3, 80:8, 83:8, 83:13, 86:4, 91:8, 103:5, 103:6, 111:2, 111:11
questions
12:22, 38:5, 40:8, 51:8, 80:9, 108:13, 111:5, 114:3, 115:14
quick
31:4
quite
50:12, 109:6
quotation
55:11
quote
58:20, 62:17, 70:2, 97:19, 98:4, 98:12
quoted
55:9, 59:1
quoting
98:10

R

rabbit
116:19
raised
29:3
rapid
93:1, 109:22, 115:3
rapidly
95:21
rationale
31:15, 35:8, 35:13, 35:17, 37:5, 40:19, 41:3, 69:6, 69:7, 69:11, 69:22, 70:7, 70:12, 71:18, 73:13, 77:5, 77:9, 78:7, 114:20, 117:13, 118:13, 118:21, 119:2
rats
49:20, 49:21, 81:16
raymond
3:16
rdr
1:26, 121:11
reach
34:17
reaction
24:20
read
31:4, 45:8, 56:13, 59:8, 59:10, 60:18, 73:3, 89:11, 93:3
reading
16:6, 25:1, 75:1, 85:18, 90:5, 90:22, 91:21, 99:9, 108:2, 117:9
readout
71:3
reagan
70:2
real
43:20
real-world
87:12
really
33:15, 34:16, 34:20, 40:16, 40:17, 40:21, 102:13, 113:9
reason
28:6, 28:10, 32:8, 36:2, 51:9, 51:16, 74:19, 96:10, 104:10, 109:7, 110:22
reasonable
22:15, 25:21, 26:2, 26:7, 26:12, 27:22, 28:5, 28:16, 29:21, 29:22, 30:6, 30:16, 37:6, 37:16, 38:13, 38:16, 40:13, 43:17, 67:22, 68:2, 71:20, 78:8, 118:19
reasonably
31:17, 31:21, 33:20, 42:20
reasons
26:19, 31:14, 32:4, 33:3, 33:11, 33:12, 36:10, 39:3, 65:20, 119:3
recall
47:8, 106:11
receive
17:21, 76:3
received
111:18
receiving
24:1, 82:6
recently
81:9, 81:11
recess
56:4, 96:12,

108:12, 113:21
recognize
46:1
recognizing
39:18, 54:22
recollection
25:5, 25:12
record
44:20, 45:9, 56:13, 57:5, 59:8, 119:10, 120:10
redirect
92:3, 114:3
refer
7:17, 7:21, 17:16, 29:4, 58:17, 62:19, 93:5
reference
11:17, 12:4, 12:19, 46:2, 62:10, 64:15, 67:2, 82:7, 100:21, 104:8, 104:14, 104:18, 118:12
referenced
49:14
references
9:4, 9:8, 9:13, 9:16, 12:21, 14:13, 27:17, 27:20, 38:3, 43:6, 43:9, 49:7, 54:15, 55:2, 55:19, 72:19, 78:13, 100:17, 102:13, 105:2, 111:3, 111:4
referencing
59:15, 76:14
referred
12:5
referring
27:6, 47:18, 54:18, 55:1, 95:15, 99:14
refers
47:3, 60:14, 109:19
reflected
48:6, 87:18
refresh
90:8
regard
22:2
regarding
78:3, 86:22, 116:8
regardless
77:7, 79:22
regards
20:22
regulated
20:7
regulation
10:3
regulatory
10:2, 10:6, 14:17, 16:7, 16:10
relate
9:3
related
9:16, 15:19, 56:1, 57:20, 78:4, 85:7, 85:9, 85:11, 95:6, 120:20
relatedness
87:4
relates
8:5
relation
18:21, 108:8
relatively
74:6
relevance
37:21, 38:18, 38:20, 40:3, 74:21, 80:1, 117:12, 118:17
relevant
9:5, 10:17, 38:15, 39:20, 39:21, 39:22, 41:4, 41:22, 43:2, 43:6, 44:7, 48:22, 49:2, 51:3, 51:6, 53:3, 64:15, 65:16, 66:20, 67:18, 67:19, 68:7, 68:14, 71:6, 79:17, 79:18, 101:22, 117:5
relied
48:6, 109:1
relies
19:22, 20:4, 20:5, 20:12, 21:3, 21:7
rely
20:6, 21:19, 76:21, 77:2
relying
17:18, 24:14, 101:15, 104:6, 117:3
remember
9:12, 25:8, 25:9, 115:14
remembering
54:21
reorient
80:22
repeat
48:12
replacement
99:3
replicon-based
81:12, 82:8
report
11:18, 64:21, 118:9
reported
1:26
reporter
98:2, 120:1, 120:3
reporting
52:19
reports
68:16, 81:12, 100:10
represent
12:9, 13:9, 14:5, 29:15, 101:6
representation
12:13, 12:15, 14:7, 14:8, 58:6, 102:14
representations
20:9
represented
120:12
represents
8:22, 20:19
request
18:3, 42:14
requested
23:4
required
22:11, 92:1
requirement
22:4
requirements
9:11
research
36:22, 96:6, 98:22, 100:8
researchers
97:2
respect
17:7, 36:4, 74:1, 92:10, 105:22, 107:22
respectively
50:4
respects
22:6
respiratory
81:15
response
29:9, 30:9, 55:19, 72:14, 82:18, 83:3, 112:7, 112:11, 113:7, 115:3

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 147 of 158

responses
51:2, 56:21, 57:7, 60:3, 60:6, 61:11, 105:15, 112:2, 116:18
restricted
29:18
result
32:16, 36:1, 76:7, 84:18, 85:13, 85:20, 86:7, 93:17
results
32:14, 93:15, 98:4
review
11:21, 15:3, 15:6, 15:18, 38:8, 38:21, 39:2, 40:1, 43:22, 108:15, 108:18, 111:10, 111:12
reviewed
41:9, 41:10, 42:12, 46:5, 54:22, 79:18, 79:20, 104:17, 118:11
reviewing
15:14, 25:5, 25:9
reviews
16:15, 39:13, 99:11, 99:12
rhartsmith@wc
2:21
ribonucleic
90:21
rights
22:6, 36:4
ring
47:10
risk
22:10, 22:11, 22:12, 22:14, 22:20, 23:2, 23:6, 23:15, 33:7, 36:7, 75:2, 75:17, 94:5, 107:17
risks
23:16, 23:21, 33:6, 75:18
rna
51:18, 60:22, 77:14, 104:9, 104:16, 107:8, 107:12, 115:4
rna-based
49:1
rnas
111:21, 111:22, 112:2
robert
2:15
robust
56:21, 57:7, 60:3, 60:6, 61:11
role
15:15, 38:7, 109:11, 110:15
ronald
70:2
room
28:14
roughly
99:15
rule
13:7, 13:17
ryan
2:4
ryanmeuth@paulha-stings
2:9

S

s
57:13, 59:17, 115:8
safe
20:14, 30:17, 30:21, 32:1, 32:15, 32:19, 32:20, 32:21, 37:1, 37:3, 37:7, 37:17, 37:22, 43:16, 51:11, 57:22, 67:14, 69:22, 70:3, 70:7, 72:17
safely
82:16, 82:22
safety
20:18, 31:13, 32:4, 33:2, 33:11, 33:12, 36:13, 38:17, 68:4, 69:12, 70:6, 70:13, 71:8, 76:16, 76:17, 78:3, 100:14, 101:16, 109:19
said
34:2, 42:4, 50:13, 52:16, 75:11, 87:17, 97:21, 110:13
same
12:22, 14:12, 35:11, 37:13, 53:6, 57:10, 65:20, 96:14, 100:2, 103:19, 113:4
sarna
82:17, 83:1
sars
63:13, 63:20, 68:1, 68:17, 70:10, 94:20, 94:21, 94:22, 95:2, 95:7, 95:16, 96:1, 96:6, 96:8
sars-cov
88:13, 89:5, 92:6
sars-cov-1
92:19
sars-cov-2
65:2, 78:5, 117:8, 117:14
sars-cov-2s
56:21, 57:7, 60:3, 60:7, 61:11
satisfied
93:20, 94:14, 95:14
satisfy
93:14
satisfying
93:8
saudi
94:7
saw
15:17
say
14:15, 14:21, 15:1, 16:18, 17:4, 25:17, 26:2, 26:7, 27:22, 29:21, 32:20, 33:19, 33:20, 34:3, 35:12, 37:20, 38:15, 41:2, 41:18, 42:22, 44:5, 44:8, 44:10, 47:11, 49:9, 52:8, 52:14, 52:16, 52:17, 52:18, 53:13, 54:1, 58:6, 68:7, 68:9, 69:10, 71:19, 72:2, 73:18, 77:7, 79:1, 82:5, 83:16, 84:1, 84:11, 87:11, 88:9, 92:7, 99:19, 105:21
saying
23:18, 29:19, 35:16, 35:18, 37:4, 55:16,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 148 of 158

64:10, 89:3, 103:6, 104:2
says
26:6, 27:15, 31:11, 32:3, 32:5, 44:14, 45:5, 45:6, 46:7, 46:20, 53:10, 55:12, 55:13, 56:19, 57:12, 57:19, 60:5, 60:18, 61:5, 62:7, 70:16, 70:18, 73:12, 76:11, 85:19, 86:6, 92:3, 97:1, 98:1, 99:7, 100:12, 103:12, 104:11, 104:21
scalable
110:1
schrum
11:22, 12:1, 12:18
science
16:10
scientific
16:11, 16:13, 16:16, 18:16, 36:6
scope
84:14, 85:1, 86:14, 87:14, 87:21, 88:5
scour
78:6
se
1:5, 2:2, 18:14
search
10:19, 78:10, 106:11, 106:13, 106:16, 107:1
searched
14:5
second
31:10, 46:2, 46:3, 46:7, 46:20, 69:10, 81:8, 97:1, 98:21, 103:13, 115:2
second-to-last
56:19, 59:4
section
37:15, 37:20, 38:19, 39:1, 41:3, 41:4, 41:21, 44:1, 46:17, 48:15, 48:19, 48:20, 49:14, 52:9, 52:13, 52:20, 54:16, 54:17, 62:10, 68:6, 81:21, 82:15, 82:21, 84:2, 87:8, 96:18, 96:19, 100:21, 114:16
sections
40:19, 40:20, 41:3, 41:8, 69:7
see
6:12, 11:17, 12:11, 13:10, 14:6, 15:4, 26:5, 29:5, 31:10, 31:18, 31:19, 33:21, 35:9, 35:15, 45:5, 45:14, 45:15, 46:9, 46:17, 47:1, 47:6, 47:7, 54:9, 56:18, 56:22, 57:8, 57:17, 57:18, 58:1, 58:18, 59:4, 59:9, 59:21, 62:7, 62:17, 63:10, 64:5, 64:15, 64:17, 66:9, 67:8, 68:11, 69:16, 71:22, 73:21, 74:4, 76:18, 81:3, 81:8, 81:16, 81:19, 81:20, 82:1, 82:10, 82:20, 83:18, 84:9, 84:15, 84:19, 86:11, 87:14, 88:14, 89:11, 90:6, 97:7, 97:10, 97:19, 98:5, 98:11, 98:19, 99:3, 100:14, 100:16, 101:5, 101:7, 101:9, 101:11, 103:14, 106:4, 106:7, 114:17, 114:21, 115:11
seeing
55:10
seemed
109:1, 109:5
seems
26:22, 104:20, 109:12, 111:6
seen
64:14
selected
117:17
seminal
109:11, 111:20
senior
101:20
sentence
27:5, 31:11, 54:1, 55:9, 57:1, 60:17, 69:10, 71:14, 82:14, 84:12, 84:22, 85:13, 97:1, 97:19, 97:21, 97:22, 98:20, 99:15, 100:12, 100:18, 115:7, 115:15, 118:15, 118:20
september
101:7
sequence
97:5, 104:11
sequences
70:22, 72:13
serves
47:12
set
12:22, 54:3, 61:17, 120:7, 121:5
sets
55:15
setting
112:8, 112:10
settings
27:1, 35:4
several
59:8
sfisher@wc
2:19
shade
53:11
shoes
78:22
shorthand
120:1
should
23:20, 32:6, 36:16, 44:7, 69:4, 89:10, 110:11
shouldn't
79:3
show
117:19
showed
98:2, 113:2, 113:5, 116:16, 116:18
showing
31:22
shown
30:21, 46:22, 68:10, 84:12, 85:19, 86:3, 86:5

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 149 of 158

side
44:9, 44:13
sign
75:15
signature-p1kal
121:9
signed
44:21, 45:1
significance
15:11
significant
33:7
similar
25:2, 42:16, 95:3
since
94:20
sir
58:4
sitting
9:12, 13:13, 14:9
situation
27:6
size
106:14, 107:14
skeptical
93:8
skepticism
96:19
skill
25:18
skip
31:7
small
74:6
so-called
11:22
sold
89:9, 92:12
sole
61:14
solicitor
19:5
solving
93:7
some
9:1, 9:2, 9:3, 9:5, 10:8, 10:21, 11:1, 13:18, 18:9, 18:13, 18:14, 24:21, 27:16, 28:10, 28:21, 29:13, 30:12, 33:6, 33:7, 36:12, 38:18, 38:20, 39:6, 39:20, 40:3, 51:9, 51:16, 54:8, 63:8, 74:13, 74:21, 78:6, 78:11, 78:19, 86:20, 91:12, 93:19, 104:9, 104:16, 106:11, 111:14, 115:1
somebody
24:22, 25:2, 28:21, 44:14, 79:22
somebody's
68:20
somehow
40:10, 67:12
someone
65:9, 67:13, 103:7
something
27:12, 29:18, 80:6, 83:10, 86:8, 95:3, 104:22
something's
44:2
sometimes
10:22
somewhere
28:21, 28:22
sorry
48:13, 57:1, 57:3, 71:11, 103:16
sort
40:21
sounds
8:1, 40:9
spans
58:14
speak
21:13, 24:10, 24:20
speaking
18:11, 18:16, 91:19
species
49:20, 53:5
specific
10:15, 10:17, 16:11, 24:20, 25:5, 25:13, 37:2, 43:21, 51:7, 55:2, 84:6, 85:6, 85:7, 88:11, 89:11, 91:2, 92:4, 95:11, 104:7, 108:22, 109:2, 109:17, 110:19, 113:6, 119:2
specifically
17:3, 17:6, 23:3, 105:21, 110:4, 114:16, 114:19, 116:12
specification
88:12, 92:5, 116:13
specified
91:20
speed
78:17, 117:18
spike
29:8, 57:13, 59:17, 60:10, 60:20, 106:1, 106:7, 115:8
spikevax
14:18, 87:19, 90:13
spite
94:20, 96:8
sponsor
19:20, 20:8, 22:8, 22:9, 22:10, 22:13, 24:2, 24:4, 24:8, 31:17, 32:5, 32:6, 33:1, 33:5, 33:16, 34:20, 36:12, 41:7, 41:21, 42:3, 42:7, 42:11, 42:14, 42:20, 43:7, 44:1, 44:12, 48:5, 48:21, 49:6, 49:17, 76:22
sponsor's
19:22, 20:12, 21:3, 22:12, 22:20, 34:5, 49:22
sponsors
20:10
spreading
95:21
stability
105:10
stable
97:6, 103:14, 104:4, 104:20, 109:20
stage
34:15, 34:17, 35:22, 43:17, 43:21
stamp
62:6
stamped
56:17
standard
28:14, 29:2, 30:19, 30:20, 31:1, 35:1
standards
28:13, 34:22, 83:16, 83:21
stanley
2:13

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 150 of 158

start
6:11
started
110:17, 116:9
starts
115:2, 115:7
state
3:6, 28:3, 87:1
stated
49:8, 86:1,
93:4, 119:4
statement
20:21, 27:2,
27:4, 27:18,
29:20, 31:20,
33:20, 34:2,
35:10, 35:19,
52:21, 55:1,
56:19, 56:22,
57:5, 57:10,
59:21, 60:1,
60:9, 61:8,
72:9, 72:18,
73:4, 73:11,
83:7, 83:9,
83:13, 92:8,
93:3, 101:16,
104:3, 104:19,
116:3, 117:2
statement's
54:11, 69:18
statements
15:12, 15:16,
15:17, 19:22,
20:6, 20:12,
21:4, 21:7,
21:16, 38:22,
39:7, 39:14,
39:16, 39:17,
40:18, 40:22,
59:8, 59:14,
108:22, 109:3,
109:17, 116:11
states
1:1
steps
21:2
stepwise
36:2
still
70:18, 96:9,
103:16, 103:17
stimulate
54:5, 54:7,
55:5, 55:7
stood
110:15
stop
25:17, 32:6,
32:7
strain
88:12, 92:5,
97:4
strains
50:3
strategy
110:19
street
3:6
strength
93:11
strike
8:3, 113:17
structurally
54:6, 55:6,
55:17
struggling
86:12
studied
118:17
studies
46:18, 47:8,
48:8, 48:16,
48:22, 49:15,
49:17, 54:4,
54:14, 55:3,
57:12, 59:16,
60:8, 60:9,
60:12, 60:19,
61:9, 61:18,
68:22, 69:1,
70:9, 71:2,
71:15, 71:19,
72:2, 72:3,
72:9, 72:11,
72:15, 72:21,
73:6, 73:9,
74:7, 74:14,
78:11, 79:8,
79:13, 81:18,
115:7
study
39:19, 40:3,
40:6, 42:5,
42:9, 43:17,
48:5, 48:21,
49:6, 55:17,
61:16, 63:12,
63:20, 65:16,
68:16, 69:7,
70:11, 71:7,
73:14, 75:3,
75:18, 76:12,
77:6, 77:10,
77:12, 79:13,
114:21, 116:22,
117:6, 118:14,
119:3
stuff
44:13
subheader
114:19
submit
27:13
submitted
15:13, 25:6,
25:7
submitting
21:11, 22:9
subsequent
33:17
subset
91:2
substantial
15:15, 96:3,
98:13
substantially
109:21
succeed
52:22
success
25:22, 26:2,
26:8, 26:13,
28:1, 28:5,
28:16, 29:21,
29:22, 30:6,
30:17, 31:16,
31:18, 31:21,
33:19, 33:21,
34:1, 34:2,
34:4, 34:5,
34:10, 34:18,
34:19, 35:3,
35:14, 35:18,
35:19, 36:20,
37:6, 37:16,
38:13, 38:16,
40:13, 71:20,
80:2
successful
32:11
successfully
31:22, 106:3
sufficient
28:10, 40:4,
41:6
sufficiently
41:13, 112:20
suggest
55:17, 71:16,
72:4, 72:15,
72:21, 73:6,
73:9, 77:13,
105:16
suggested
9:4
suggesting
40:9, 67:1,
108:20
suggests
40:11
summarized
110:22
summary
10:5
superior
105:5
supplied
78:1
support
29:13, 60:1,
60:8, 61:9,
61:14, 61:17,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 151 of 158

61:18, 61:19, 72:10, 82:15, 82:22, 84:15, 86:9, 86:15, 86:16, 86:17, 87:8, 94:12
supported 72:19, 95:7
supports 79:19
suppose 39:2
supposed 40:3
sure 9:9, 9:15, 22:4, 23:11, 36:5, 36:18, 38:3, 39:4, 39:7, 48:15, 51:15, 53:20, 58:14, 61:2, 69:13, 75:17, 80:8, 86:14, 99:20
surely 65:5, 102:1, 110:14, 110:15, 110:19
surprise 66:16
surprising 78:9
susceptible 107:5
suspect 22:22, 64:18
sw 2:16
sworn 6:4, 120:8
syncytial 81:16
synonymous 86:17
synopsis 114:17

T

tailored 97:4
take 6:19, 11:15, 14:7, 31:4, 44:2, 49:6, 49:9, 53:19, 56:3, 76:1, 86:16, 96:11, 103:3, 103:9, 108:2, 108:11, 113:20
taken 43:19, 44:11, 56:4, 108:12, 113:21, 120:9
taking 78:19, 112:4
talk 19:15, 23:11, 35:7, 40:18, 40:20, 47:19, 69:6, 83:16, 87:4, 104:9, 110:2
talked 19:9
talking 14:21, 31:20, 31:21, 40:16, 41:13, 75:13, 77:15, 77:16, 77:17, 100:4, 104:15, 109:19, 110:6, 110:10
talks 10:2, 86:13, 90:5
target 107:7
targeting 34:1, 57:20, 63:9
teachings 26:1
technological 98:22, 100:7
technology 22:18, 53:6, 69:14
tell 10:9, 12:3, 21:15, 23:8, 28:20, 44:1, 49:5, 94:18
telling 29:1
ten 99:21
tend 49:11
tendency 65:21, 102:5
term 29:17, 100:3
terms 11:16, 16:22, 21:18, 23:22, 30:5, 55:3, 59:14, 91:4, 92:10, 93:7, 101:14
test 76:16
tested 48:1, 110:21
testified 6:6
testify 6:4, 8:8, 17:22
testimony 8:12, 17:15, 19:10, 115:1, 120:10
testing 31:15, 35:8, 35:13, 37:5
text 18:18, 18:19
textbook 10:2
th 64:17, 65:3, 65:7, 70:17, 70:18, 71:1, 71:2, 71:3, 99:7, 121:5
thank 96:14, 96:15
themselves 32:7, 38:5, 44:12, 116:9
theoretical 23:2
therapeutic 98:17, 99:1, 112:8, 112:10
therapeutics 46:8, 98:14
therapy 99:3, 104:12, 104:15
therefore 56:20, 57:6, 87:16
thess 101:7
thin 78:2
thing 21:14, 22:15, 28:22
things 16:20, 20:5, 35:6, 44:10, 53:13, 64:10, 85:9
think 9:15, 13:5, 13:13, 17:15, 18:19, 19:14, 20:21, 22:1, 22:13, 22:14, 23:9, 27:9, 27:15, 28:9, 28:17, 29:10, 29:15, 29:17, 30:12, 32:10, 33:13, 34:22, 44:5, 44:7, 44:10, 50:18, 51:10, 53:9, 58:14, 58:22, 63:22, 64:7, 67:11, 67:17, 67:18, 67:21, 68:1, 72:18,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 152 of 158

73:3, 75:12, 78:15, 79:2, 79:22, 86:5, 86:18, 92:21, 93:3, 93:19, 96:3, 98:10, 103:9, 104:8, 104:18, 107:16, 110:11, 118:19, 119:6
thinking
15:15, 15:22, 16:4, 25:8
thinks
22:13, 33:5
third
71:14, 109:22
thomas
19:2, 19:3
thought
10:16, 42:17, 51:3, 51:6, 52:17, 55:20, 64:12, 95:1
threat
96:9
three
11:3, 11:12, 15:10, 100:17
through
12:6, 15:1, 24:22, 35:22, 36:2, 57:12, 59:7
throughout
7:18
throws
53:11
tied
84:6, 87:12
time
11:15, 12:8, 17:2, 17:12, 22:8, 25:14, 51:18, 66:8, 71:6, 74:15, 78:18, 100:5, 100:7, 111:12, 112:22, 116:20
times
12:10, 13:10, 14:6, 96:7
title
19:7, 46:3, 104:11, 104:21, 105:4
titled
48:15, 49:14, 80:19
today
8:8, 8:12, 9:12, 13:13, 14:9, 88:17, 110:6
together
113:10
told
53:18
took
52:5, 52:7, 112:15, 113:10
tool
99:2
top
70:16, 98:21
topic
74:22, 101:22
topics
15:10
total
78:1
totally
66:4
tough
58:6
towards
10:5, 22:22, 78:21, 111:14
track
94:13
trademark
1:1
training
83:17
transcript
4:10, 119:7, 119:8
translatable
103:14, 104:5, 104:20, 109:20
translation
112:1, 112:5, 112:18
translational
105:10
trial
1:3, 22:7, 33:17, 36:5, 38:4, 38:6, 38:8, 38:9, 39:6, 39:11, 43:2, 53:17, 66:22, 75:16, 76:3, 76:7, 79:4, 79:20
trialists
74:16
trials
20:2, 21:6, 22:6, 31:13, 32:1, 32:16, 34:13, 36:16, 36:19, 37:8, 37:18, 38:1, 50:3, 53:8, 57:20, 76:13, 76:18, 76:20, 110:18
true
29:10, 37:9, 37:13, 54:11, 58:5, 69:18, 74:5, 90:18, 111:1, 120:10
truth
6:5
truthful
20:9, 20:11
truthfulness
19:19
try
16:9, 51:1
trying
20:15, 40:7, 40:17, 53:9, 66:17, 80:14, 112:10
turn
8:16, 37:7, 37:17, 46:15, 54:7, 55:7, 55:13, 69:3, 71:10, 73:15, 96:15, 114:12
turned
110:8, 113:13
two
7:5, 7:8, 33:21, 47:3, 48:22, 49:13, 49:22, 50:6, 63:4, 90:12, 92:11, 93:5, 93:9, 105:2, 110:5, 110:10, 116:5
tying
40:22
type
80:4
typically
67:4

U

uh-huh
23:11
ultimate
61:9
ultimately
20:20, 27:14, 32:17, 36:22, 37:3, 37:22, 38:7, 38:9, 38:13, 43:15, 73:20, 93:19, 95:7, 116:6
unbiased
101:21
under
36:16, 92:15, 119:8
undergoing
50:3, 53:7

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 153 of 158

underlined
114:20
understand
7:11, 9:6, 20:15, 23:10, 25:18, 26:12, 31:14, 35:12, 35:18, 36:19, 36:21, 39:10, 40:5, 40:8, 43:11, 50:21, 56:6, 56:16, 62:1, 82:7, 82:14, 84:5, 87:18, 88:2, 89:3, 91:17, 104:8, 108:5, 108:7
understanding
8:15, 13:18, 27:7, 28:9, 38:4, 45:20, 53:16, 85:1, 85:4, 85:5, 86:2, 89:6, 91:9, 113:14
understands
69:14
understood
44:20, 80:15, 83:12, 97:2
undertaking
44:21, 45:1
undue
36:7
unexpected
93:17
unfull
99:11
unique
84:18, 85:15, 86:8
united
1:1
unknown
90:17
unless
8:13, 112:12
unlikely
32:14, 64:8, 79:1, 117:16
unmet
93:8, 93:15, 94:14, 95:9, 95:14, 95:15, 96:2
unpack
60:18
unsafe
33:4, 33:7, 54:9, 71:18, 72:6, 72:17, 73:10
unstable
107:4, 107:5
unusual
77:22, 78:15, 78:18
urgent
95:22, 96:1
usa
50:4
use
15:7, 27:3, 46:21, 51:17, 75:14, 75:16, 78:8, 100:1
useful
42:6, 51:22, 68:10, 110:9, 113:1, 116:21
uses
91:6
using
10:21, 47:9, 51:17, 53:6, 60:9, 113:6
uspto
19:8
usually
44:4
utility
91:12, 91:16, 91:17, 92:1

V

vaccinated
68:20
vaccine
15:3, 18:22, 30:13, 30:17, 30:21, 31:16, 31:22, 32:6, 32:7, 32:10, 32:22, 35:8, 35:14, 37:5, 37:6, 37:17, 43:3, 43:4, 46:11, 46:21, 47:9, 47:15, 47:22, 48:1, 48:2, 48:5, 48:8, 51:10, 51:18, 51:20, 51:21, 52:9, 53:7, 55:21, 63:13, 63:20, 64:16, 65:2, 66:7, 66:12, 67:7, 67:13, 68:1, 68:3, 68:5, 68:9, 68:18, 69:22, 70:11, 70:14, 71:1, 71:8, 72:14, 72:16, 75:3, 77:13, 77:14, 78:3, 81:2, 90:16, 91:6, 91:15, 91:16, 91:17, 93:1, 93:2, 93:14, 93:16, 93:18, 93:21, 94:2, 94:7, 94:13, 94:15, 94:16, 94:17, 95:10, 95:11, 99:2, 105:17, 110:17, 112:4, 112:12, 112:15, 113:13, 115:4, 116:1, 116:8, 116:15, 116:17, 116:22, 117:6, 117:14, 117:16, 117:20, 117:22, 118:17, 118:20, 119:1
vaccine"
52:22
vaccine-enhanced
23:12
vaccines
5:7, 10:1, 10:3, 14:17, 15:4, 15:7, 15:18, 15:20, 15:21, 16:19, 17:3, 17:8, 17:13, 31:12, 46:18, 48:9, 48:16, 49:1, 49:15, 49:22, 52:3, 52:4, 52:6, 53:6, 57:15, 57:20, 57:22, 59:18, 60:21, 61:3, 61:4, 61:6, 63:9, 64:3, 66:3, 69:21, 71:5, 74:4, 74:7, 74:10, 74:17, 74:18, 76:4, 77:5, 77:8, 78:5, 81:12, 81:22, 87:12, 89:9, 90:13, 90:19, 90:20, 91:3, 91:20, 92:12, 92:18, 93:5, 93:6, 93:10, 94:9, 94:22, 96:21, 97:3, 97:6, 102:15, 105:22, 109:12, 110:3, 110:9, 110:16, 110:18, 110:20, 115:9, 118:7, 118:9, 118:13
vaccinology
5:8

vague
30:11, 100:5
valerie
10:3
valuable
53:16
value
103:10
variety
49:20, 53:4
various
16:19, 46:22, 103:13, 107:6
vasopressin
98:3
vast
31:11
vector
105:6, 105:9
version
70:17
via
9:19
view
117:15
viewed
71:6, 96:20
viral
97:4
virus
46:22, 49:19, 64:16, 66:4, 67:10, 67:12, 68:21, 81:16, 91:6, 95:6, 95:11
viruses
57:21, 88:13, 92:6, 95:20, 96:5
vivo
98:4, 98:16, 106:3
vouch
106:16

W

want
19:15, 42:21, 43:7, 44:14, 45:8, 46:2, 63:4, 72:1, 77:16, 82:13, 102:20, 105:17, 112:8, 112:9
wanted
10:18, 50:15
wants
34:8, 83:10
warp
78:17, 117:18
washington
2:17
way
8:4, 12:3, 22:6, 28:3, 32:13, 51:19, 68:10, 68:21, 69:1, 72:1, 74:17, 76:5, 76:9, 86:4, 86:5, 98:9, 100:2, 111:22, 121:1
wayback
9:20
ways
35:5, 51:21, 86:3
we'll
11:4, 23:11, 44:16, 45:21, 89:14, 119:6
we're
41:13, 53:13, 75:13, 77:15, 77:16, 80:11, 99:20, 113:20
we've
12:9, 64:13
wednesday
1:22, 120:17
weight
40:11
weissman
101:1, 101:13, 101:19, 103:8, 105:3, 107:19, 108:20, 111:17, 112:17, 113:11
welcome
6:18, 96:13
went
8:22, 112:16
whatever
25:7, 32:8, 39:5, 66:11, 74:20, 79:18, 109:7, 110:22
whereof
121:4
whether
11:19, 12:4, 20:13, 21:5, 21:19, 28:21, 34:16, 37:21, 38:12, 38:16, 40:12, 41:12, 51:1, 67:13, 70:5, 71:6, 75:15, 77:7, 79:5, 90:17, 91:14, 106:7, 111:17
whoever
65:8
whole
6:5, 71:19, 119:7
widely
66:17
williams
2:12
wilmer
3:2, 120:16
wilmerhale
9:2, 86:19
win
108:6
within
70:21, 102:4, 120:4
without
12:5, 37:1, 43:1, 54:20, 104:12, 104:16
witness
120:6, 120:10, 121:4
wo
4:16, 4:17
won
108:7
wong
3:5
wong@wilmerhale
3:11
word
6:19, 27:3, 63:5, 100:1, 108:2
wording
48:13
words
76:14
work
17:1, 17:4, 17:7, 18:22, 19:8, 32:15, 33:4, 36:18, 52:10, 55:22, 82:8, 92:22, 95:6, 102:7, 102:8, 104:7, 108:21, 109:2, 109:6, 109:8, 109:11, 109:15, 109:16, 110:8, 110:13, 111:10, 115:22, 116:4, 117:12, 117:15, 118:1, 118:6, 118:9, 118:12, 118:16, 118:20, 118:22
working
50:20, 50:22, 86:20, 112:21, 116:9, 116:13
world
13:4, 94:6, 95:12, 110:15
worried
94:19, 95:3,

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358

95:18
worth
12:8, 69:12, 70:6, 70:12, 71:7, 96:5
wouldn't
35:22, 44:10, 51:14, 52:10, 72:16, 72:17, 78:12, 85:10, 86:16, 102:3, 105:16
write
77:20
writing
74:19, 78:20
written
29:2, 64:2, 66:14, 66:15, 73:19, 85:2, 111:12
wrong
67:1, 71:4
wrote
64:4, 72:8

Y

yeah
13:3, 18:19, 19:17, 21:13, 45:17, 58:9, 63:3, 76:10, 93:11, 106:20
years
15:2, 18:13, 99:21, 100:4
yield
37:1, 112:17
yields
105:5
york
2:7
yourself
25:8, 78:22

Z

zika
46:11, 47:15, 47:22, 53:6, 74:13, 81:2, 110:17

.

.3
46:17, 48:15
.5000
2:18
.6000
2:8, 3:8

0

000205848
5:1, 56:13
000477491
5:4
001417294
4:20, 45:11
006369
4:16
01358
1:11, 7:8, 7:11
01359
1:14, 7:9, 7:14
02109
3:7
0266640
4:15
08
1:23, 6:1, 120:17

1

1
119:9, 120:18
1.0
70:17
1.1
114:16
10
14:20, 50:2, 71:1
10,702,600
1:12, 5:6, 7:12, 7:17
10,933,127
1:15, 7:15, 7:21
100
46:5, 106:17
1001
89:19
1009
11:6, 11:16, 12:18
1010
11:7, 12:22, 13:14
1012
11:8, 14:1, 14:11
10166
2:7
103
82:2, 96:16
11
4:14, 4:16, 4:17
114
4:5
116
62:9, 62:14
118
4:6, 73:15
118813
4:17
119
69:3
12
83:14, 99:7, 100:18, 101:6, 103:21, 104:9, 104:11, 104:14, 104:18
120
76:8
121
1:25
122
62:16
127
7:21, 29:8, 87:22, 88:9, 89:4
1273
56:20, 57:6, 60:2, 60:6, 61:10, 65:11
13
100:18, 101:10, 103:21, 105:3
1325
4:18, 46:11, 80:20
14
1:22, 6:1, 64:17, 70:17, 70:18, 71:2, 120:17, 121:5
1417297
4:20
1417309
4:20
1417480
4:21
1417483
4:21
1417491
4:21
1417492
4:22
15
100:11, 119:9, 120:18
163
87:7, 87:11
172
88:7, 89:4, 92:2, 92:21
179
96:16, 97:1, 97:18, 102:18
18
65:3, 71:3
19
14:17, 15:4, 15:7, 15:18, 15:20, 16:19, 16:22, 17:3, 17:6, 17:8, 17:13, 30:13, 67:14, 89:8, 92:12, 92:20, 93:2, 93:6,

93:9, 95:8,
96:3, 107:22
192
105:18, 105:19
1990
98:2
1st
17:9, 17:11

2

2.4
81:21
20
65:7, 84:1
200
2:6
2002
95:16
20024
2:17
2003
95:16
2004
63:13
2005
4:17, 63:13
2008
63:17, 99:15,
100:22, 101:4
2011
101:11
2012
4:16, 47:5,
81:19
2013
4:15, 47:6
2015
48:7, 63:19,
99:19, 101:7,
101:18, 106:9
2016
46:13, 74:13
2018
24:16, 25:7,
99:6, 99:8,
99:16, 99:19,
102:1, 108:15,
110:16
2019
24:16, 25:8
202.434
2:18
2020
9:17, 17:2,
17:5, 17:7,
17:9, 17:11,
24:15, 25:7,
64:18, 65:3,
70:17, 72:20,
74:12, 115:19,
115:21
2023
1:11, 1:14,
7:8, 7:9, 7:11,
7:14, 107:18
2024
1:22, 6:1,
120:17, 121:5
2027
97:9, 97:14,
98:8, 121:7
2051
44:17, 45:4,
45:5, 45:21,
48:6, 54:18
2054
62:1, 62:7,
62:10, 62:14,
62:17, 62:20,
70:9, 114:6
2056
56:6, 56:16,
58:18, 59:12
205849
5:1
205865
5:2
205866
5:2
205867
5:2
205868
5:3
212.318
2:8
2154
10:6
219
52:13
22
25:16, 27:3,
29:5
2200
6:22
222
108:17, 108:19,
109:10, 111:2
25
121:7
27
46:13

3

3,650
100:3
309
45:16, 46:15,
55:12, 55:13

4

44
4:18
477498
5:4
477504
5:5
477505
5:5
479
45:18
480
45:18
481
45:18
482
45:18
483
45:18
491
45:19
492
45:11, 45:19,
81:5
497
114:14

5

505
63:1, 63:3,
70:10
53
82:3
547018
1:24
55
119:10
56
5:1

6

60
3:6
600
7:18, 29:8,
87:22, 88:9,
89:4, 89:19,
91:10
617.526
3:8
62
5:4
63
62:16, 62:17
66
54:19
680
2:16
69
31:3, 53:18

7

737
90:3
74
58:15, 58:17
79
71:10, 71:11

8

849
56:14
865
56:14, 59:1

BioNTech-Pfizer Exhibit 1105
BioNTech SE and Pfizer Inc. v. ModernaTX, Inc. IPR2023-01358
Page 157 of 158

866
56:14
867
56:14
868
56:14, 56:18,
59:3, 59:13
89
5:6

9

9
1:23, 6:1,
120:17
9.1
46:17, 48:15
94
45:15
95
45:15
96
45:15
97
5:7, 31:7,
31:10, 40:19,
45:15, 88:7
98
66:11
99
64:22