

REFINITIV STREETEVENTS

EDITED TRANSCRIPT

MRNA.OQ - Moderna Inc at JPMorgan Healthcare Conference (Virtual)

EVENT DATE/TIME: JANUARY 11, 2021 / 9:30PM GMT

CORPORATE PARTICIPANTS

David W. Meline Moderna, Inc. - CFO & Principal Accounting Officer

Stéphane Bancel Moderna, Inc. - CEO & Director

Stephen Hoge Moderna, Inc. - President

Tal Zaks Moderna, Inc. - Chief Medical Officer

CONFERENCE CALL PARTICIPANTS

Cory William Kasimov JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

PRESENTATION

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

All right. Good afternoon, everyone, from the virtual JPMorgan Healthcare Conference. My name is Cory Kasimov. I'm the senior large-cap biotech analyst, and it's my pleasure to introduce our next company, Moderna, and CEO Stéphane Bancel. Please note that following this presentation, we will have a Q&A session right here. (Operator Instructions)

So with that, Stéphane, thank you so much for being here today. Look -- very much looking forward to this presentation and discussion. With that, let me turn things over to you.

Stéphane Bancel - Moderna, Inc. - CEO & Director

Thank you, Cory, and good afternoon, everybody. Can you see my screen, Cory?

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Yes.

Stéphane Bancel - Moderna, Inc. - CEO & Director

Good. Thank you. So let me remind you as a start that we'll be making forward-looking statements that there are risks involved when you're investing in Moderna. And also now that we have an authorized product, I have to make some disclosure around indication and safety information. You can find those 2 slides online in the presentation.

We get asked quite often, how could a team of 1,000 people go from the novel virus sequence online to an approved -- to an authorized product with 94% efficacy for COVID-19 vaccine in just 11 months. As all of you know, software uses a binary system. And as all of you know, life uses a quaternary system, AUCG codes for messenger RNA. Messenger RNA is an information molecule, and so much comes from that future.

mRNA is now a new class of medicines. For 10 years, we asked ourselves a question: what if mRNA could be a new class of medicine? But now we know mRNA is a new class of medicine. For the last 10 years, we've been energized by the idea of what we could do for patients if we could make this technology work safely in human and get products approved.

The thing that has always excited us is the incredibly large product opportunity. Like recombinant, we can make secreted protein, as you see in green on this slide. But unlike recombinant, we can make transmembrane protein and also intracellular protein. We can code a large number of

protein in human made by human cells that cannot be done or drugged using recombinant technology. We can also make antibodies, as we've shown with our chikungunya antibody program, safely in human. We can also make the protein of viruses, as we have seen in our vaccines.

So very large product opportunity. And also, we can combine products. And so that's -- make it very interesting from what we can do from a marketing standpoint for patients and for health care professionals. Because mRNA is an information molecule, we believe there'll be a much higher probability of technical success of a drug starting in the clinic to getting approved.

For example, our CMV vaccine uses exactly the same chemistry, the same formulation, the same manufacturing processes when our COVID-19 vaccine will get authorized. Same thing for our flu vaccine and so on and so forth. Given what the team has done this year, I don't have to talk about the speed at which mRNA technology enables to make high-quality medicine. And of course, because mRNA is an information molecule, because mRNA is a platform, we have greater capital efficiency over time just as with recombinant because we always use the same equipment and the same processes across the entire portfolio.

The vision we had since the beginning is as follow. We said because mRNA is an information molecule, if we can invest in science to invent novel delivery systems to get into different cell types, we should be, over time, able to create a lot of new applications, which we call modalities.

And so basically, we thought if we can get into the muscle, if we can get into the liver, if we can get into the lung, over time, we should be able to get a lot of medicine because mRNA being an information molecule, if you get a first medicine to work in humans for given modality. Once you have optimized the technology to do that, then you can scale very quickly within that modality because between medicine I and medicine II and medicine III, within that modality, you use the same technology bricks.

And because we know the genomics information of human, if human genome has been sequenced, and because it's very quick and cheap to get pregenomic information of a virus, you can turn into a new product very quickly, like we've shown with the COVID-19. Because we had done 9 vaccines in humans before the COVID-19, we were able, in only 48 hours, to optimize the product, design the product and then start making the product at GMP scale. And then if you do it for one modality, you can replicate the same model for many more modalities over time.

So where are we today, 10-year into the story? We have our first commercial modality with infectious disease vaccine. For development, we have 2 types of modalities. We have a modality like you see in pink on the left that is a co-modality. It's our systemic secreted and cell surface therapeutics. With our chikungunya antibody program, which was a sentinel program for that modality, we demonstrated the ability to safely make an antibody in humans using an IV injection, and we show the ability to repeat that. That was enough clinical data to convince us we could scale that modality, and I'll come back to it in a minute.

At the same time, we have 4 modalities that we call exploratory modalities. Those are modalities that give us intriguing signal in animals, but for which before we invest more, we want to see clinical signal. And so today, we have 5 drugs in immuno-oncology in the clinic: 2 in blue and 3 in green here. We have a very interesting program with AZ in Phase II in the clinic for VEGF that is currently being injected in a placebo-controlled study in people's hearts with the hypothesis of regenerating new blood vessel to revascularize a heart after a heart attack. And in orange, what you see here is a new modality for systemic intracellular therapeutics, where we're trying to go after rare disease.

In addition to development, we, of course, continue to invest in research to try to invent new modalities to bring new families of medicines to patients. One that is very important to us right now is the lung. We are working actively with our friends at Vertex to finalize the technology to be able to safely bring into the clinic mRNA drug delivered into the lung.

So let me spend a few minutes on our infectious disease vaccine. There are a lot of reasons why we are very energized by this modality. As you know, we believe that because of the 2020 pandemic that this will change how the world thinks about infectious disease. A few years ago, a lot of people thought infectious disease didn't really have a future.

We believe it was not true, which is why we invested heavily in vaccines. But we believe that looking forward for the next 5, 10, 20 years, consumers, health care professional, payers will pay a lot of attention for infectious disease because there are still a lot of unmet medical need.

We believe that mRNA is the best platform to make vaccines. We have the ability to make complex antigen with high biological fidelity. How could making a protein neutral cell be better than making a protein in a human cell in your own body? The ability to combine multiple antigen in one dose, like we've done for CMV, which is now on its way to Phase III after a successful Phase II same manufacturing process, same manufacturing equipment and rapid development.

We talked about probability of technical success. While so far in the clinic, we have elicited neutralizing antibodies against all 9 viruses that we tried in clinical trials. And they are still an incredible unmet medical need. If you look at the last 40 years, since 1980, more than 80 viruses have been discovered by scientists and clinician around the world.

They are approved vaccine for less than 4% of this that you see in green in the graph in the middle. But also there are a lot of vaccines -- sorry, a lot of viruses that were discovered before 1980 that you see on the left that still do not have commercial vaccine. You see the list on the left.

So if you think about it, what is the real size of the total addressable market for vaccines if one was able, thanks to a technology like mRNA, to develop a lot of vaccines for high unmet medical needs. In 2019, the worldwide vaccine revenues was \$35 billion. How big do you think that market could be 5, 10 years from now if one was able to develop a lot of infectious disease vaccine?

So let me say a few words about 1273 or Moderna COVID-19 vaccine. So let me start with 2021 revenues. We have been spending quite some time with the team to think about how to give a market some framework on how to think about 2021 revenues. And because it's a pandemic, we thought that guiding as it's done traditionally was not really adapted to our situation. But we still wanted to find a way to tell the market what we see coming in 2021.

So what we've done this morning for the first time is we've disclosed the size of the Advanced Purchase Agreement, the APAs, that have been already signed for fiscal year 2021. This does not include options. This is the volume of business that we have already signed with governments around the world, which is \$11.7 billion of potential revenues if we deliver those products in fiscal year 2021. Of those \$11.7 billion, we have already received deposits for \$2.8 billion.

Of course, we are not done. This is only January 11. So the team is working hard with governments to sign more APAs for delivery in 2021, but also for delivery in 2022, including with COVAX, the WHO facilities. For supply, we anticipate being able to deliver in fiscal year 2021 from 600 million doses, which we feel very comfortable achieving, to up to 1 billion doses. We have the CapEx, the people, to deliver up to 1 billion doses. But given it's a new manufacturing process, yield and raw material availability might impact the number, and we will refine this bracket as the year goes by. Because of the ramp in manufacturing capacity, we anticipate supply next year, fiscal year '22, to be up to 1.2 billion doses.

We are now authorized in over 30 countries. Last week was a great week. We got on Monday, Israel; on Wednesday, Europe, 27 countries; and on Friday, the U.K. We have a few more countries that are reviewing our application as we speak.

In term of indication expansion, we have started an adolescent study, and our goal is to potentially have a label extension 12 and above from the summer so that adolescent can be vaccinated before going back to high school and to middle school in September. We're going to start soon a young children's study, but this will take much longer because we have to age deescalate and start at a lower dose. So we should not anticipate clinical data in 2021, but more in 2022. And we're going to start soon boosting participant in our clinical studies to get safety and neutralizing antibody data for the boost market.

We have another interesting respiratory vaccine against hMPV and PIV3. This could be potentially a new first-in-class vaccine. There are no vaccine against either hMPV or PIV3, and this is a problem both in children and in the elderly.

For RSV, we are very pleased also to be working on a first-in-class potential vaccine and to announce today that we're going to try very soon our RSV candidate into the elderly. So far, we have been in the clinic for healthy adults and recently healthy children. But we believe that the profile of this product makes it very interesting to go into the elderly.

And if you look at this slide, with also the addition of flu, we should be able to do very interesting combinations of respiratory vaccines. For flu, of course, there are flu products on the market. But we think, given the high neutralizing antibody that we demonstrated in COVID-19 in the elderly, that we have a potential for a best-in-class vaccine. We're going to start our seasonal flu vaccine covering the 4 seasonal viruses recommended by WHO, and then we'll keep improving the product from there. And we're currently on track to start Phase I in 2021.

We are also very excited by our products for complex antigen. The first one is CMV, cytomegalovirus. This is the #1 cause of birth defect in this country. There are no vaccine on the market against CMV. After a successful Phase I and recently a successful Phase II, we are on track to start this year in 2021 the Phase III that will be pivotal restriction study for our CMV vaccine. We believe this product could peak at \$2 billion to \$5 billion annual peak sales.

The other one that is very exciting to us is EBV, Epstein-Barr virus. This virus is the cause of mononucleosis. There are no vaccine on the market against EBV, and we are on track also to start a Phase I study in 2021.

Last but not least is public health readiness. As we showed this year, it is very important that the world is ready for new outbreaks and new pandemics. We have been working at this for several years. First with our Zika vaccine, which is on track to get into Phase II, partnered with BARDA. We announced today a new program against HIV. AIV, the Gates Foundation and the team of Dr. Tony Fauci at the VRC at NIH have been working for many, many years to try to understand HIV better and try to find the best antigen to drug a vaccine against HIV. While we are very pleased to partner with them, and we are on track to start also in the clinic on HIV vaccine this year.

The other one is Nipah, which is a new vaccine we announced a development program this morning. Same, it's a virus existing in Southeast Asia, very high mortality rate. And we believe it is the right thing for the world to prepare in a public-private partnership, again, with Dr. Fauci's team at the VRC to get a Nipah vaccine in the clinic so that at least we can understand dose and safety profile.

So if you look at the modality, we have 4 first-in-class vaccine against respiratory viruses. We've won already on the market with up to -- sorry, at least \$11.7 billion of sales for 2021. And the potential best-in-class vaccine for influenza; 2 first-in-class vaccine requiring complex antigen, CMV and EBV; 3 public health vaccine. And we have many more candidates that the team is working on in the labs that we look forward to take to the clinic as soon as we can.

If you look at the totality of our programs, we believe that Moderna has the most innovative vaccine pipeline in the industry, despite being one of the most recent player in vaccines.

Let me spend 2 minutes on another co-modality, systemic secreted and cell surface therapeutic. We were very pleased to be able to show in 2020 that not only we can dose in a dose-responsive way, as you can see at 0.1, 0.3 and 0.6 mgs per kg on the left for one dose. But that if you dose a second time a week after -- sorry, 2 weeks after the -- sorry, a week after the first dose, you can go back and you can basically double the AUC. You have no loss of protein production. Safety profile is similar. And so we are very excited to show that you can repeat those, an IV-injected mRNA with Moderna's technology.

These open applications in autoimmune disease, and we have a program for PD-L1 and a program for IL-2 as well as cardiology program like relaxin.

Let me spend 2 minutes on exploratory modalities. On exploratory modalities, we have 6 programs today that -- with ongoing clinical trial and a few that I would like to highlight. The first one is cancer vaccine, has 2 very interesting programs: a randomized Phase II: one arm in combination with KEYTRUDA, one arm with KEYTRUDA alone, to try to see can we improve standard of care versus KEYTRUDA monotherapy in melanoma?

The second one is in head and neck HPV negative, where we've got some interesting early signal that we presented at SITC. And we are expanding the Phase I as we speak. The OX40 ligand program is in Phase II in ovarian. The VEGF, as I said, is in Phase II, placebo-controlled. And propionic acidemia is getting ready to move into the clinic. And future modality, we will keep you informed as we learn more about the lung and when the lung might be able to move into clinical development.

So I won't read this slide. We have now 24 programs. That's quite a lot. That just gives you a sense of all the catalysts that are ahead of us.

If you look at Moderna today, 2020 was, of course, a transformative year for the company. We became a commercial company with first product. We are on track to start the Phase III for CMV. We have 3 programming currently in Phase II, and we've had 12 positive Phase I readouts. If you look at the portfolio, on the vaccine front, we now have 9 vaccines for major and medical needs. And on the therapeutic front, we are now playing in 4 therapeutic areas.

The company is strong. We now have 1,300 employees. For the sixth year in a row, we have been named by our employees as one of the top employer in Science. We are on track to make 600 million to 1 billion dose this year. We have been busy setting up commercial subsidiaries. We now have 8 commercial subsidiaries in North America, U.S. and Canada, but also in key countries in Europe. And the company sits strong on the balance sheet of \$5.25 billion as of the end of the year.

We have planned a few events this year to be able to double-click and to provide you new information about our products and our technology. We plan to have our second Vaccine Day this year on April 14, our annual Science Day at the end of May. We will present new advancement in our core science around the platform and our annual R&D Day on September 9.

To close, I would like to share a few thoughts. First, I believe that 2021 is going to be an inflection year in Moderna history. Before, we believe that mRNA might work and might deliver a safe medicine approved. Now we know this is possible. mRNA is an information molecule. Moderna has built, over the years, a very broad platform, making mRNA medicines and vaccines. We're now a commercial company, and we're already generating positive cash flow, which enable us to have a strong balance sheet and to increase the size of the balance sheet so that we can invest in the company to scale the company. Moderna has been built for scale. So far, we were constrained by cash. And now we have a very strong cash position.

It's important to know about us that since our founding 10 years ago, every day we've asked ourselves, how do we grow our impact by 10x? And it's important that you know that today and tomorrow and in a month from now, every morning, as we start the day, we ask ourselves the same simple question that's very powerful: how do we increase our impacts by 10x? I cannot wait to see what the next 10 years will lead and what Moderna is going to look like in 2030. I believe this is just the beginning.

Thank you very much for your attention, and I look forward with the team to take your questions. Cory, back to you.

QUESTIONS AND ANSWERS

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Perfect. Thank you, Stéphane, and we'll bring the rest of the team in here now for these questions. (Operator Instructions) But we have a ton of them to try to get through. No way we'll get to all of them in the 20 minutes or so that we have. We'll work in as many as we can.

So maybe to start, very interested in your assessment of the early rollout of your COVID vaccine, just really the 2, in particular, especially here in the U.S.

Stéphane Bancel - Moderna, Inc. - CEO & Director

Tal, you want to take this one?

Tal Zaks - Moderna, Inc. - Chief Medical Officer

Yes. I'm sorry, I just lost my audio for a second. Could you please repeat that?

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

The -- your assessment of the early rollout of COVID vaccines, especially here in the U.S.

Tal Zaks - Moderna, Inc. - Chief Medical Officer

Yes. So I think what we're seeing is the gradual deployment and the interface between the federal government and the states, frankly. Our job is complete when we deliver our vaccine to OWS. I think beyond that, really, it's up to the logistical challenges between the federal and state levels.

I do think our vaccine offers the states more flexibility in terms of how they deploy it, given the cold chain requirements. We use existing infrastructure. And so we're seeing more and more uptake, but of course, I'm going to defer to OWS for the logistics on that.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. And a question from the audience I'm not surprisingly getting is, what's your view on cutting the dosage in half to reach more people? How confident are you that you will have sufficient inventory for the second dose, assuming President-elect Biden gives "everyone" the first dose?

Tal Zaks - Moderna, Inc. - Chief Medical Officer

So those are 2 separate questions. On cutting the dose in half, look, I think we're advocating for following the data and following the science. The data was obtained all with a dose of 100-microgram twice. We do not have data for efficacy on half the dose. We have some emerging data from Phase II on the immunogenicity, but I think those are early. It will require more work to demonstrate that on validated assays and make sure that what we're measuring actually is an accepted correlate of protection before we would have a sufficiently robust scientific basis for advocating for half the dose. And at that point, we will obviously, have the discussions with the regulators on that.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. And then there's obviously a lot of talk and concern of late about the emergence of these new variants. How confident are you that your vaccine will protect against them? And how concerning is it that the virus can mutate to a point where the vaccines could potentially be less or even ineffective?

Tal Zaks - Moderna, Inc. - Chief Medical Officer

So from what we've seen so far, the variants being described do not alter the ability of neutralizing antibodies elicited by vaccination to neutralize the virus. My definition of when to get worried is either when we see real clinical data that suggest that people who've either been sick or have been immunized are now getting infected at significant rates with the new variants. So for me, it's really a clinical definition.

Yes, we've seen some case reports here and there of people getting reinfected. But in the context of millions getting infected, I don't think that is material. If you look only at neutralizing antibody, remember, we measure the ability to neutralize on a log scale. So if we see a 2 log loss on the ability of antibodies to neutralize, we would get concerned. So far, we've not seen either a scientific level in terms of the assays or a clinical data that would suggest we get concerned.

Now that's not to say that a variant can't emerge that will indeed be SARS-CoV-21. And we'll probably call it something else, if indeed that happens. I think the -- we're keeping our finger on the pulse, just like many others here, and we'll continue to evaluate variants as they emerge. Should such a variant emerge, I think our technology is very well suited to actually rapidly deploy a vaccine based on the new variant. But so far in the data that we've seen to date, we don't see a need for it.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. Another audience question follows on precisely that point. And it says, "One of the major benefits of validated messenger RNA, LMP vaccine platforms is the ability to develop and approved vaccines for virus variants without Phase III clinical trials. Is this Moderna's expectation? Will there be at least nonclinical studies done to verify safety and efficacy before it's given to man?"

Tal Zaks - Moderna, Inc. - Chief Medical Officer

So I think largely, the answer is yes, but it's an expectation, and it will depend on regulatory pathways. Regulators have approved a very clear path for flu, for example, whereby once you demonstrate Phase III data, the next variant, you simply put that in and you show some data for accepted surrogates of protection.

My anticipation is that there will -- should the need emerge, the regulatory framework will follow closely behind that. And scientifically, you would postulate that, that would indeed be the case.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. Question next on scale and ramping up. And you recently raised the lower end of your capacity guidance to 600 million doses this year. What would it take to get to that \$1 billion upside number in 2021 when Lonza's talked about 4 lines with 100 million doses per line? Is the rest at this stage coming from your Norwood facility?

Stéphane Bancel - Moderna, Inc. - CEO & Director

Yes. So the way to think about it is, I think sometimes people confuse capacity and supply. And so what we're basically saying is we have invested Board-authorized CapEx and hiring, since we have a capacity to deliver 1 billion dose in fiscal year '21.

The piece that is very difficult for us to predict precisely, and we want to be conservative and cautious, is what is the year going to look like? And I think there's 2 variable that people need to appreciate. One is manufacturing yields. Given it's a new process, we have not made already 1 billion doses. This is the first commercial product we have. We would rather be conservative on the yield. We have our own assumptions on the yield.

And as the year was going to go by, we're going to see how we're going to make actual yields that are better than what we projected, same or below what we projected. And as you can understand, this will have an impact on what comes out of a system in term of supply.

The other factor is raw material. The supply chain raw material is tight just because nobody was expecting this pandemic. So since last February, we have worked very closely with our key suppliers so that they could start investing last year to get up to the capacity we needed and we have the 1 billion dose as our target capacity since February, March of last year.

But the piece I cannot predict, Cory, is on May 12 -- on July 26, we're going to have all the raw material that day to make the product. We are trying to build safety stock, but we're not at the level of safety stock yet that we'd like to see so that we know, for sure, we can, for every shift, make all the products we can.

We are running 24/7. So if for one shift, that's why I picked random dates this year, if that day, there's one raw material missing, we cannot start making products. And that capacity will be lost forever because we cannot make it up. We are running flat out 24/7. So that's why you see the swing, which is we are structuring the company to deliver 1 billion dose of supply. We today feel very comfortable based on what we have seen in the last few months in term of our yield and our capacity to execute. And as you know, our team is very experienced. This is not a biotech team that has never made commercial product. Our team is highly experienced with commercial products.

The team feels very comfortable with the track record we have now since July when we started making the product that we are on track to deliver at least 600 million doses. As the year will go by, we just tighten that range. But today, we think that 600 million doses, we feel comfortable. That's our base case. And we are working as hard as we can every day over weekday and weekends to get 1 billion dose out of the system to protect as many people as we can.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. Wanted to ask next about your thoughts on duration of immunity at this point. Is this simply a question of waiting to see and following your early volunteers as they have now approached their 1-year anniversary? Or are you able to do any predictive modeling beyond that right now?

Tal Zaks - Moderna, Inc. - Chief Medical Officer

Let me take that. I think it's a little bit of both in the sense that we're watching the antibodies, and we'll be able to measure them in all the Phase I, the Phase II and the Phase III eventually. And I think in the coming months, we hope that there will emerge a correlative protection such that you will know at which level of antibodies who actually want to pick the immune response to.

From what we've seen so far, I think our expectation is that the vaccination should last you at least a year. To the degree that you need a booster shot, we'll make a database recommendation, and that will require us getting the data. So we have to follow people until we see the year. We'll try and boost some of them to see how well a boost works. Remember, with an mRNA platform, you expect the ability to boost almost irrespective of the platform that you were initially treated with.

And so we think there is an opportunity to boost, especially the ones that high risk should you need it, but it will take us some time to generate that data.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. And then a follow-up question from our audience is, what would you expect in terms of reactogenicity or tolerability of a booster when you're down to your -- when you get -- when you're out to your third, fourth or fifth shot given some of the side effects associated with the second shot?

Tal Zaks - Moderna, Inc. - Chief Medical Officer

So I don't -- I think those plateau, and I say that based on 2 observations. First, if you look at our CMV vaccine, which is our first experience where we gave a second booster or a third dose, you don't see worsening of the systemic adverse events on the third dose relative to the second. Albeit it's still early days in small studies, but so far, that's our sense.

Perhaps more importantly, if you look at the COVE study, we had about 600 people, 300 on active vaccine, that were already with antibodies. These were people who had been infected previously. And so they're walking around already immunized, right? And yet, if you look at the adverse event profile, it is not materially different than it is if you were naive, neither on the first nor on the second. Maybe a little bit more reactogenicity on the first, but the second looks exactly the same. And so based on those 2 elements, I do not expect worsening adverse events if people get boosted over time.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. We have a number of questions around pricing and your Advanced Purchase Agreement. So can you just -- are you able to speak to if the right way to think about this is if \$11.7 billion divided by 600 million doses is the right calculation to determine the average price of 1273 for this year. I have it asked like 4 different ways here.

Stéphane Bancel - Moderna, Inc. - CEO & Director

David, can you take this one?

David W. Meline - Moderna, Inc. - CFO & Principal Accounting Officer

Sure. Yes. So I think, Cory, the 600 million is a supply that we're targeting availability for, which is a different number than the contracts. So the contracts, what we've done here is we've simply stated as a matter of an actual signed contract status, we've listed \$11.7 billion. And then what I'd encourage people to do is look at the list of disclosed agreements, so the U.S., the EU, et cetera. And I think if you add that up, you'd find that it's around a little over 500 million, 520 million or 516 million. So a little less than the 600 million. And that's our status as of today. And as Stéphane said, not with option agreements.

So what we'll do then is, as we move through the year, as we see additional contracts that are confirmed, we'll then update the outlook for '21. And to the extent that, that starts extending beyond '21, we'll provide that information.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. I have a couple of questions as well on the allergic reactions that have been noted with the vaccine so far, so just combining these. Could components in the vaccine that are responsible for allergic response, say, PEG, be removed from future batches of mRNA LP vaccines or LMP vaccines? And also, is the allergy potential of these something that's able to be checked in nonclinical animal models?

Tal Zaks - Moderna, Inc. - Chief Medical Officer

So I'll let Stephen talk about the nonclinical models. From a clinical perspective, so far, I think the data that connect PEG to any anaphylactic reactions is really hypothetical and sparse. And our sense so far is that, that's a tenuous hypothetical connection.

More importantly, from what we've seen so far, and obviously, we keep our finger on the pulse here, I'm not sure that we see anaphylactic reactions for our vaccine that are among background -- above background rates. Remember, even flu vaccines cause 1.3 cases of unnatural access per million dose. And I think we'll keep monitoring this. But so far, I think we've seen very, very few cases, and it's hard mechanistically to say what they are due to.

I'll let Stephen talk maybe about the nonclinical and the mechanistic basis for that.

Stephen Hoge - Moderna, Inc. - President

Well, I think Tal already covered pretty well the biggest challenge with identifying in a nonclinical assay or a model, whether you can speak to this is, in fact, that there's really not any mechanistic hypothesis that links the current components of the vaccine against some sort of clinical finding.

And so while it's possible if you could identify that you could reverse engineer it, and certainly people talk a lot about PEG because there has been in the past reactogenicity to PEG and some other PEG-related products have been associated with anaphylactic reactions or anaphylactic reactions as well.

At this point, there is not that data for us to rely on from a clinical study that we can then translate back into a preclinical model that were allowed to screen for it. So it's a little bit premature. I think we're getting ahead of the science on that one.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. Another question from our audience is, how is Moderna studying whether those who are vaccinated can still transmit the virus?

Tal Zaks - Moderna, Inc. - Chief Medical Officer

Yes. That's a really tough question. I think the truth is that transmission studies per se are usually -- usually refer to Hamster studies. There are studies that you do in groups of animals that are in cages that you can actually follow. They're really tricky to do in humans.

Our approximation of that is asymptomatic infection. And I think on that, the presumption is if somebody can't get an infection, even if an asymptomatic one, they're not going to transmit the virus.

On that front, I think we've already shown that even after a first dose for the weeks thereafter, there already is some reduction in asymptomatic infection. And as we get more data from the COVE trial, we should be able to show, based on serology and potentially additional swabs, that we eliminate asymptomatic infection or to a certain degree, we do so. To the degree that you see a reduction in asymptomatic infection, one would then expect you can't transmit because you haven't been infected.

But I think measuring transmission and viral shedding per se is really, really challenging to do in the context of vaccine preventive trials. It's something you can do in the context in the hospital and therapeutics, where you've got family members with immediate exposure, but it's really tricky to do with vaccines.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. A couple of people asking, "What do you make of estimates of herd immunity?"

Tal Zaks - Moderna, Inc. - Chief Medical Officer

Well, I think there are smarter people than me on that front. And I think it's hard to say. And one of the reasons it's hard to say is because it depends on the fraction of the population, and not all fractions of the population behave the same and transmit the same. And certainly, if we see emerging strains that are more transmissible, then they will -- that will mean that you need a higher rate of the population immunized.

So I would expect that you will need 50% or north of 50% is kind of my gut estimate based on the totality of what I've seen out there. But I don't think I've got more expertise to bring to bear on this than people wiser than me in the field.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. We're down to less than 2 minutes here. I wish I could get to all the questions we have here. I won't be able to, but I do want to end with one that kind of bridges over to what the rest of Moderna is about.

So how do you think the tremendous success you've had with COVID-19 reads over to your other infectious disease programs and then even beyond that to your other modalities?

Stéphane Bancel - Moderna, Inc. - CEO & Director

So let me maybe take a first pass at it, and we'll have Stephen's scientific opinion behind it. In the vaccine, because we use the same chemistry for the mRNA, the same manufacturing process to make the mRNA molecule, the same lipid -- the same manufacturing process to make the lipid, we believe there is very high transferability between what we've seen in COVID-19 to the other vaccines.

The other piece of the infectious disease that sometimes people don't fully appreciate is unlike oncology where animal model don't tell you much, in infectious disease, there's a very high level of translation from animal models when you use the right animal model to humans. So we are quite optimistic that for a lot of products that are now in development, we should see good clinical data, which is why, as I've said in the past, I believe we will launch the CMV vaccine because Sanofi had 50% efficacy published in New England with only gB antigen. That was a gB antigen made in a nonhuman cell, whereas we're making product in the human cell. And in addition to gB, we have a pentamer that everybody in the field say is required.

So when you put gB plus pentamer made in the human cell in your own body with the same technology as the COVID-19 vaccine, I believe we'll have more than 50% efficacy. It's too early to say how high it's going to be, but I believe the CMV vaccine of Moderna will be launched one day.

Stephen, do you want to add anything about the transferability from...

Stephen Hoge - Moderna, Inc. - President

I think you've covered it well, except to say that a year ago, we were saying we're -- I think we were saying we're 9 for 9 or a little bit less than a year ago, in terms of viruses where we try to develop a vaccine we developed an effective immune response against that. COVID becomes the 10th or SARS-CoV-2. And I think in some ways, it's a question of whether translation was from those prior experiences into COVID or now from SARS-CoV-2 back into what we're doing in respiratory vaccines in CMV and EBV. But we do believe we've demonstrated the ability to, in a very differential way, produce substantially highly-valuable vaccines against infectious diseases.

I think in the therapeutics context, there's -- it's a little bit more of a step away. But the same basic principle of mRNA can be converted into a medicine that can be efficiently put into cells. We can express a protein. We can reliably reproduce when we do that.

We would argue we've demonstrated with the chikungunya program, where we did 2 different doses -- we did multiple dose levels, but 2 doses are work apart. And saw a dose-dependent repeat dose pharmacology in humans, something we presented in September this year. Already pre-stage is where we're going in the therapeutics context. And in fact, the same sets of translation should happen there. But obviously, we're earlier in that story.

Cory William Kasimov - JPMorgan Chase & Co, Research Division - Senior Biotechnology Analyst

Okay. Well, I wish we had more time to get to all these other questions that we have in continuous discussion. It's going to have to wait for another day. Thank you guys very much for participating, and thanks for all the work you're putting into getting this back to an in-person event next year. Really appreciate it.

Stéphane Bancel - Moderna, Inc. - CEO & Director

Thanks, Cory. Stay safe, everybody.

DISCLAIMER

Refinitiv reserves the right to make changes to documents, content, or other information on this web site without obligation to notify any person of such changes.

In the conference calls upon which Event Transcripts are based, companies may make projections or other forward-looking statements regarding a variety of items. Such forward-looking statements are based upon current expectations and involve risks and uncertainties. Actual results may differ materially from those stated in any forward-looking statement based on a number of important factors and risks, which are more specifically identified in the companies' most recent SEC filings. Although the companies may indicate and believe that the assumptions underlying the forward-looking statements are reasonable, any of the assumptions could prove inaccurate or incorrect and, therefore, there can be no assurance that the results contemplated in the forward-looking statements will be realized.

THE INFORMATION CONTAINED IN EVENT TRANSCRIPTS IS A TEXTUAL REPRESENTATION OF THE APPLICABLE COMPANY'S CONFERENCE CALL AND WHILE EFFORTS ARE MADE TO PROVIDE AN ACCURATE TRANSCRIPTION, THERE MAY BE MATERIAL ERRORS, OMISSIONS, OR INACCURACIES IN THE REPORTING OF THE SUBSTANCE OF THE CONFERENCE CALLS. IN NO WAY DOES REFINITIV OR THE APPLICABLE COMPANY ASSUME ANY RESPONSIBILITY FOR ANY INVESTMENT OR OTHER DECISIONS MADE BASED UPON THE INFORMATION PROVIDED ON THIS WEB SITE OR IN ANY EVENT TRANSCRIPT. USERS ARE ADVISED TO REVIEW THE APPLICABLE COMPANY'S CONFERENCE CALL ITSELF AND THE APPLICABLE COMPANY'S SEC FILINGS BEFORE MAKING ANY INVESTMENT OR OTHER DECISIONS.

©2021, Refinitiv. All Rights Reserved.