Moderna

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Terence Flynn: Good afternoon, everybody. Thanks for joining us. I'm Terence Flynn, the U.S. Biopharma analyst at Morgan Stanley. We're very pleased to be hosting Moderna this afternoon. We have Stephane Bancel who is the company's CEO. Stephane, thanks so much for being here.

Before we get started, for important disclosures, please see the Morgan Stanley Research Disclosure website at www.morganstanley.com/researchdisclosures. Stephane, thanks so much, again, for your time today. Really looking forward to catching up again as it's been a while as we were just talking about before.

Maybe I thought the place to start just high level, give us an update on kind of strategic focus for the company here and capital allocation priorities as obviously we're shifting to this kind of post-pandemic world here. And again, the company has a big opportunity set across the pipeline beyond COVID. But how are you thinking about strategy and capital allocation priorities as we come out of this pandemic?

Stephane Bancel: Sure. Thank you so much for having me, and good afternoon, everybody. As you saw since last year R&D Day, and as you know, we have R&D Day again tomorrow here in New York, a lot of things have changed outside of infectious disease. Because for most people in the world, Moderna was a vaccine company with a single product COVID. Last year at the R&D Day, we showed 2 rare genetic programs, rare disease genetic programs with good clinical outcomes. Then just before Christmas, we had the cancer product, the individualized neoantigen therapy, showing great data versus KEYTRUDA monotherapy in melanoma. And then RSV positive Phase 3 in January, so a lot has changed.

What we're very happy is over the last 10-plus years we invested because we believed we could build the platform, maybe one of the true first platforms in biotech pharma. For 10 years, most people believed this was not possible. But we already built the company in terms of research and investment, process engineering, manufacturing, and so on, believing that it made no scientific sense to us that this would be a one-drug company. It would be either zero or a lot.

What is really exciting to see today is that in infectious disease, we now have 2 out of 2 vaccines, COVID and RSV. The cancer is now in Phase 3, the Phase 2 data is exciting,

and we look forward to showing some more on the Phase 2 when we get it because it's case-based, event-based. And then the rare disease, same. We should have some more data and more progress as we have 6. I really think that over the next few months and quarters, people are going to start to more and more realize that we have a very strong infectious disease franchise. We're not only going to do more now with COVID, flu, and RSV, but then combine them. And then this something later we can talk about. And in cancer, we want to double, triple down.

And as you saw, we did announce yesterday in oncology to be able to code that biology. And then the rare disease, we're still investing a lot in science. We believe it's still the early days of mRNA. We're still investing hundreds of millions of dollars in basic mRNA science in research, not development. We're looking at autoimmune disease, we're looking at lung delivery. Moderna is still extremely focused on expanding the platform. We don't think we're done. And there's a team of several hundred scientists whose only job in life is to expand the use of the operating system. We have 40-plus drugs in development, a couple of launches coming in the next year or so, so exciting.

Terence Flynn: Okay, great. And you alluded to this, you mentioned the R&D Day later this week. Can you give us a little preview of kind of what we should expect? Are there any programs that are going to be in focus? Can you give us a little teaser?

Stephane Bancel: I cannot give you a teaser, because the markets are open for few more hours and it would not be legal to do so. But as we've done every year, we'll kind of give a big update on all the R&D programs. I mean we said that we will have full data in Q3. Q3 finishes in a couple of weeks. We have R&D Day tomorrow, so there might be some full data tomorrow. As we talk about the rare disease program, because those are ongoing, we might just have some update on potentially several programs, some updates on oncology and so on. Yes, it's going to be a bit of everything tomorrow.

Terence Flynn: Okay. Looking forward to it. The one other topic just high-level I want to touch on before we go through some of the pipeline is just the company's investment in AI. Obviously, you guys have been front and center here. It's one of the big themes in the market this year in addition to obesity. Maybe just as you look at what you've seen internally at the company, where has been the highest return on those investments you guys have made? Because the pushback that I got, we did a note, and there was a conference where you guys presented was, when are -- if companies are investing all these CapEx dollars, when are they going to get a return on these dollars? Is this 3 years away? Is it 10 years away? Maybe you could speak to what you've seen in terms of returns from the AI investment.

Stephane Bancel: Sure. We've been doing machine learning way before ChatGPT because we've been a digital company for a long time. And a few examples that actually happened pre-ChatGPT, is for example our teams have used machine learning to invent new enzymes that you use in the manufacturing process. Those enzymes have basically improved the performance of previous enzymes that we used in the earlier days of the company. Enzymes that I expect most competitors are still using. But some of those enzymes were creating byproducts where they're making the manufacturing process, and we had to invent purification technology to take those out from the products so they don't end up in the vials.

Well, we engineered for machine learning new enzymes that don't exist in nature, that we proved to ourselves really work better, proved to the regulator they will work better where you don't need the purification anymore, and we removed the purification step out of manufacturing. We saved CapEx, OpEx, people, forever for every product of the

portfolio. I don't have a precise ROI for you because I don't know what the sales are going to be forever, but I don't have the finance team to run a long complex financial model to realize for the investment in dollars that is still in the hundreds of thousands of dollars in terms of IT teams and so on. The return is pretty spectacular.

Those types of examples were happening pre-ChatGPT. What we've done when ChatGPT happened and we all played with it at Christmas, like oh, geez, we want to use that to run the business. But we didn't want to teach ChatGPT what we use as a company. The team has basically built a system called mChat that we talked about on our Q2 call, that roughly half of our employees, so 2,500 people, now use every day. We're starting workshops and an AI Academy to teach people how to write prompts, because as you know, for me, large language model is all about relearning your job and how to use the systems. And how do you learn to write prompts? I mean one example, last week I was at a factory in Norwood, and actually a lady from Germany was showing us how she used ChatGPT, I mean, mChat, the Moderna platform, to code Excel macros to do a job schedule that she used to do by herself in macros. And she taught herself and used mChat to basically do all of her Excel kind of macro coding that she had never done before, and she was taught by mChat how to do that.

People use that across the board. I have seen a couple examples where our scientists actually are using it now to try to discover new chemical structure for lipids and where the system is actually speaking chemical structure that people then are making and trying in animals. I think it's going to be really across the board. And some will get returns in a matter of quarters. Some, if it's a new molecule that has to get approved of course will be a multiyear journey. But our belief is that the ability to use large language model or machine learning to complement humans, to learn much faster. Because we believe it's a world where compounding and learning is keen, and what's really good, especially as a new technology disruptor, that we want to use it across the company. We use it in research. The teams are using it now with regulatory to actually answer regulators' questions because the questions are always similar but put in a different way. And you can think about how you can even scan employees of regulatory teams' email, check the documents, put the answers. They just look at the answers and then submit it, so think about the time saved. We're trying to really use it across the board, but it will take a bit of time.

Terence Flynn: Okay. That's great. I guess just moving on to the pipeline, and maybe we'll start with COVID first, and the vaccine strain. I know you got the approval yesterday from the FDA for the updated XBB.1.5 strain, but there's also a couple of other variants, including BA.2.86 that's circulating. I guess my question is just as you look out here, do you still think an annual update is most appropriate? Or is this something where because there's still so much uncertainty around COVID and how this plays out, that we might need more frequent updates than annual? I mean how do you think about that in the context of where we are right now today?

Stephane Bancel: Sure. Again, when you go to COVID, a new virus, you always want to start by saying you need to be humble about what you're going to say next. What we currently believe is the virus is not going anywhere. People that are at high risk are going to need annual boosters. Would you need people at very high risk to need twice a year boosters? It is possible. Some countries are doing that out of caution. 75-plus people that have cancer, immunocompromise and others. But if you think about the general population, we don't think people are going to need two boosters a year. We think one booster a year will be good, a bit like a flu-like model where you have the regulators now picking up the most recent strain.

As you know, we've run -- we're actually the only company that has run a clinical study with XBB in humans. And we've run that -- those broad samples against all the variants you mentioned, all the new ones, which were very high level of antibodies. We don't see loss of neutralizing antibodies. And as you know, unlike an antibody treatment, when we all get a vaccine, we don't make one antibody, we make a super antibody. You make new ones for the new epitope you have never seen before because of mutation, but you're your old antibody repertoire gets boosted away. I think it's important people remember that 1 antibody, 1 epitope, is actually a super antibody.

Terence Flynn: Okay. That's very helpful. And I guess the corollary question is, just remind us the biggest driver or variable in terms of the kind of low end versus the high end of your guidance for this year. And then the related question is, at the end of this year, do you think we as an industry will have enough to project kind of how COVID plays out over the medium term? Because I think that's still one of the big uncertainties for a lot of the companies.

Stephane Bancel: Indeed, we've given a range of $6 billion to $8 billion of sales this year, and the swing is the U.S. vaccination rate. If you believe it's going to be 50 million doses in arms similar as a percent of what happened last year in the U.S., you are in the $6 billion range. If you think it's going to be closer to 100 million doses in arms, it may be closer to the $8 billion, upper range. Just to remind people, we're not close to those markets. Flu is 150 million doses in arm in the U.S.

What I find really interesting about what we all believe, and everybody I'm sure has a different answer if you run a survey of what will happen, we will learn much more around Christmas, is -- what is really hard for me to believe is that 1 in 3 Americans, the 150 million doses, that are going to walk into a pharmacy of a doctor saying, I want a flu shot, is not telling the pharmacist or the doctor, please don't give me COVID. Don't give me a COVID shot. Because that's why you do the math from 150 to 50, the low case of things. Do I believe we're going to be as low as last year? I don't.

I think last year, there was a lot of confusion. There was a lot of fatigue. Some people had gotten a Spring '22 booster, and so it was the January or February or December Omicron booster. That was just a lot of booster for everybody. We're investing a lot of our marketing efforts in how do we increase the vaccination rate in the U.S. in people at risk? We're not going to try to spend marketing dollars to convince the 25-year-old healthy to go get a vaccine. If they want one, they walk into a CVS, they'll get one. And we'll be very happy of course if they get protected.

But what we're really trying to use our marketing budget in the fall is, how do we drive utilization on vaccination for people that are high risk? That's really our target population. We're doing a lot of things on digital social platforms where you'll see influence. We're doing a lot of stuff that's going to kick out now because we waited of course for the approval.

Terence Flynn: Before the U.S. Open?

Stephane Bancel: Yes, we had the U.S. Open which was more corporate branding. But if you look at the target population of U.S. Open, it's directly in our age range that we care about.

Terence Flynn: Okay, great. I guess the other question is on the spend side. Given that wide range of outcomes and given we'll know more, how do you think about the levers on spend as you

think about the range of COVID outcomes? And obviously, you have this huge opportunity set that we were just talking about before that you want to continue to move the ball forward on. How do you kind of balance all those priorities?

Stephane Bancel: Sure. A few things. If I just take the P&L quickly in terms of cost, we built a very large manufacturing footprint during the pandemic, because we had to in terms of saving lives, getting people back to living a normal life, like meeting together physically. And also, of course, maximizing the business opportunities that was ahead of us. We knew that coming down from the pandemic we were going to be oversized. Not to be genius to know that. I got 2 shots of COVID from Moderna in 2021. I never anticipated I would get 3 shots of COVID from Moderna the following years, going back to our previous discussion. If we put this too big, which is why if you look at what Jamey, our CFO said on the Q2 call, if you take out the onetime drivers, the cost of goods was around 20% like it was before. But when you add the write-offs we had for the old vaccine, 1273 that we don't need anymore, and the unused capacity at the partners we have, that drove down the gross margin. Of course, that's not the way you want to run the business.

What we are doing as we speak is actually working to right-size or downsize our manufacturing footprint across the board to get our gross margin back to where it should be according to industry standards and so on.

On R&D, there was a huge jump in R&D from last year to this year because of where I started our discussion, which is the rare disease became rarer. The cancer was like, wow, the data is spectacular. And then RSV in January. So geez, we're 2 out of 2, the platform that we believe we have, we have, so let's create value. Because we had $20 billion on our balance sheet, it's like we have all that capital thanks to COVID. And then we have a platform working. And the vision has always been, if this platform is going to work and to be able to just crank a lot of products, and they're going to have a much higher probability of success to get to launch, then you have traditional pharma. We don't want to sit on the cash in T-bills and just wait for the platform, and so you saw this big jump in R&D because we went from being a COVID company to a lot of Phase 3s. But as Jamey, our CFO, explained at Vaccine Day, the good news about for example the respiratory Phase 3s is, they are going down.

For example, COVID cost of R&D is going down. As I said, we just did a small Phase 2/3 study for the XBB variant. The cost versus 30,000 people Phase 3 is a fraction of that. RSV, the product has been filed, so of course we have a tail end of cost for the safety monitoring of the participants in the study, but RSV is going down and in a couple of years will be close to zero. And same thing with flu. If you think about that franchise as a business, you're going to be maybe 2 years from now where the R&D cost is going to be down 70% from where it is now. But you're going to have those sales forever and then you're going start to combine. And those are small studies, those are immune bridging studies.

The R&D in onco we share 50/50 with Merck. And rare disease is like $70 million, whatever, for $50 million, $70 million for Phase 3. It's a rounding error on the $4.5 billion budget. And so if you think about Moderna's budget, I think it is reasonable to anticipate a similar level of spend, but not the growth we have seen on '22 into '23. You're not going to see the same growth '23, '24. It just doesn't make sense math-wise. And then we want of course to be careful in terms of spend into the P&L.

The other piece in terms of SG&A, if I kind of maybe close quickly there is, as we launch RSV and flu, it's the same medical team. Because it's infectious disease docs on our side

talking to infectious disease docs on the other side. I'm not going to add capacity in medical and so on. In the U.S., because we are already commercial this year, we hired a lot towards the end of last year and early this year. I think the P&L is going to improve on cost of goods, but the R&D or SG&A is not going to grow.

Terence Flynn: Yes. Okay, understood. I guess what -- I guess you're going to have other Phase 3 programs that are going to backfill for the respiratory Phase 3 because you said those are going to be rolling off, so --

Stephane Bancel: Yes. Flu, COVID, and RSV are going to roll off. Then you're going to have those studies to combine, because as you know, combination is a huge piece of our strategy, but those are small. Those are a few thousand people, not 30,000 people. Those are immune bridging, so it's 6 months of safety, not 3 or 4 years of safety. When you look at it from a cost standpoint, it's just a fraction of what the Phase 3 efficacy studies are.

Terence Flynn: Right. Okay. Very, very helpful. I guess that's a good segue to the seasonal flu program. Again, it sounds like we'll get some more details here over the near term. But maybe just remind us what the target profile was that you set out to achieve. And then, any more deals around this new construct, maybe changes you guys made to better address the B on this?

Stephane Bancel: Yes. In terms of -- let me start by the end game, and I'll come back. Our end game is to have combination products, COVID, flu, RSV, with a much higher efficacy on flu. We believe scientifically that there's a lot of tools we have with the mRNA platform to drive a much higher efficacy through product. As you know, flu in a good year, the efficacy is around 60%. In a bad year is around 20% to 30%, where there's a big shift of strain between what WHO guesses in February and what happens within in the U.S. following fall.

And we think we can get there in 2 ways technically. One is to add more H3 strain in the product. Why? Because H3, which is A influenza, drives 80% of hospitalizations. And when WHO picks one strain, they pick one strain of H3. Why? Because the protein guys can only make 4. They need 2 As and 2 Bs at the current setup, so we cannot pick two H3s.

But in the case of Moderna, you can look at the H3 that WHO picked and which one was next on our list. And which one was next on our list and put them together. As you know, a CMV vaccine has already 6 mRNAs in Phase 3, most fully enrolled, 6 mRNA in the vial. Putting 6 mRNA for 3 H3s and 3s that cover the A and the 2 Bs doesn't scare us technically. And so that's one way.

The other way is using both the HA and the NA antigen. As you know, flu gets into human cells by over binding through the HA or the antigen. But the current products contain the HA. And if you believe why 20%, 50% in a good year in our efficacy, we believe it's because the virus can still get into human cells and replicate in your body and create disease. And so we think that the perfect product for the magic wand is put the HAs, put GNAs and put several H3s. You're going to really have very few people getting hospitalized if they go through a vaccine. And that's what we're aiming at, and we want of course to do this with COVID and with RSV.

As you play a movie backwards, we have a lot of debate with the team. Do we go for the perfect flu product as I described, but it might be a couple of years out in terms of launch? Or do you go more like an iPhone-like strategy, which is start with a noninferior

product to get your foot in the door for mono that is noninferior to what people can get at the CVS. And you can combine with COVID. Because I already believe commercially there's a huge opportunity for us to take share from the other mRNA player in COVID monotherapy and the flu guys if you can bring the combination in a single dose. Nobody likes to get 2 shots. One shot is better. But especially the payers. One of the things we realized during COVID, given we talked to a lot of health care ministers and their teams and so on, is they are trying to worry about how are they going to deal about the post-COVID pandemic world. Where we hope that people at risk will get a COVID shot, a flu shot every year. And now you put RSV into the mix. And they're like, what's going to be the compliance of that? Because that's what we want, so people don't get hospitalized. Because we should not forget, the respiratory diseases combined are the third cause of death after cardio and cancer.

It's a big issue for governments who in most of the world, as you know, pay the bill. And as you now, we've done long-term deals with the U.K., like U.K., Canada, and Australia. 10-year deals building a plant, and 10-year supply deal. In the U.K., they did the deal because they did the math. Given aging population and you need to build the capacity of your hospital for the peak winter season, that they will have to build more hospitals in the U.K. at a very high cost of course. And their biggest worry was being able to even staff the hospitals. And when they look at all that, they're like geez, if we could get a combinatory vaccine into a single dose, and if we know Stephane got his vaccine from Moderna and we know he has COVID and flu and RSV protection, we're very happy with it. So that's a bit how we've been thinking about this.

Terence Flynn: Okay. Maybe 2 related questions. Is one of the -- you talked about the perfect profile included all these different combinations. Of those, what one did you implement to improve the formulation from the prior to the one we're going to see?

Stephane Bancel: Yes. The one we're going to see by the end of this month for the P303 study is we changed several features that we cannot disclose because there's a couple other companies doing mRNA flu vaccines, and proof of data that some have shared we think they have similar technical challenges that we have. But because of our insights we have on the platform, given we've been doing mRNA for 11 years, we think we fixed it. That's what Stephen Hoge, Head of R&D, stated at R&D Day. Again, we'll see the data this month. But it's several changes that we did across different parts of the product design that makes Stephen and the team confident it should work. We'll see when we get the data. And that's really the first-generation product. It's a noninferior product. It was designed as a noninferior product to what you can get at CVS because we believe that's what you minimally need to combine with COVID.

Terence Flynn: Okay. And I guess the second question is just the other debate I think is just the reactogenicity when you add let's say 2 vaccines or 3 vaccines together into one. Are you comfortable when you talk about the ideal vaccine candidate, a triple combo vaccine, that the reactogenicity profile is going to be comparable to what you see with a single COVID?

Stephane Bancel: It's interesting. We've already done combinations. Most people have forgotten because it was pre-COVID. But if you go back to our data and our R&D Days before COVID, we showed in adults first before going to infants, for hMPV, PIV2 respiratory virus that's impacting infants quite a lot combined. And we don't see more reactor combining them than not. The vaccine we're going to be able to play with this dose, which is as we all know, the Moderna vaccine is way superior in terms of reducing hospitalizations than the overall mRNA vaccine. And we believe it is mostly driven by the dose. At 50

micrograms, we're almost twice the mass of mRNA that you get versus the other the other mRNA vaccine. If you look at the data, in big, big real world evidence studies as you're highly aware, but maybe not everybody in the audience, there's a marked drastic difference in hospitalization rates between the Moderna vaccinees and the other mRNA vaccine vaccinees.

We believe that there is also potentially ways for us to play with dose, including product sharing several products. I think the flu business, there are some high dose products and some low dose products. Why would the COVID flu require the same thing? And it makes sense that the 25-year-old that's healthy with a strong immune system might not need the same as the 75-year-old who has comorbidity factor and T cells having dropped like crazy. And so I think 2 products as you deal with the age might be actually the right way to basically do different product positioning.

Terence Flynn: Okay, great. Just in the interest of time, I think we'll move on. But I want to talk about the individualized neoantigen therapy. And the question we get a lot is just how should we think about the near-term opportunity for an accelerated approval here based on the Phase 2 data? I mean I think historically, it seems to me that FDA usually sets a very high bar, particularly in adjuvant, early-stage cancers. Whereas late line, the bar is lower for obvious reasons. And so, I guess, how do you think about that opportunity when you weigh that and historical kind of FDA stance on adjuvants?

Stephane Bancel: I personally believe that we have a good case for an accelerated approval. Let's go back to what do we need to be able to even file. We need the Phase 3 to be started, which now is the case since the end of July. As you know, the regulatory agencies, and I think they are right, do not want to give excess approval because some companies as you know have in the past slow worked their Phase 3. That's not fair. I mean the deal is, we believe it might work, prove to me it works, it's working. In the meantime, I give you accelerated approval. We started the Phase 3 ahead of time, which I'm very pleased about the work the teams have done, both the Merck team and the Moderna team. We should start very soon the lung study in Phase 3, so that's done.

The second piece we need is a bit more data. As you know, there's the next interim data without -- coming potentially in the coming months. I'm not talking weeks, but I'm talking quarters, coming months. And the third piece is manufacturing, which is -- not a lot of people ask about manufacturing, which is I don't think you want us to file for accelerated approval and not be able to sell. That's not super useful. And then there's also a peer side of the house with the doctors and the patients, which is I don't want to have a product approved that I cannot supply. And because it's individual, it's the only product of all the portfolio that cannot use the same reactors as COVID. Think about the platform, just to go back to it before I go back into more details on manufacturing and INT. The platform, whether for flu, COVID, RSV, rare disease, it's all the same reactor it's using. That's the beauty of a platform. I don't need another plant. It's the same reactor, the same teams. The only exception we have in the entire portfolio is INT. Why? Because if you and I have prostate cancer, we're going to get 2 very different chemical matter, so we may make one in a small volume for you and one in small volume for me.

That's what we're actually currently building for launch. If you look at our Q2 press release, we bought a site in Marlborough, very close to our Norwood, Massachusetts site where we -- it's basically a flagship site where all our process engineers, more than 500 of them, are. And we are building the Marlborough site so that we can launch out of there. But when you submit approval, you need to submit your CMC package. And for your CMC package, you need to have something built and be clear how you're going to do it.

If not, you cannot even submit the package.

We're trying to just triangulate those 3 things. Again, the Phase 3 study is done, that's good. And I think again, if we can recruit a big chunk of the Phase 3 that will help the FDA. But also other regulators, because we cannot forget -- because of course we cover the FDA because it's the biggest market in the world. But the Phase 2 was started in Australia. The Phase 3 was started in Australia. This is the country with the highest incidence of melanoma in the world. It would be great if the FDA was the first country in the world to give us accelerated approval, but it could be another country that will also help us tremendously in many ways.

Manufacturing is the very piece that we are working a lot on and try to find the right balance when is the right time to basically have all that dataset. Again, soon, we should have additional data in the Phase 2. Because if we hold or even improve the efficacy profile compared to KEYTRUDA, because if you look at the survival curves, which I know you have, the Moderna curve is flattening. The KEYTRUDA curve is not. And we know what it looks like because we have our Phase 3 data. So my guess, and I've seen no data because it's an event-based study, my guess is it might widen even further.

If you show the time duration of treatment with even a better profile than we have now, and even if it's what we have now it's superb at 44% improvement, I believe a lot of regulators around the world are going to want to go just because of how many lives you could save. And if you look at the downside, going back to your comment about later cancer stage, the downside will be safety. The safety profile is similar to KEYTRUDA. If you think about it, if you can have 44% of people having a better outcome with roughly the same safety profile, I don't think it will take a lot of doctors or patients a long time to decide which one they prefer.

Terence Flynn: Great. Well, I think we're up against time, Stephane, but always a pleasure.

Stephane Bancel: Thank you so much.

Terence Flynn: Thank you.