Attachment—Additional Questions for the Record

Subcommittee on Oversight and Investigations
Hearing on
"Pathway to Protection: Expanding Availability of COVID-19 Vaccines"
February 23, 2021

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The Honorable Anne McLane Kuster (D-NH)

1. Can you speak to your reliance, if any, on foreign sources for vaccine manufacturing supplies?

At this time, there is minimal reliance on foreign sources for our US supply chain. Some raw material components have foreign manufacturing sources as well as a portion of the adjuvant utilized in NVX-CoV2373. Our facilities in the US will provide vaccine doses for the US. We have a separate supply chain for foreign demand. Over the summer, we announced an agreement with Fujifilm Diosynth Biotechnologies for the manufacture of bulk drug substance and Jubilant HollisterStier to provide fill/finish manufacturing services. The protein antigen produced at the Fuji sites in North Carolina and Texas are critical components of our US supply chain. Adjuvant production and fill/finish are also completed in the US as well.

2. Considering the federal government's actions to date, what gaps or restrictions still exist across the domestic manufacturing supply chain and the export/import landscape that influence your decision to use foreign over domestic sources?

We have collectively seen tremendous success with vaccine development in the past year and that is only because the federal government and the private sector brought their full resources to bear against this pandemic. This pandemic response has required every mechanism available to create a resilient US-based supply chain, and it is important that these tools be used strategically and as part of a comprehensive approach.

3. What changes should be made for you to prioritize using domestic sources?

We are using domestic supply sources to the greatest extent possible and do not believe any changes need to be made at this time.

4. Can you speak to what constraints, including with respect to specific products within the supply chain (e.g., APIs, bioreactors, glass vials, stoppers, fills/finishers, etc.), are currently preventing the production of more vaccines?

We are not facing any domestic supply constraints. The pandemic has created global material and supply constraints for all of the COVID vaccine developers. We are working closely with our supply chain partners to prepare for and find solutions for these challenges outside of the US.

5. Can you speak to how making the investments called for in the American Rescue Plan, like the investment in new factories, may optimize vaccine fill lines to ensure maximum efficiency to meet future demands?

Incredible progress has been made towards ending this pandemic, and that progress is in part due to the extensive support and investment provided by the federal government. Novavax was awarded up to $1.75 billion by the federal government to complete late-stage clinical development in the US, including a pivotal 30,000 subject Phase 3 clinical trial; establish large-scale US-based manufacturing; and deliver 110 million doses of our COVID-19 vaccine candidate, NVX-CoV2373 to USG and DoD. This essential funding, together with the dedicated partnership of the US government, has provided Novavax the ability to conduct a timely and robust clinical development program while simultaneously establishing a dedicated US manufacturing and supply chain for this pandemic.

The Honorable Lori Trahan (D-MA)

1. T cells and antibodies are two arms of the immune system that provide insights into disease activity and an individual's personal immunity. Serology is more commonly used to measure immune responses to infections. Since antibody responses wane within 2 – 3 months of COVID-19 infection, serology alone is not enough to assess personal immunity or "herd immunity" against SARS-CoV-2. We have seen that other countries have approached vaccine approval differently than the U.S. For example, the United Kingdom established a "vaccine task force" to objectively compare the T-Cell and antibody immune response of each vaccine approved for usage in the country. Based on published reports, the UK government felt this was important to enable objective comparison across vaccine modalities. Did any of your company study T-Cell responses during the development of your vaccines?

Novavax conducted a phase1/2 trial to evaluate the safety and immunogenicity of NVX-CoV2373 and secondary outcomes included T-cell responses (ELISpot and cytokine staining), among other things. The benefit of our vaccine with Matrix-M™ adjuvant was clear in the magnitude of the cytokine response with Th1 bias. Cell-mediated testing is ongoing for samples from our phase 3 study in the UK and will be conducted in our US phase 3 study as well. For additional discussion, please refer to our publication of this trial in the New England Journal of Medicine, *Phase 1–2 Trial of a SARS-CoV-2 Recombinant Spike Protein Nanoparticle Vaccine*. While there may be some benefit to T-cell responses, the most important outcome is the efficacy of the vaccine against mild, moderate, and severe disease caused by COVID-19, which has been demonstrated with our vaccine in a pivotal Phase 3 trial in the United Kingdom and is currently being studied in over 30,000 participants in the US.

2. When thinking about expanding the availability of vaccines, one thing that is extremely important is that vaccine distribution is done in an equitable manner. Many state leaders, including those in my state of Massachusetts, tried to approach plans for vaccine distribution early on in an equitable way—they consulted with public health leaders to develop a tiered plan to equitably prioritize distribution. Due to the limited supply of vaccines and slow distribution to the state, the implementation has heavily relied upon mass vaccination sites. While mass vaccination sites may work well for some patients, others will be best served by their own physicians, in their own communities. Physicians are a trusted source of medical information, and they can proactively reach out to their patients who need the vaccines most, including the elderly, the sick, and specifically communities of color who have been disproportionately affected by this pandemic. Mass vaccination sites, while getting the vaccine out quickly, prioritize those with access to transportation to get to the site, as well as resources to navigate the process to register for a vaccine. What role can manufacturers play in helping states get vaccines distributed to physician practices—whether by allowing smaller shipment sizes tailored to physician offices (that may only need ~50-100 vaccine doses) or creative solutions to aid in vaccine storage?

    a. What assistance would you need from the government for this, in terms of ramping up production/manufacturing and packaging shipments in a manner tailored to physician offices?

During the pandemic, the government made the decision to manage the distribution process. We will continue to work with government leaders to ensure patients who need a vaccine get it. When the pandemic is no longer a public health emergency, we will provide our vaccine through the existing vaccine distribution networks and do not anticipate needing any assistance from the government.

The Honorable Morgan Griffith (R-VA)

1. What types of process improvements and innovation can lead to boosting vaccine production?

There is significant value in the utilization of nanoparticle technologies because they can lead to highly potent antigen and combined with an adjuvant provide a dose-sparing effect. We have also found that utilizing a manufacturing process using fully optimized and mature platforms provides better yields in production and this is best achieved by investing in these platforms in advance of a pandemic. In addition, we have found that the incorporation of an adjuvant improves immune responses and enables vaccine dose-sparing. Our Matrix-M adjuvant means that our vaccines can use lower doses of antigen to achieve the desired immune response, which results in increased supply and manufacturing capacity. Finally, development of new manufacturing technologies for higher throughput can maximize existing facility capacity.

2. Given the variants that are circulating across the world and that we may need a booster or annual shot similar to the influenza vaccine, how quickly can your vaccine manufacturing platform be adapted to scale up and manufacture a new or altered vaccine formula?

Novavax initiated development of new constructs against the emerging strains in early January

and is already testing them in preclinical models. Our vaccine platform is easily adaptable to producing other versions of the protein that match the new strain. The company plans to initiate clinical testing of these new vaccines in the second quarter of this year, and we are already producing newer versions of the antigen at small scale and are finalizing plans to produce at commercial scale.

3. Has your company developed partnerships with other companies to provide your company with assistance in the vaccine manufacturing process?

    a. Is your company looking to develop additional partnerships?

Novavax has partnered with dozens of organizations around the country and world to maximize our ability to meet global and domestic demand once we receive the necessary regulatory authorizations. This includes our decision to license and transfer our technology to partners like the Serum Institute of India, Takeda, and SK Bioscience to ensure that our vaccine will be widely distributed and accessible to the world's most vulnerable populations. In addition, we recently announced that GSK will provide fill and finish manufacturing capacity for Novavax at its Barnard Castle facility in the North East of England beginning as early as May 2021.

4. Is your company utilizing, or has explored utilizing, the Department of Health and Human Services' (HHS) Centers for Innovation in Advanced Development and Manufacturing (CIADM) program to expand existing manufacturing capacity? Why or why not?

Novavax has partnered with Fujifilm Diosynth Biotechnologies Texas, a subcontractor of the CIADM, at its Flexible Biomanufacturing Facility in College Station, Texas, for production of the bulk drug substance for NVX-CoV2373.

5. As time passes, the virus continues to mutate causing new variants to emerge. Can you explain the level of difficulty involved in creating a booster shot to provide protection against these new variants, specifically in an mRNA vaccine?

We cannot speak to the difficulty of developing an mRNA vaccine booster, but we can provide details on our protein-based vaccine. A primary benefit of our adjuvanted recombinant nanoparticle platform is that we can create new vaccine candidates quickly and it uses a very small amount of antigen, enabling large-scale production of new (or perhaps multivalent) vaccine candidates that could potentially address multiple circulating strains of COVID-19. Combined with the safety profile that has been observed in our studies to-date of our COVID-19 vaccine in more than 50,000 participants, as well as prior clinical studies in influenza, we are optimistic about our ability to rapidly adapt to evolving conditions. Ultimately, we also hope to study the use of our vaccine as a booster for other authorized COVID-19 vaccines, as we believe our technology is very promising in this respect.

6. As you clinically evaluate the dosage for a booster shot to provide protection against new variants, do you have any projections for the necessary dose in these booster shots? How will this estimated dosage affect production capacity?

Any monovalent vaccine will likely use the same dose we are assessing in phase 3 studies, yet we are also investigating an even lower dose which has the potential to be just as efficacious and dose sparing. Our safety data would allow for the creation of a multivalent vaccine with up for 5 times the amount of antigen in our current phase 3 trial vaccines.

The Honorable Neal P. Dunn, M.D. (R-FL)

1. In addition to your heroic efforts in vaccine development, are your companies also engaged in research and development of therapeutics? That is to say anti-virals that could potentially have a broader spectrum of activity across the coronavirus variants?

Novavax is a biotechnology company that promotes improved health globally through the discovery, development, and commercialization of innovative vaccines to prevent serious infectious diseases. At this time, we are exclusively focused on bringing our COVID-19 vaccine candidate to the market and are not developing any therapeutics.