This is a preliminary, unedited transcript. The statements within may be inaccurate, incomplete, or misattributed to the speaker. A link to the final, official transcript will be posted on the Committee's website as soon as it is available.

RPTR TELL

EDTR HOFSTAD

EXAMINING U.S. PUBLIC HEALTH PREPAREDNESS FOR AND RESPONSE EFFORTS TO SEASONAL INFLUENZA

THURSDAY, MARCH 8, 2018

House of Representatives,

Subcommittee on Oversight and Investigations,

Committee on Energy and Commerce,

Washington, D.C.

The subcommittee met, pursuant to call, at 10:58 a.m., in Room 2123, Rayburn House Office Building, Hon. Gregg Harper [chairman of the subcommittee] presiding.

Present: Representatives Harper, Griffith, Burgess, Brooks, Collins, Walberg, Walters, Carter, Walden (ex officio), DeGette, Schakowsky, Castor, Tonko, and Ruiz.

This is a preliminary, unedited transcript. The statements within may be inaccurate, incomplete, or misattributed to the speaker. A link to the final, official transcript will be posted on the Committee's website as soon as it is available.

Also Present: Representative Green.

Staff Present: Jennifer Barblan, Chief Counsel, Oversight and Investigations; Adam Buckalew, Professional Staff Member, Health; Karen Christian, General Counsel; Ali Fulling, Legislative Clerk, Oversight and Investigations/ Digital Commerce and Consumer Protection; Ed Kim, Policy Coordinator, Health; Jennifer Sherman, Press Secretary; Alan Slobodin, Chief Investigative Counsel, Oversight and Investigations; Austin Stonebraker, Press Assistant; Natalie Turner, Counsel, Oversight and Investigations; Hamlin Wade, Special Advisor, External Affairs; Christina Calce, Minority Counsel; Chris Knauer, Minority Oversight Staff Director; and Miles Lichtman, Minority Policy Analyst.

Mr. Harper. Good morning.

This year, like so many previous years, we have had a bad flu season. After months of record-breaking, widespread flu activity, the CDC has reported that the flu season has finally peaked. We are probably still going to see flu activity until the middle of April, so if you have the flu or flu symptoms, it certainly is important to see your doctor and stay at home.

Influenza is a leading cause of death in the United States, especially in a severe flu season. Every year, thousands of Americans die from the flu and thousands more are hospitalized from flu-related complications. Since 2010, the flu has caused between 12,000 and 56,000 deaths per year.

This year was no exception. Tragically, as of February the 24th, there have been already been 114 influenza-associated pediatric deaths this season. Some of those deaths have occurred in my home State of Mississippi. Although we have enhanced our preparedness for the flu in recent years, there is still room for improvement.

The best way to prevent the flu is by getting your flu shot. Billions of Americans receive a flu shot every year to help protect them against this illness. Unfortunately, there are many Americans that do not do that. Last year, only 59 percent of children and about 43 percent of adults received flu vaccination.

Even though only a little over half of Americans typically get vaccinated, CDC estimates that flu vaccination prevented 3,000 pneumonia and influenza deaths during the 2015-2016 flu season alone. Increasing the number of Americans that get the annual flu vaccine will prevent more deaths and illnesses.

Not only can the flu vaccine help prevent an individual from getting the flu, but it also helps reduce severe outcomes when someone does get sick with the flu. During past seasons, about 80 percent of flu-associated deaths in children have occurred in children who were not vaccinated.

Similarly, a recent study found that receiving the flu vaccine reduced severe outcomes in hospitalized patients by reducing deaths, reducing ICU admissions, reducing ICU length of stays, and reducing overall length of stay for hospital patients.

While the flu vaccine is currently the best tool to prevent illness, there is room for improvement. The CDC recently announced that this year's flu vaccine was only about 36 percent effective in preventing an individual from getting the flu. The vaccine's effectiveness varied from different age groups and for different strains of the virus. For example, the vaccine was 59 percent effective in children. However, it was much less effective in adults. For all age groups, the vaccine was only 25 percent effective this

season against the deadliest strain of the flu, H3N2.

The vaccine's reduced effectiveness against H3N2, the most virulent and predominant strain of the flu this season, is especially concerning. Historically, we have struggled to make an effective vaccine against H3N2.

For example, during the 2014-2015 flu season, this committee closely examined the flu vaccine's reduced effectiveness due to the mismatch between the H3N2 strain used to develop the vaccine and the H3N2 strain that was actually circulating.

During the 2014-2015 season, the flu vaccine was only 9 percent effective because the H3N2 virus had mutated before the flu season began. This experience reminded us of the importance of being able to rapidly detect and respond to changes in the challenging and circulating flu viruses.

According to the FDA, this year, the vaccine's reduced effectiveness against the H3N2 virus was not caused by a mismatch. One factor that may explain why the flu vaccine was not that effective against the H3N2 strain is a mutation caused by the vaccine and egg adaptation through the egg-based manufacturing process.

Currently, about 80 to 85 percent of the flu vaccines are manufactured through the egg-based manufacturing process. When an inactivated flu virus is grown in chicken eggs during the vaccine

manufacturing process, genetic changes can occur in the virus that make the vaccine less effective in humans. Some researchers think that egg adaptation might be especially problematic for the H3N2 virus.

Of course, there are many different factors that also might explain the flu vaccine's reduced effectiveness for H3N2. This issue needs to be thoroughly investigated so we can improve the vaccine manufacturing process, if necessary, and improve the vaccine's effectiveness in the future.

I appreciate the hard work and dedication of the people at HHS to improve our flu preparedness, including those at CDC, NIH, ASPR, and FDA. One of our top priorities is to keep Americans healthy during flu season and improve the Federal public health response. And I look forward to today's testimony.

The chair will now recognize the ranking member, Ms. DeGette, for purposes of an opening statement.

[The prepared statement of Mr. Harper follows:]

******** COMMITTEE INSERT ********

Ms. DeGette. Thank you so much, Mr. Chairman.

I am always happy to have this flu hearing, which we seem to do every year. Looking at the witnesses, I feel like we are getting the band back together again to talk once again about what we can do.

I appreciate you all coming. And I am hoping that this year we can actually make some progress in talking about all of these issues that the chairman mentioned.

We have had in this subcommittee seven hearings on flu preparedness since 2004. Most recently, in 2015, we had two hearings after the country was hit with a particularly severe 2014 and 2015 flu season, in which the H3N2 strain of flu predominated. This year, again, we are experiencing a severe flu season caused by the H3N2, and that is really a stark reminder of how the flu is very, very serious.

Hospitalizations have been high throughout the country. A hundred and fourteen children have died. As an example, my home State of Colorado set two records, not good records, this year, with nearly 4,000 people hospitalized due to flu and 160 flu outbreaks in long-term-care facilities.

As the chairman mentioned, this year's flu vaccine was only 36 percent effective, and that is of concern. Even I had the flu, and I had my vaccine too.

And so, you know, this really is something that one would think

in the year 2018 we would be able to tackle in a more meaningful way.

I understand that the FDA's Vaccine Advisory Committee just met to make recommendations for next year's vaccine. I am looking forward to hearing from the FDA about how data on this year's vaccine effectiveness helped to inform the decisionmaking for next year.

I am also hoping, as usual, to hear more about research efforts to produce a more broadly protective vaccine or even a universal vaccine that can target all strains of flu.

And, Mr. Chairman, we have talked in these various hearings over the years about the egg-based vaccines. And the mutation of the virus within the egg is only one of the problems with egg-based vaccines. When you look at the more remote but yet very real threat of a pandemic flu, if you are relying on egg-based vaccines, you can't be very nimble in producing vaccines in an effective and fast way.

And so I think that, this year, if it is any good news, a silver lining about the ravages of this flu season, maybe it will make the public understand how important this issue is for our public health agencies to address.

And I know all of our witnesses will remind us, even a vaccine with a low effectiveness rate will still protect millions from getting sick or may help mitigate the symptoms when people do get sick. And so, until we fix this system in a broader way, the flu vaccine is still

our best tool.

But, unfortunately, the number of Americans who got a flu shot this year has not changed from our last hearing in 2015. I am hoping that that is another thing we can discuss, about how we can persuade people to get the vaccine and concrete steps that perhaps we can take next year.

As I said, we also have to work towards better treatment methods -- in particular, more effective antiviral medications so that people who do become sick can be cared for before their illness becomes more serious. And I understand there are some of these medications in the pipeline right now. Maybe some of our witnesses can talk about these drugs that are in the pipeline, and also maybe they can talk about some of the spot shortages we saw this past season.

Finally, the importance of a strong public health infrastructure cannot be overstated. Because of the critical work of Federal and State public health experts, we are always in a good position, but there is still more that needs to be done. And I am looking forward to hearing how we can coordinate our strategies across all levels of government.

So, Mr. Chairman, again, I want to thank the witnesses who are here today, some of which I have worked with for years. They are true public servants and truly dedicated to tackling this issue. And I know they will be our partners in this committee as we continue to go forward.

Thanks, and I yield back.

Oh, also, I would ask unanimous consent to put Mr. Pallone's opening statement in the record. He will not be able to come today.

Mr. Harper. Without objection.

[The prepared statement of Mr. Pallone follows:]

******** COMMITTEE INSERT ********

[The prepared statement of Ms. DeGette follows:]

******** COMMITTEE INSERT ********

Mr. Harper. The gentlewoman yields back.

The chair now recognizes the chairman of the full committee, Mr. Walden, for the purposes of an opening statement.

The Chairman. I thank the chairman, and I thank our witnesses for being here today.

You know, this has been, I think, one of the most severe flu seasons in the United States that we have seen. Nearly 50,000 people die in a single season. Today, we are currently experiencing a severe flu season with a predominantly deadly strain, by all accounts. It is vital to find ways to reduce deaths and hospitalizations from this challenging and changing virus.

At Energy and Commerce and this subcommittee in particular, we have a long history, as you have heard, of connecting these oversight hearings and trying to be as helpful as we can to you all as we work on the public policy.

During our last hearing, in November of 2015, we explored many important issues, including how the Department of Health and Human Services could help improve our ability to respond to seasonal flu vaccine mismatches.

For more than 70 years, most flu vaccines have been made through an egg-based process, and over the last decade we have seen some innovation in the manufacture of the annual flu vaccine. The FDA

approved the first flu vaccine manufactured using cell culture technology in 2012. And the FDA approved the first flu vaccine manufactured using recombinant DNA technology in 2013.

And in addition to new manufacturing technologies and methodologies, we have also seen new types of flu vaccine made available for the American people. Historically, flu vaccines, I understand, have been offered to protect against three different strains of flu virus. And, in 2012, the FDA approved the first flu vaccine that offered protection against four different strains. In 2009, the FDA approved the first high-dose flu vaccine for older adults, and some data show that the high-dose flu vaccine is more effective in older individuals than the normal dose.

Now that we have different ways to manufacture the flu vaccine, we need to ensure we have enough data and information to make sure we are making the most effective seasonal flu vaccine possible. The FDA recently announced that preliminary data show that the cell-based flu vaccine might be somewhat more effective, I understand, in preventing the flu than the egg-based vaccine this season. We need to understand why that might be and why there are differences in effectiveness so we can improve vaccine manufacturing processes as necessary.

As Subcommittee Chairman Harper has said and emphasized, the annual flu vaccine is still the best defense. Every year, thousands

of lives are saved because people get that vaccine.

And so, if you do get the flu, there are antivirals, as we all know. And we have heard -- I can't remember a flu season where more people I know have said, oh, yeah, I got Tamiflu, or somebody I know got Tamiflu, or whatever the antivirals are. So that is an important part of this, as well. And I would love for you to talk a bit about what has been in the press about the Japanese product, apparently, in Japan that might cut off the flu even sooner and what you see on that one, if anything.

And one day we hope to have a universal vaccine. We are encouraged by the National Institute of Allergy and Infectious Disease's recent release of a strategic plan for developing a universal flu vaccine.

I am also glad we have all of you here today and the director of the Biomedical Advanced Research and Development Authority here to share the information that you all are working on. So thank you.

And, with that, I would yield the remainder of my time to the chairman of the Health Subcommittee, the good doctor from Texas, Dr. Burgess.

[The prepared statement of The Chairman follows:]

******** COMMITTEE INSERT ********

Mr. Burgess. Thank you, Mr. Chairman.

And I want to thank our witnesses for taking the time to testify before us today. Most of you are well-known to this subcommittee.

The flu has hit many of our districts with astonishing force this year. The district that I represent in north Texas, our public health departments were strained. We had schools that had to close temporarily to prevent the spread of flu amongst children. Since the start of this flu season, more than 400 people in my area have been hospitalized as a result of the flu; 12 reported influenza-associated deaths, including 1 pediatric death.

Earlier this year, the Health Subcommittee was briefed by Dr. Fauci and someone from the CDC about the development and effectiveness of this year's flu vaccine. The timing of this particular hearing is appropriate, given that we are just past the peak of flu season, and now people are working on the development of next year's vaccine, and we are all anxious to hear what awaits for next year.

Mr. Chairman, thank you for holding this important and timely hearing, and I certainly look forward to hearing from our witnesses. And I yield back.

[The prepared statement of Mr. Burgess follows:]

******** COMMITTEE INSERT ********

Mr. Harper. The gentleman yields back.

I ask unanimous consent that the members' written opening statements will be made part of the record.

Without objection, they will be entered into the record.

Additionally, I ask unanimous consent that Energy and Commerce members not on the Subcommittee on Oversight and Investigations be permitted to participate in today's hearing.

Without objection, so ordered.

I now would like to introduce our witnesses for today's hearing.

First, today, we have doctor Anne Schuchat, the Acting Director for the Centers for Disease Control and Prevention.

We welcome you today.

Second, we have Dr. Anthony Fauci, the Director of the National Institute of Allergy and Infectious Diseases at the National Institutes of Health.

Then we have Dr. Rick Bright, the Deputy Assistant Secretary for Preparedness and Response and Director of the Biomedical Advances Research and Development Authority at the Office of the Assistant Secretary for Preparedness and Response, which means there's no way that gets on a business card.

But we're glad to have you here.

And, finally, the Honorable Scott Gottlieb, who serves as the

Commissioner for the U.S. Food and Drug Administration.

I want to thank you each for being here. This is a very important topic, and we look forward to having this discussion today.

Are you each aware that the committee is holding an investigative hearing and, when so doing, we have the practice of taking testimony under oath? Does anyone have an objection to testifying under oath?

Seeing none, the chair then advises you that under the rules of the House and the rules of the committee you are entitled to be accompanied by counsel. Do any of you desire to be accompanied by counsel for the purposes of today's hearing?

Seeing none, in that case, if you would please rise and raise your right hand, and I will swear you in.

[Witnesses sworn.]

Mr. Harper. You are now under oath and subject to the penalties set forth in title 18, section 1001 of the United States Code. And you may now each give a 5-minute summary of your written statement.

And we will begin first with Dr. Schuchat, and you are now recognized for 5 minutes.

TESTIMONY OF ANNE SCHUCHAT, M.D., ACTING DIRECTOR, CENTERS FOR DISEASE CONTROL AND PREVENTION, U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES; ANTHONY S. FAUCI, M.D., DIRECTOR, NATIONAL INSTITUTE OF ALLERGY AND INFECTIOUS DISEASES, NATIONAL INSTITUTES OF HEALTH, U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES; RICK A. BRIGHT, PH.D., DEPUTY ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE, DIRECTOR OF THE BIOMEDICAL ADVANCES RESEARCH AND DEVELOPMENT AUTHORITY, OFFICE OF THE ASSISTANT SECRETARY FOR PREPAREDNESS AND RESPONSE, U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES; AND SCOTT GOTTLIEB, M.D., COMMISSIONER, U.S. FOOD AND DRUG ADMINISTRATION, U.S. DEPARTMENT OF HEALTH AND HUMAN SERVICES

TESTIMONY OF ANNE SCHUCHAT, M.D.

Dr. Schuchat. Good morning, Mr. Chairman and members of the committee.

Influenza is a formidable adversary. The virus is ever-changing, it is with us every year, and it's too often able to outsmart our immune systems. At CDC, we have worked with domestic and global partners to build cutting-edge systems to characterize influenza viruses and the disease they cause and to monitor vaccine effectiveness.

We know that people are concerned about this flu season, and that concern is warranted. Influenza can be a very serious threat to the health of Americans. And despite the progress we've made, we have much more work to do.

I'll provide brief updates about this season and the work that CDC is doing to improve the tools for influenza prevention and control.

As you've heard, this has been a severe season. Hospitalizations have broken records. Influenza-like illness presenting to doctors' offices and emergency departments at its peak was about as high as we saw during the pandemic of 2009. Too many children have died already from influenza this season. We had intense activity in virtually the whole country at the same time, and that contributed to some of the spot shortages of antivirals. We are not over with the season. Disease is decreasing, but the B strains are starting to be as common as the H3N2 strains.

As you've heard, the vaccine effectiveness this season was lower than usual. It was at 36 percent overall and even lower for the H3N2 strains that dominated. Children did receive better protection from the flu vaccine -- 59 percent effectiveness in children and about 50 percent effectiveness against the H3N2 strain -- a reminder that vaccinating children can be lifesaving against flu. Sadly, the vast majority of children who die from influenza have not received any

vaccine at all.

There are many theories about why influenza vaccines work less well against the H3N2 strains. One theory is that there are egg-adapted changes that occur in the process of developing the vaccine. There may be differences in effectiveness based on prior immunization or prior exposure to flu strains.

We are still characterizing the viruses for this year. We do not think there was antigenic drift, but there may be some changes in the viruses that could account for the severe season. That's still under study.

Some vaccine is better than no vaccine protection. We wish the vaccines worked better, but we do know that the vaccines are providing protection to many and they're mitigating the severity of the disease.

CDC has three objectives in our work with vaccines. We want to maximize use of the current vaccines. We want to support the NIH's leadership in developing a universal vaccine. And, in the near term, we want to improve the current vaccines that we have.

We have made significant progress since the 2009 pandemic. We have more data than ever before. We have more information on vaccine effectiveness from our multi-State network. We are producing more potential vaccine candidates. We are collecting more information on the genomic characteristics of the viruses using next-generation

sequencing. We are working with pharmacies, long-term-care facilities, and insurers to address the spot shortages of antivirals and were able to smooth things out a bit during this season, but we know people were still frustrated.

But, despite the progress we've made, there is much more to learn about influenza. And we think that investing in that learning can have direct implications for prevention and control.

In closing, I know this has been a difficult flu season and a heartbreaking one for too many families. Flu continues to be a priority for the CDC; we are literally working 24-7 on this issue. And we are all, across HHS, committed to working together to find ways and tools to help Americans reduce their risk of getting sick.

I look forward to answering your questions.

[The prepared statement of Dr. Schuchat follows:]

******** INSERT 1-1 ********

Mr. Harper. Thank you very much.

The chair will now recognize Dr. Fauci for 5 minutes for the purposes of his opening statement.

TESTIMONY OF ANTHONY S. FAUCI, M.D.

Dr. Fauci. Thank you very much, Mr. Chairman, Ranking Member DeGette, Chairman Walden, members of the committee. Thank you for giving me the opportunity to talk to you about the role of the National Institute of Allergy and Infectious Diseases at the NIH in addressing seasonal and pandemic influenza.

All right. Next slide.

As you can see, as I have testified before this committee multiple times, that the NIH research in this case in influenza is multifaceted, involving basic research, research resources, clinical research, ultimately with the development of countermeasures in the form of diagnostics, therapeutics, and vaccines. For the purpose of today's discussion, I'll focus only on vaccines.

If I can have the next slide.

As seen in this slide, as mentioned before -- and let me start off by reiterating what you said, what Ms. DeGette said, and what Anne Schuchat said, is that it is always better to get vaccinated than not

to get vaccinated.

But, in that reality, we can do better with the vaccines that we have, because the current influenza vaccines are not consistently effective. We have an example of that this year. Also, pandemics occur, and the responses are generally not very effective. We've seen that with the 2009 pandemic flu, and we continue to chase after potential pandemics like H5N1, H7N9.

Next slide.

The major challenges in influenza vaccinology is we need to improve on the current influenza vaccines. We need to improve the production of these from egg-based to cell-based to recombinant DNA technology. And I'll get back to that in a moment. And, also, we need to, as Anne mentioned, develop universal influenza vaccines for broad coverage.

Next slide.

Egg-based technology is time-honored indeed, it has been effective, but it's antiquated. We need to graduate into the 21st century. Cell-based is better, but recombinant DNA technologies that I'll get into in a moment, which will be the tools to which we develop a universal flu vaccine, is the way of the future.

Next slide.

When you talk about improving seasonal influenza preparedness,

that essentially marries you to the preparing for a pandemic. And I'll explain what I mean.

Next slide.

I wrote an article just recently when we got into the problem of the growing in eggs, with the adaptation in eggs leading to a less effective vaccine, to emphasize the need for a universal flu vaccine.

Next slide.

Now, let me talk to you a little bit about that, because there are some mechanisms that are simple now but nonetheless were not fully appreciated before we really understood the structural biology of these viruses.

On the left-hand part of this slide is an influenza model. That's the virus. The arrow points to one protein, the hemagglutinin molecule, which is the part that binds to the cell receptor that gets you and I sick when we get the flu.

Next slide.

Now, a very interesting thing was noticed several years ago, is that this is made up, this molecule, of a head and a stem. Now, this is the way it really looks like, but if you want to emphasize it, think of a broccoli with a head and a stalk or a mushroom with a cap and the stalk. The head is the part that the immune system makes a response again. That's the good news.

The bad news is that that head is one that has many mutations that change from season to season -- the drift that Dr. Schuchat spoke about and that Ms. DeGette spoke about. The stem, however, has few mutations. The little red dots are the mutations. So the trick is, how do you make a response selectively against the part of the virus that does not change as opposed to one that does change?

Next slide.

There are a number of ways of doing that. I'm going to just show you one example among many.

Investigators at the NIH and funded by the NIH have a situation now where they can take that molecule, that hemagglutinin, and essentially shave off the head. It's called a headless stem. Now, normally, that would fall apart, but it doesn't fall apart because investigators at the Vaccine Research Center have made mutations in the molecule to keep it stable.

And what we've done, we've put on what's called a nanoparticle. That's on the far right of the slide. This is what it looks like 10 million times blown up. So this is a little particle, but all of these are stems, so that when the immune system sees that, it doesn't get distracted about anything else and it focuses in on making an antibody or a cell-mediated response against something that does not change.

Next slide.

Now, we recently, in June of this year, had a workshop in Rockville, Maryland, where we called together experts from the United States and throughout the world to help us at NIH to develop what we call a pathway to a universal influenza vaccine.

Next slide.

And I'm happy to say that just a few days ago we recently published our strategic plan and our research agenda in the Journal of Infectious Diseases to help us get to the goal that I've just been describing over the last 5 minutes.

Thank you.

[The prepared statement of Dr. Fauci follows:]

******** INSERT 1-1A ********

Mr. Harper. Thank you very much for that testimony.

Dr. Bright, we'll now recognize you for 5 minutes for the purposes of your opening statement.

TESTIMONY OF RICK A. BRIGHT, PH.D.

Mr. Bright. Great. Thank you.

Chairman Harper, Ranking Member DeGette, and distinguished members of this committee, thank you for the opportunity to speak with you today on behalf of our Assistant Secretary for Preparedness Response, the ASPR, to discuss influenza and progress towards the development and availability of effective flu vaccines.

I'm Rick Bright, the Director of the Biomedical Advanced Research and Development Authority, known as BARDA, and also the Deputy Assistant Secretary for Preparedness Response.

ASPR's mission is to save lives and protect Americans from 21st-century threats. BARDA is a component of ASPR that was created to ensure that we have medical countermeasures to protect people from the dire threats we face as a nation. And make no mistake, influenza is one of the most dangerous of those threats.

BARDA was established and empowered with special authorities in the Pandemic and All Hazards Preparedness Act. Guided by a national

strategy on pandemic influenza and largely funded through supplemental appropriations, we have proven what can be done when the government is able to hire the best people, work with the best partners, and remain focused on the strategic fight against influenza. We have shown that the BARDA model works.

With our industry and our Federal partners, BARDA has achieved 34 approvals from the FDA for drugs, vaccines, and diagnostics against a wide range of threats. We have increased domestic flu vaccine capacity over tenfold in world-class production facilities. We have shortened the vaccine response time with modern technologies.

And we have diversified vaccine production platforms, most of that right here in America. No one can rival BARDA's success in expanding capacity and pushing new products to the marketplace. We are proud of these new flu vaccines and the adjuvants now being produced in Pennsylvania, North Carolina, Connecticut, and New York. These include the world's first recombinant flu vaccine and the world's largest cell-based vaccine production facility.

And we are not done yet. Everything that BARDA and our partners have done and accomplished for pandemic influenza can make our seasonal influenza vaccines better and more responsive to the ever-changing virus. Building on our success, we are poised and we are partnered to make better flu vaccines available right now.

Most vaccines today are still made in eggs. Although the process is optimized for efficiency, it has not changed much for decades, and it is no match for a rapidly changing virus. Cell- and recombinant-based technologies are now used to make licensed vaccines, and they offer speed and greater flexibility and may even be more effective than traditional egg-based vaccines.

Despite these advantages, marketplace competition and limited domestic production capacity have largely kept these approaches on the shelf, representing only a fraction of the seasonal vaccine on the marketplace today.

There are actions to improve influenza vaccines now that can produce dramatic near-term benefit in parallel with the long-term efforts being undertaken across the government to develop a universal flu vaccine. To make better, faster flu vaccines now, we propose, in collaboration with our industry partners, to take the following steps to improve the effectiveness of our existing vaccines:

First, we must expand domestic capacity of the cell- and recombinant-based vaccines. Second, we must enhance their effectiveness with the addition of adjuvants or higher doses of antigen. Third, we need to conduct clinical trials to expand their use in all age groups. And, finally, we need to continue modernizing the vaccine production processes for speed and flexibility.

While we are grateful for the supplemental funding that disrupted the status quo and fueled our progress, those funds have been fully obligated. To win this battle, it is critical that we sustain these hard-won gains and we implement these steps to reduce the threat we face every year from influenza.

And the near-term vaccine improvement activities are only one piece of the puzzle. Equally important is the ongoing work funded by BARDA to develop diagnostics that can detect influenza sooner as well as more effective drug treatment options to treat sick people. These priorities, combined with improved vaccines, represent a comprehensive approach to protecting the Nation and the world against influenza.

Together with our Federal and our industry partners, we have made tremendous progress. However, the threat remains. We stand at a unique moment in time, where we have tools and capabilities to dramatically enhance our fight against influenza. I look forward to working with this panel, your committee, and congressional colleagues.

Thank you for the opportunity to present to you today.

[The prepared statement of Mr. Bright follows:]

******** INSERT 1-2 ********

Mr. Harper. Thank you very much.

The chair now recognizes Scott Gottlieb for 5 minutes for the purposes of his opening statement.

TESTIMONY OF SCOTT GOTTLIEB, M.D.

Dr. Gottlieb. Thank you, Mr. Chairman and Ranking Member DeGette and members of the subcommittee. Thank you for the invitation to testify on our response to the 2017-2018 seasonal flu.

This flu season has been particularly hard. I agree with my colleagues that investing in and working towards a universal flu vaccine is crucial. Unfortunately, given where we are today in the development process, that reality is still many years off.

While we should continue to focus on the discovery of a new breakthrough vaccine, we must also consider what immediate and intermediate steps we can take to enhance the production of existing licensed vaccines and what should be done to invest in advanced domestic manufacturing to ensure that new and existing technologies are scalable so that manufacturers meet domestic and global demand.

There have been successes in developing alternatives to egg-based vaccines, such as cell-based and recombinant technologies, in part because of the collaborations and work by BARDA. However, despite

these advances in vaccine development, the majority of manufacturers are still continuing to produce egg-based vaccines.

There are reasons for this. The egg-based process works, and the vaccines are safe and effective. But, even more so, it would require an enormous investment to fundamentally change manufacturing.

However, we believe it's worth better understanding the potential of cell-based or recombinant alternatives. Some studies have found that cell-based or recombinant vaccines are more efficacious -- or could be more efficacious than egg-based vaccines, but more data and analyses are needed.

As one step to better understanding the differences between egg-based and cell-based technologies, we're using CMS data to compare Medicare patients that received the cell-based vaccines to those who received an egg-based vaccine to determine which vaccine was more effective in that population.

As we consider greater investments in alternative vaccine development processes, it's important to note, however, that there are also challenges with these new cell-based approaches. To help address these challenges, FDA is working to help develop more effective cell lines that can be better scaled through continuous manufacturing. We're also looking at how we develop a more robust recombinant vaccine manufacturing process to increase yield while reducing cost.

Continuous manufacturing holds great promise for both cell-based and recombinant vaccines because supply could be more easily ramped up on short notice. This would allow us to more rapidly address newly emerging strains or strain drift. Getting all the necessary preparatory work done is one limiting step of the egg-based processes.

The FDA can help industry make investments in these new manufacturing technologies and facilitate such a transition. We need to develop a science-based framework that includes the regulatory tools and guidelines for products to be developed in these systems and to be properly evaluated. And, ultimately, our investment will provide regulatory clarity for this kind of new technology. That regulatory framework can increase the efficiency and reduce the cost of transitioning to this kind of new cell-based and recombinant product development manufacturing.

More immediately, as we prepare for next year's flu season and analyze the data from this year, we're trying to better understand why this year's vaccine was less effective against H3N2. At FDA's recent advisory committee meeting, the data presented continued to suggest that the strains selected for the 2017 and 2018 vaccines and used by manufacturers reasonably match the circulating strains. This includes the H3N2 strain.

Although adapting circulating virus strains from manufacturer

can lead to differences between the circulating strains and the one used for manufacturing and although those changes could affect vaccine effectiveness, the case this year is likely to be much more complex.

And this year is not the first time we've seen vaccines be less effective again H3N2. Recent flu vaccines have proven, on average, to be only about 33 percent effective against the H3N2 viruses. Given this, we're looking at several factors to better understand why effectiveness tends to be lower against this strain.

As we continue to invest in the future of manufacturing and vaccine technology, we also need to remember the importance of simply ensuring that more people get vaccinated with available vaccines each flu season. And we also must work hard to ensure that products used to treat the flu, including antivirals and IV saline, are available and that we take steps to address any potential shortages.

As always, FDA remains committed to communicating and sharing updates with the public about all aspects of our flu response. And I look forward to answering your questions today. Thank you.

[The prepared statement of Dr. Gottlieb follows:]

******** INSERT 1-3 ********

Mr. Harper. Thanks to each of you for your opening statements. And, you know, this is an incredible panel of witnesses that are here today, that cover the entire spectrum of people that are daily dealing with this important issue. So thank you for this time, this education you're giving us.

And so I'm going to recognize myself to ask the first set of questions. And this is for each of you, just for quick responses, if you would just reply to this.

This year has been an especially difficult and severe flu season. A lot of lives have been lost, and many people have been hospitalized. Would you get the vaccine and have your loved ones get it also?

Dr. Schuchat. Yes. I get the vaccine every year and make sure my whole family does.

Dr. Fauci. Same here. I got the vaccine this year and every year over the last as many years as I can remember, as has my wife and three children.

Mr. Bright. Absolutely.

Dr. Gottlieb. Absolutely, sir. I go to the pediatrician with my children, and the pediatrician gives it to me and gives it to them.

Mr. Harper. That's great.

All right. If you get the flu after getting the flu vaccine, is having gotten the flu vaccine likely to reduce the severity of the

illness?

Dr. Schuchat. Yes. There are studies now that have shown reduced severity following immunization even when the disease itself isn't prevented.

Dr. Fauci. That is true, and that's an important point that many people don't appreciate, because they say, "I did get the flu even though I got vaccinated." What they don't realize, that it is likely -- not likely, but it is possible that having gotten the flu without the vaccine would have wound them up in the hospital, particularly if they were someone in the risk groups that are more prone to getting complications.

Mr. Harper. Dr. Bright?

Mr. Bright. Absolutely. There's data to support that the vaccine, even if it's not the most effective vaccine, still does a lot to reduce the severity of illness and reduce hospitalization.

Dr. Gottlieb. I would just echo those statements.

Mr. Harper. Great.

Now, I've heard some concerns that some individuals are worried that they may get the flu from the flu vaccine. Is that possible?

Dr. Schuchat. No. The flu vaccine cannot cause the flu.

Dr. Fauci. Very few things that you say are impossible, but this is impossible.

Mr. Harper. Okay.

Mr. Bright. Agreed.

Dr. Gottlieb. I agree as well, sir.

Mr. Harper. That's great. There are those misconceptions out there, that when I had this esteemed group here I wanted to make sure that people realize those important facts going forward.

Dr. Schuchat, if I may talk to you for a moment, this year we've seen a lot of headlines about the flu vaccine's reduced effectiveness. Later, we're going to ask questions about why we likely saw reduced effectiveness in the flu vaccine, but, first, however, I want to ask about vaccine effectiveness for children this year.

You had answered the effectiveness of that was 59 percent effective, much better than it was in adults. But why was it more effective on children than it was, say, older adults?

Dr. Schuchat. We don't have all the answers, but there are a couple of possible explanations. One is children's immune response is often better than adults, particularly better than older adults.

A second is your response to an influenza vaccine may differ when it's the first time you've ever been exposed to influenza or the vaccine. You may have a better response. Some people think that the first influenza you're ever exposed to, through the vaccine or the nature, has a long-term effect on your immune response.

But we were very pleased to see the better response in children this year.

Mr. Harper. So how do we communicate that? Why is it especially important for school-age children to get vaccinated? How do we communicate that? And, certainly, you would agree that's true?

Dr. Schuchat. Yeah, we have simplified our recommendations for children, and now we recommend everybody 6 months and over get a flu vaccine every year. The first time you're getting a flu vaccine, if you're a young child, you're supposed to get two doses of the vaccine.

Communication about vaccination has to be multisectoral. We think the healthcare provider, pediatricians, are the most important influence on kids getting vaccinated, but we also use trusted channels, social media, and other influencers.

Mr. Harper. We've obviously seen that the number of children receiving the flu vaccine has remained steady at just under 60 percent, and the number of adults receiving flu vaccines remains fairly steady, between 41 and 43 percent.

So how do we do that, not just for children but for adults also, to communicate to America the importance of being vaccinated with a flu vaccine?

Dr. Schuchat. Yeah, there is a nuanced message, because being open and honest is really important and not promising that the vaccine

will, you know, cure cancer -- although we have a vaccine that does that, actually, the HPV vaccine. Sorry. But I think Americans want us to be open and honest about vaccine information.

We know that flu vaccines can prevent disease and reduce severity, and we know that they can also prevent spread. Children are very important in getting flu disease but also in spreading it. And so getting higher coverage among children is in the whole public's interest.

Mr. Harper. That's great. Thank you very much.

The chair now recognizes Ranking Member DeGette for the purposes of questions.

Ms. DeGette. Thank you, Mr. Chairman.

Dr. Fauci, I think everybody on this panel agrees with you when you said that we need to get away from the antiquated production model, which the egg is.

And I know the chairman, particularly, appreciated your slideshow. He's new to this subcommittee, so he hasn't seen it before. And he told me he was a chemistry major, so I'm happy to have him to educate me.

So the recombinant-based vaccine was only 3 percent last year, from what I understand. I'm wondering if you can talk to me, what the barriers are for moving from the current methods that we have, the

egg-based methods which are used for the majority, to this cutting-edge vaccine.

And I'm going to ask everybody else for their opinion, too, on that.

Dr. Fauci. Yeah. I think there are a few barriers, at least two, that stand out. One is that there are still scientific challenges to get the very best recombinant DNA technology. And there are three or four or five in addition to the one that was used in the 3 percent from protein sciences, the flu block. There are things that are even better than that.

So we need -- and that was part of what I put, Congresswoman DeGette, in the strategic plan, that there are scientific gaps in the arena of what we call platform technology, is different types of vaccine. That's the first one, scientific obstacle.

The second one that's important is that, whenever you have, as Dr. Gottlieb mentioned, whenever you have something that's time-honored and works and is safe, there is an understanding -- fundamental underlying inertia for companies to make a change to something in which they were going to have to make a major investment in resources to switch over from one to the other. Because you have one that you know that works --

Ms. DeGette. Sorta.

Dr. Fauci. -- one that you know is safe. They're going to have to make an investment.

But the thing that I think we need to emphasize is that we've got to go there. We can't stay stuck in the old technologies.

Ms. DeGette. Thank you.

Dr. Bright, do you want to add to that?

Mr. Bright. I think everything Dr. Fauci said is spot-on, I mean, but, in addition to those, it's about the capacity and the yields of the new technology. So we've had 70 years to optimize the efficiency and the yields for an egg-based vaccine. We've had about 5 years to try to work on optimization of recombinant and cell-based vaccines. So it's remarkable to see the progress that's being made in those companies to improve the efficiency of production and the yields of those vaccines.

Another challenge, however, though, the vaccine is blended together in the marketplace, so there hasn't been a focus on getting the differentiated data set to show the benefit and effectiveness of egg-based or non-egg-based vaccines. We all know the benefits of non-egg-based vaccines is speed and flexibility. Those are critical for a pandemic response. That's critical if we had to change late season for a virus drift. We're also getting the additional data now to understand the true effectiveness difference.

Ms. DeGette. So, Dr. Gottlieb, did you want to add anything?

Dr. Gottlieb. I agree with my colleagues.

I'll just add, you know, with the recombinant processes, one of the challenges still is the cell culture and the yield you're able to derive using the recombinant process. And, you know, while we've commented that we observed better efficacy with the cell-based vaccine this year relative to the egg-based vaccine, it is the case that in some years we observe better efficacy with the egg-based process versus a cell-based process.

And so I think the underlying message here, from my standpoint, is the egg-based process is safe and effective; it works. The challenge with it --

Ms. DeGette. Sorta.

Dr. Gottlieb. -- is it's hard to scale --

Ms. DeGette. Right.

Dr. Gottlieb. -- and it's hard to make a midseason change.

Ms. DeGette. And it's also hard if you have a pandemic flu that hits.

I'm wondering if any of you can -- Dr. Schuchat, did you want to add? I didn't want to leave you out.

Dr. Schuchat. Yeah, just to say that the investments in vaccine effectiveness studies on a large scale are really worthwhile. It's

only recently that we could tell you that the effectiveness against H3N2 is less than against H1N1 and B or that children have higher --

Ms. DeGette. Because the studies were -- and so, aside from funding, I'll ask any of you -- I don't have much time left -- is there anything else Congress can do to move this along? Because I remember years ago asking the same questions. I'm glad we've made some progress, but clearly we're going to have to get to the gold standard.

Dr. Gottlieb. I mean, if I may just quickly comment, Congresswoman, as part of the President's budget this year, we did put forward a proposal to try to make investments in continuous manufacturing. That was geared towards this kind of an opportunity --

Ms. DeGette. Yes.

Dr. Gottlieb. -- to try to establish the regulatory parameters to enable these innovations to come forward.

Ms. DeGette. Yes.

Anyone else?

Mr. Bright. And, again, I mean, it does go back to funding in some ways, but just to support, to encourage the movement to the modernized technologies, in addition to expanding their domestic capacities that we have and when we need them.

Ms. DeGette. Okay. I think you can say we have got bipartisan support for that on this committee.

Right, Mr. Chairman?

Mr. Harper. I believe that's true.

Ms. DeGette. Yeah.

Mr. Harper. That's great.

Ms. DeGette. Thank you. I yield back.

Mr. Harper. The gentlewoman yields back.

The chair will now recognize the chairman of the Energy and Commerce Committee, Greg Walden, for the purposes of questions.

The Chairman. Thank you, Mr. Chairman.

And, again, thanks to our very distinguished panel of witnesses not only for your help in crafting public policy here today but also the great work you do every day to improve the lives and the health of Americans and, frankly, people around the world.

Dr. Gottlieb, one of the treatments that's available for individuals who get the flu is the antivirals. We've talked some about that today. Are antiviral drugs more effective the earlier they are given?

Dr. Gottlieb. They are, Congressman.

The Chairman. And how do they work?

Dr. Gottlieb. The currently available --

The Chairman. To a layperson.

Dr. Gottlieb. -- antiviral drug works by blocking a different

step in the replication cycle of the virus itself than the one that the vaccine targets. The vaccine targets the ability of the virus to attach to the cell membrane in the lungs.

The Chairman. All right.

And, last week, the FDA issued a press release warning of fraudulent and unapproved flu products. Why did you feel that press release was necessary, to warn consumers to be cautious?

Dr. Gottlieb. Because we see a lot of efforts online to try to entice consumers to purchase products that we know are fraudulent, that are making false claims, false and misleading claims, that are claiming to have antiviral and antiflu effects, when, in fact, they are not approved for those purposes, including dietary supplements.

The Chairman. And if consumers feel like they've been defrauded, what should they do?

Dr. Gottlieb. Well, they should certainly -- I think any consumer that feels they might have used a product that was making an inappropriate or fraudulent claim should certainly contact their medical provider and certainly refer the information to FDA.

The Chairman. All right.

And, recently, as I mentioned in my comments at the beginning, a new antiviral drug was approved in Japan, or is in that process, that supposedly has the potential to treat the flu in just one dose.

Are you familiar with that product? And can you talk to us a little bit about whether that's the case and what we might see here?

Dr. Gottlieb. So I'm familiar with the product. I would defer to my colleagues on the panel a little bit.

I will just say that what the sponsor has said publicly is that they plan to submit an application at some point this year. And they currently have disclosed that they have some studies ongoing in the U.S. looking at a high-risk population.

This is a drug that acts at a different point in the replication cycle, mechanistically an earlier stage in replication than the other drug that you referenced, so it is differentiated. And the other, you know, potential opportunity is that the onset of action appears to be earlier than the currently available antiviral.

I think the bottom-line message is that we are very interested in having a spectrum of antiviral drugs that act differently, at different points in the virus. In case the virus itself becomes resistant to one approach at targeting the virus, we have backups and we have alternative approaches.

The Chairman. Very good.

Other members of the panel want to comment on that specifically? And then I have one other question.

Mr. Bright. If I can add to that, yes, so BARDA has been engaged

with this company developing this drug for quite some time, as well as some other companies that we're supporting to develop new classes of antiviral drugs for influenza.

It's critical to note that we have not had a new class of antivirals approved for influenza in over 20 years.

The Chairman. Wow.

Mr. Bright. We rely on a single class of influenza antivirals now. And the virus, as we know, continues to change, and resistance to that class of antivirals continues to emerge. And it's very concerning in avian influenza viruses, such as pandemic strains H5N1, H7N9, to see these high levels of resistance emerging to that class of drugs.

So it's remarkable that this company took the lead in developing a new class of antiviral drug. It has attributes of a single dose. Instead of 5 days at twice-a-day dosing, it brings down the viral load in the patient very rapidly, faster than the currently approved antiviral drugs. And it has this new mechanism of action, so if a virus becomes resistant to the only approved class of drugs we have now, this drug would still work. And it could also be used potentially in combination with the existing class of drugs.

Another thing exciting about this drug is that they've partnered now with a U.S.-based company. That U.S.-based company has taken the

lead in bringing that to the FDA for discussions and consideration for approval in the United States. And their plans are to transfer the knowledge and the capability to manufacture that drug in the United States in the near term.

So, again, it's one of about a dozen or a half-dozen promising candidates with new mechanisms of action, several of those supported by BARDA, and even monoclonal antibodies, to make better treatments for flu.

The Chairman. Yeah, Dr. Fauci?

Dr. Fauci. So I can't help myself on this, Mr. Chairman, for the benefit of Chairman Harper, is that Rick Bright said that this is very extraordinary, that the company did this. However, the first recognition of this particular mechanism was in a paper from 1979 in the Proceedings of the National Academy of Sciences --

The Chairman. Who authored that?

Dr. Fauci. -- by the National Institutes of Health. Okay? It's entitled, "Transfer of 5'-Terminal Cap of Globin mRNA to Influenza Viral Complementary RNA During Transcription."

So it just goes to show you, I mean, that basic science is the root of everything we do, even something that 20 years later turns into a product made by a Japanese company.

Thank you.

The Chairman. We'll let you -- that's good. You know? And that's part of why we did 21st Century Cures, to continue that funding and that cycle and all.

I was hoping to ask a question about domestic manufacturing of vaccines and threats and opportunities, but my time has expired, and maybe we can get some of that as the hearing continues.

Thank you again for your good work and for being here.

Mr. Harper. The gentleman yields back.

The chair will now recognize the gentlewoman from Illinois, Ms. Schakowsky, for 5 minutes.

Ms. Schakowsky. I want to thank you, Dr. Fauci, for that addendum and the information. I think it's really important to appreciate how much our researchers and the Federal Government contributes to addressing these.

So I have some basic questions as just an ordinary consumer and person. I think, Dr. Schuchat, you might be the person to ask. Can you tell us generally how easy it is to spread the flu virus person to person?

Dr. Schuchat. Yeah. It varies by strains, but, of course, this is one of the more infectious or contagious viruses that we have. And so, in a household, spread is frequent. In a school, spread is frequent.

It can be spread through respiratory droplets or through fomites, sort of, on your hand. That's why you've seen us so many times say cover your nose when you cough or sneeze and don't touch your eyes or mouth after you're -- you know, with your hands -- you know, sort of, wash your hands frequently.

Ms. Schakowsky. And how long is a person contagious with the flu? Is it possible for a person to be contagious and not know it?

Dr. Schuchat. You can be contagious before you develop symptoms, and usually we say about 24 or 48 hours after the fever goes down. Again, with influenza, it varies by virus and by year. But that's sort of the general facts.

Ms. Schakowsky. Twenty-four hours to 48 hours after the fever.

Dr. Schuchat. After the fever goes down.

Ms. Schakowsky. Goes down. Right.

So the CDC recommends that people stay home for 24 hours after their fever breaks. But I wanted to point out, according to the Bureau of Labor Statistics, 28 percent of workers have no access at all to paid sick leave. And this is particularly a problem for those in the lowest-wage jobs. One-third of lower-paid workers, including those who work in fields such as food preparation, have no paid sick leave. And, in fact, the United States is the only industrialized country in the world without paid sick leave.

I leave this to anyone, really. Can you explain why it's important for people to stay home when they're sick?

Dr. Schuchat. We're really trying to limit the spread of the virus. And so staying home while you're sick will help you heal but also keep you from the spreading to others.

Ms. Schakowsky. So, in 2016, the National Bureau of Economic Research found that if paid sick leave were mandated it would prevent 100 flu-like infections per week for every 100,000 people. So, when people can stay home when they're sick, people are less likely to get the flu.

So I know this is not your jurisdiction, but I think it's just important to note that some of the cautions that we suggest for people are really hard to abide by if you are depending on that paycheck for that day. I think we need to think about it. It's a public health issue. Paid sick leave is a public health issue.

I wanted to also note that Heather Holland in Texas, a Texas mother, 38 years old, died because she could not afford the co-pay for Tamiflu, which was $116. And she had insurance, so this was a co-pay.

So, first of all, Tamiflu, would it have helped her if she took it in time? And what do we say about that? $116 for a low-income family is a lot of money even when insured.

Can someone comment on that?

Dr. Schuchat. Yeah, I can just say that, in response to the spot shortage of antiviral medicines this year, we work closely with manufacturers and pharmacies and insurers, and we learned that there was actually plenty of supply, but much of what was viable was brand product rather than the generics, the newer generics.

We did, in the midst of the season, get some agreement by pharmacies or the pharmacy benefit managers and insurers to offer the generic as preferred brand or as -- sorry, to offer the brand as either generic or preferred brand, which would give a lower co-pay.

But, of course, you know, that's a very, very sad story. We don't know that antivirals will cure a person. The best data suggest they shorten the course of illness. And, of course, being able to start them quickly is what we think helps reduce the severe complications.

Ms. Schakowsky. So, then, in conclusion, let me just say, paid sick leave and affordable pharmaceuticals, very important issues that we need to grapple with as we put in context this flu virus.

Thank you.

Mr. Harper. The gentlewoman yields back.

The chair will now recognize the gentleman from Virginia, Mr. Griffith, for 5 minutes.

RPTR FORADORI

EDTR HUMKE

[11:56 a.m.]

Mr. Griffith. Thank you very much, Mr. Chairman. It's been very informative. I appreciate all the testimony. You all are doing some great things.

I will tell you that it's kind of interesting and it was timely, on February 28, just a week or so ago, I got an email from a constituent who apparently keeps up with a lot of these issues. And he started talking in his email about NanoFlu and what was going on and how we might be able to push that particular product forward.

And one of the things that he raised in his comments that I thought was very interesting, he says that they are planning -- they have already done phase one, so I guess we are coming to you, Dr. Gottlieb. But he said they have already done phase one human trials, they don't plan to do phase two until the third quarter of 2018 because, obviously, you want the flu to be out there to a certain extent in order to be able to test it.

And he said, you know, I don't -- and I'm going to quote from his email: I do not understand why the FDA and CDC do not push a vaccine like this ahead. It would seem to me they might be -- they might push

for phase two in Australia this year and possibly a phase three this year in the U.S. That could make the vaccine available for flu season starting in the fall of 2019.

If the government is really serious about speeding up the slow approval process and reducing health costs, a process like this would help to do it. And I ask the question because it makes some sense. Why are we using the Australian flu season to start testing some of these new ideas? You've indicated -- several of you have -- that there may be 20 or 30 or 40 new products out there, and wouldn't we be able to shorten that time period, particularly in the live trials, if we did some of it here and some of it there where they have the opposite seasons and a different flu season as well?

So I'll start with you and welcome anybody's comments.

Dr. Gottlieb. I'll just kind of briefly, Congressman, I'm not sure I'm familiar with the product. I think this is a recombinant vaccine that you're referring to.

Mr. Griffith. I believe that it is, too. I'm not well enough versed in it to say, but yes -- and it's been tested mostly, comparing it to the vaccine for senior adults. But since I'm apparently rapidly approaching that category, very interested. I turn 60 later this month.

Dr. Gottlieb. I will just say, it is not uncommon to see products

tested in the southern hemisphere, so I'm not sure what the particular circumstance here is, but that is a common phenomenon with new products. You'll see them tested there to help accelerate the development process.

Mr. Griffith. So I can tell Paster Jones that you all are not against it?

Dr. Gottlieb. You could pass on to anyone that we are willing to actively engage with any sponsor that is developing an innovative product in this space.

Dr. Fauci. Mr. Griffith, it's not a testing in Australia versus here. The product that your constituency was referring to is the nanoparticle that has gone into phase one, the one I showed you the model of.

Mr. Griffith. Right.

Dr. Fauci. The reason it's not going to go into phase two from the standpoint of until the end of the year is really a production capability, it's what Dr. Gottlieb referred to when he said, what we haven't gotten efficient yet is the yield of this.

Show we don't have enough GMP product to start a phase two until the end of 2018. It's not that we -- that the FDA is holding us up or anything, it's just that we don't have enough product.

Mr. Griffith. Well, I really appreciate that. Dr. Bright, did

you want to weigh in?

Mr. Bright. I was going to weigh in and say that its very typical. When you develop any new vaccine it's difficult and takes time. When you develop an influenza vaccine you have to time it with an outbreak of influenza. So as long as it's under a USIND, we are very flexible in allowing the companies to get the data and conduct clinical studies wherever flu might be in the world, as long as it's following that IND process.

Mr. Griffith. Well, that's great. And I appreciate you all helping me answer that question. And I know that Mr. Jones, who I spoke with yesterday, makes sure I could say his name in public, he'll be very pleased to hear that as well.

Let me ask this, because the chairman brought it up just -- and if you all can get to it briefly, the domestic supply and the threat of maybe having our supply mostly offshore of our flu vaccines. And it doesn't matter to me who wants to respond to that. I guess that would be ASPR, is that correct?

Mr. Bright. We work very hard -- it's a very important question. We worked very hard over the last years and invested great sums of money to make sure that we can develop these vaccine and get them licensed. It is critical now that we expand that domestic manufacturing capacity, so not only they are able to meet a seasonal market demand, but they

are also available when we need them for a pandemic. And in a pandemic situation we know we cannot import vaccines from other countries easily. So the domestic manufacturing capability for these modern technologies for recombinant cell-based is absolutely critical to our national security.

Mr. Griffith. And I appreciate that and my time is just about up. But I would say, could you please let us know what we can do to assist in trying to get more onshore production?

And I yield back.

Mr. Harper. The gentleman yields back. The chair now recognizes the gentlewoman from Florida, Ms. Castor, for 5 minutes.

Ms. Castor. Thank you, Mr. Chairman, and thank you to all the witnesses for being here and everything you do to help keep Americans healthy and safe. We're now exiting peak flu season, but we're entering allergy season. And what I've learned over the past decade is that our allergy seasons are longer and more intense, we have hotter days. Back home in Florida the pollen is already raging.

What advice do you give to families with children and others in vulnerable populations that are on alert because of the intensity of the flu season as they begin to deal with allergies? When is the appropriate time to head right to the doctor's office and get checked out if you have a flu? Is it the onset of fever? Dr. Fauci?

Dr. Fauci. If the question you're asking is the overlap between the two, how do you know which one it is. Well, the recommendations that we get from the CDC, and I'll yield to Dr. Schuchat in a second, but what we say is that if you have symptoms that persist, number one, that's certainly something you want to go to a physician for.

If you have a situation where you look like you're recovering and then you have a relapse, it could possibly be a bacterial infection. But, importantly, if you fall into one of the risk categories, elderly, underlying disease like heart disease, chronic lung disease, diabetes, obesity, pregnancy, child from birth to 4-years old, you should not hesitate to see a physician because that's the group that really would benefit from getting an antiviral drug like Tamiflu.

And that's the reason why the CDC recommends that we do that, and, Ann, you might want to --

Dr. Schuchat. Yeah, and I would just say that even though we're pleased that the peak of the season seems to pass, there's still a lot of flu out there. And the B strains are more common right now than they were a few weeks ago. So we certainly look for fever with flu or flu-like illness.

But as Dr. Fauci did describe, the warning signs, things like getting better and then getting worse is a warning sign, difficulty breathing, a very high persistent fever. For children, you know, not

being very responsive or being hard to wake up. Those are really important things to --

Ms. Castor. You know, and I continued to hear the refrain from folks that don't get a flu shot that they don't get it because last time they got it, it made them sick, and that's the reason that they don't get the flu shot.

What do you say to them?

Dr. Schuchat. You know, the influenza vaccines don't cause flu. There can be some feeling of not feeling that well, but in general we give flu vaccines during a season where there is a lot of other stuff out there, and so the symptoms are rarely related to the vaccine itself.

Dr. Fauci. We had a season this year, because before we had the peak of flu, there was a lot of parainfluenza and even respiratory syncytial virus among adults that we were seeing, at least at our clinical center at the NIH. So that was before the onset of the flu. And people were saying, well, I already got the flu, therefore I don't need the vaccine. Well, they are wrong on two accounts. One, because they likely did not have the flu, they had something else. And even if you have the flu, you should still get a vaccine because there are other components in the vaccine that could protect you against the other flu that is circulating besides just H3N2.

Mr. Bright. And if I might add. This is an area for innovation

that is just screaming out to give patients more information, more knowledge about what they might be exposed to in the home. And that's one of the reasons that we're trying to drive diagnostics out of centralized laboratories into the homes of the patients so they have actionable information to be able to distinguish that they have a bacterial infection or a viral inflection or flu or some other area. So they can take responsible action to get treated sooner and to take actions to reduce the spread of that virus.

Ms. Castor. Thank you. And preliminary estimates are that this year's flu vaccine shows 36 percent effectiveness. I want to hear more about how we assess vaccine effectiveness to better understand this measure.

Dr. Schuchat, how do we test for vaccine effectiveness, and what does it mean that the vaccine is 36 percent effective? And is it true that this effectiveness was different for different age groups?

Dr. Schuchat. Yes. We have a multistate, multisite network that tests vaccine effectiveness, and they evaluate people who come in with symptoms consistent with influenza, do laboratory testing of them. Those who have confirmed laboratory-proven influenza are enrolled as cases, and those who have those symptoms but didn't have laboratory-confirmed influenza are enrolled as controls. We compare vaccination history verified with the records in them, and then do sort

of math to calculate what the vaccine effectiveness is against particular types and particular age groups.

The larger the sample, the more we can look at ages and narrow categories and look at the different types. We do interim estimates in January and February each year, and then end of season estimates. If we had a larger sample, we would -- a larger network, we would be able to more reliably look at the age groups, but potentially also look at different types of vaccine like the cell-based or the egg-based.

Ms. Castor. And I guess your overriding message is, no matter what percentage you come up with, it benefits you, and your neighbors, and your family to get your flu shot?

Dr. Schuchat. The flu vaccine is the best way to protect yourself and your family against influenza. And some protection is better than no protection.

Ms. Castor. Thank you very much.

Mr. Harper. The gentlewoman yields back. The chair now recognizes the gentleman from Texas, Dr. Burgess, for 5 minutes.

Mr. Burgess. Thank you, Mr. Chairman. While we're on the commercial to get your flu short, I want to thank Dr. Fauci personally because he told me in December I better get it, and I did, and I didn't get the flu this year. So I thank you for that. And it has been a tough year back in Texas.

Dr. Bright, you said that there had not been a new antiviral introduced in the past 20 years. Did I understand that correctly?

Mr. Bright. That is true. Well, 1999 with the approval of oseltamivir and zanamivir.

Mr. Burgess. So let me -- I guess this question is for Dr. Fauci and Dr. Gottlieb, Dr. Fauci as far as the scientific side, Dr. Gottlieb as far as the regulatory side. Why is this so difficult? A virus is a pretty simple organism, nowhere near as sophisticated as a mammalian cell. It seems like selective toxicity, you talk about it a little bit in that -- in that paper that you showed us. It seems like that should be pretty straightforward.

Dr. Fauci. It seems that way, but -- and you're right, there are targets in the replication cycle, polymerase and other -- pronase and other inhibitors that we have for that. The interesting thing is that we -- even though we're doing the fundamental basic research to examine that, we have not had an overwhelming amount of interest on the part of companies, which is the reason why BARDA has been so important in helping to chaperone the companies along to get involved in this.

So it really is, you're right, it isn't a completely insurmountable scientific problem. It has a replication cycle. Remember, when we pull all of that effort into looking at the various aspects of the replication cycle of HIV, we came up with now a total

of 30 effective drugs. There's no reason why, with the right scientific and industry interest in it, that we couldn't do to same thing. And I just yield to my colleagues to my left to amplify that.

Mr. Burgess. Well, Dr. Gottlieb, then I assume that on the regulatory side that is something -- that is work you'd be prepared to take up?

Dr. Gottlieb. Well, absolutely. And I think there's a lot of interest in seeing differentiated products put forward that can address the flu for a whole host of reasons, not least of which is the strategic rationale of having that available. I will just comment that, you know, the standards for approval are relatively straightforward, and I think the agency would show a lot of interest and a lot of high level attention to products that were put forward to try to address both pandemic flu as well as the seasonal flu.

I will comment, that there have been safety issues associated with products that have been in early stages of development in the past. But one of the bigger challenges, quite frankly, and this is a little bit outside of my remit, but they have been commercial challenges. Just the ability to get a commercial return on a property to target the seasonal flu.

And I will remind the committee that at the time that the agency approved Tamiflu, the agency was roundly criticized by many outside

groups, not by Congress, but by outside groups, for that approval, who commented that a drug that diminished flu symptoms by 1.42 days wasn't something the agency ought to be approving.

And so our mindset has changed around this, but in some quarters not entirely.

Mr. Burgess. That's an incredibly important point. I was in practice at that time, and that did temper your judgment about writing this prescription, regardless of cost. If it's really only marginally effective, why put someone through the potential side-effects that possibly would occur.

Dr. Bright, you provide the market that Dr. Fauci referenced is not readily available, so it's hard to incent companies to take these challenges on. But you provide the market, right? You're going to be the one -- the bulk purchaser of this stuff?

Mr. Bright. Well, the marketplace for antivirals for seasonal flu is the marketplace. And I don't think there's full appreciation and recognition of the impact and benefit that one could receive from getting an antiviral drug in a timely manner when they are infected with influenza.

We had a new antiviral, same class from the Tamiflu, approved by a company, BioCryst, called Peramivir, just a few years ago, and there's still very little up-take of that new antiviral drug. And it is a

single dose, IV administered drug. So there is hesitancy in the marketplace to develop new antiviral drugs, even with benefits and reducing viral load and saving the -- reducing the severity of illness, if the marketplace and the patients and the healthcare system doesn't understand and appreciate the power of that drug.

Mr. Burgess. Let me just ask you a related question. You talked about bringing down the viral load. Kind of encountered when Ebola was causing all of the problems, the rapid reduction of the viral load caused kind of a Herxheimer reaction in some patients, and that caused some concern. Is that -- is that something, a phenomenon with which you are concerned with these types of medications?

Mr. Bright. We haven't seen that with the influenza antiviral drugs. Reduction of viral load, we believe would lead to less transmission. We believe it would lead to less severe illness in influenza antivirals.

Mr. Burgess. Yes, Dr. Fauci.

Dr. Fauci. And in Ebola, that was more a viremia, as opposed to what you see with influenza, which is mostly a local reaction in the lung. So you would you not expect a Herxheimers with that.

Mr. Burgess. Very good. Thank you, Mr. Chairman. I yield back.

Mr. Harper. The gentleman yields back. The chair will now

recognize the gentleman from New York, Mr. Tonko, for 5 minutes.

Mr. Tonko. Thank you, Mr. Chairman. And welcome to our panelists. Data from the National Immunization Survey found that fewer than half of children and adults were vaccinated by November of this current flu season. Only about 40 percent of people 6 months and older received the flu vaccine. These numbers appear to be just about what they were in the last couple of flu seasons. I'm just interested in hearing from this panel about why you believe these numbers continue to be in that realm, and just how do you approach that as an organization?

Dr. Schuchat, the data show that nearly 60 percent of Americans did not take advantage of that flu vaccination, is that an accurate number?

Dr. Schuchat. You know, the numbers that you're citing are from November, and those are our early results. By the end of the season, what we've seen in the last several years, is that about 48 percent of Americans get the flu vaccine, it's much higher in children, about 59 percent, and 43 or so in adults. There's a lot of mixed messages. And when we -- the thing with influenza, when we have a year like this where it's so severe, everybody actually knows how bad it can be, but then there's also questions about whether the vaccine is helpful or not.

It's really important for the clinicians and for us in public health to remind people that the vaccine has provided protection, particularly in children, and that getting the vaccine each year is worthwhile.

Mr. Tonko. And, Dr. Schuchat, again, and Dr. Gottlieb, perhaps, what have your organizations been doing to improve the rate, if anything?

Dr. Schuchat. Right. We do quite a bit of research on communication. We've done, I think, more than 30 studies to test messages over the past 18 years to try to understand what motivates individuals, as well as what influences clinicians in giving a strong recommendation. One of the biggest factors for patients is a strong recommendation from their doctor.

We've seen an increase in OB/GYNs recommending the vaccine and more women who were pregnant getting the flu vaccine each year, really after they saw how severe it was in 2009 when you were pregnant and got influenza. But we've probably hit a wall right now. And after this season, there's a lot of concern that -- we don't know how the medical community or public is going to react, so we're out there doing research right now and testing messages for next fall.

We do use multiple channels in doing communication about vaccine, both traditional channels and social media, trying to find influencers

and address the myths that people have.

Mr. Tonko. Uh-huh. And Dr. Gottlieb.

Dr. Gottlieb. I would just comment, I think the CDC has the most robust platform for communicating, but we not only echo the CDC recommends and their statements, but put out a number of our own to try to build on that. I think one of the things we did this season in particular was try to be very transparent about what we were learning about the vaccine effectiveness as we learned it. To continue to remind providers, in particular, and consumers, that this vaccine still had efficacy, and it had efficacy in particular against H1N1 and the B virus, which tend to peak later in the season.

So even if people perceived it as being less efficacious against H3N2, there was still a lot of value in getting vaccinated because later in the season you tend to see an upswing in the H1N1 and B virus, as we're seeing right now. And the vaccine was actually quite effective against those strains.

Mr. Tonko. And in terms of the 100 percent number that, obviously, is something that sounds like you shoot for, how important is it to reach that?

Dr. Schuchat. With many vaccines, there's direct protection, but also indirect protection and at a certain level the higher proportion of the population is vaccinated, they may actually be

helping others not get sick. So, in particular, I think the pediatric vaccination is important for the children, it's also important for the adults that often get flu from their kids or from their grandkids.

Mr. Tonko. Representative Castor touched on this a bit. This season we saw many new reports focused on the fact that the vaccine was only 36 percent effective. In addition, some inaccurate and misleading social media posts have warned people against vaccinating themselves or their children.

Dr. Schuchat, does CDC have any way of tracking how these media sources impact the number of people who are actually vaccinated?

Dr. Schuchat. We do assess attitudes periodically and try to understand whether there are rumors that are resonating or not. You know, when we do research on why didn't you get vaccinated for influenza, we hear more often about the -- well, I heard that's not an effective vaccine, rather than concerns about safety or concerns about cost. But I think that it varies for each vaccine what the barriers are or what the concerns are.

We work hard through our messaging, but also through partners and others to get the word out. You know, sometimes the faith-based community can reach a lot of people in some areas. There are mommy bloggers that are influential in some circles. Friends and family can be influential. Our most critical audience are clinicians and

healthcare providers because doctors, nurses, pharmacists have a lot of influence on peoples' behavior.

Mr. Tonko. Thank you very much. Anyone else that wants to comment on that? If not, I yield back and thank you, Mr. Chairman.

Mr. Harper. The gentleman yields back. The chair now recognizes the gentlewoman from Indiana, Mrs. Brooks, for 5 minutes.

Mrs. Brooks. Thank you, Mr. Chairman. And thank you to all the panelists for being here, and thank you for your service. As the panel here may or may not know, Congresswoman Eshoo and I recently started a biodefense caucus. I would encourage all of the members here to consider joining our caucus. And this is in a lead-up to the hopeful reauthorization of PAHPA. But I want to go back a little bit because during the 21st Century Cures debate, we did get signed into law the return of contracting of authority to BARDA.

And I'm curious, Dr. Bright, this was something -- we wanted it restored, it was in the original passage when BARDA was created, but it's my understanding there's been some hesitation by the contracting office to move the contracting back over to BARDA. Has that contracting authority yet been properly restored use since it was authorized and passed into law under 21st Century Cures?

Mr. Bright. Thank you for the question, and we are so grateful for 21st Century Cures to include that in the law that passed. It's

critically important. It has not been finalized yet, but it's important to know that it is part of an overall realignment of the entire as ASPR organization, and we look forward to the full implementation of that very soon.

Mrs. Brooks. And what is the hold up?

Mr. Bright. The hold up is the alignment with the overall realignment of ASPRs. So it's fully intended that Dr. Kadlec, our ASPR and I, are in full alignment to implement this as quickly as possible. We anticipate it will be done in a matter of months.

Mrs. Brooks. Okay. We'll continue to ask questions until we hear that what was authorized in the 21st Century Cures has been implemented.

I do have a question, though, in the original PAHPA, it's my understanding that BARDA was also given other transaction authority to reduce regulatory burden on the Federal contracting process that could both inhibit innovation and our preparedness. Is BARDA able to use that other authority that was in the original -- in the original PAHPA bill?

Mr. Bright. BARDA has been using other transactional authorities. Now, we have six of those in place with different industry entities. The process of getting the other transactional authorities is still -- a process is going to outside senior

procurement executive that we're working on improving the effectiveness and efficiency of that process now with our ASPR, but we are finding ways to utilize that OTA, other transactional authority, effectively.

Mrs. Brooks. Okay. Thank you. Sorry, you're on the hot seat today, however, with the reauthorization of PAHPA coming -- due to expire in September, talk to me about the administration's fiscal year 2019 request of $250 million for pandemic influenza.

Can you explain, at BARDA, authorization of pan flu program, BARDA, I assume is beneficial, assuming it is authorized or reauthorized, would you agree?

Mr. Bright. It's absolutely essential, yes.

Mrs. Brooks. Can you share with us how those funds would be used to prepare for the next influenza pandemic?

Mr. Bright. I described for you a lot of the work that has been done already with the investment that we've been provided and supplemental funds, and those funds are all obligated. And we've made great strides with our industry partners to make our country better prepared for pandemic influenza, but there is a lot of work still to be done.

As I said, we need to expand the access and availability of the vaccines we created so they are useful and available for all ages. We

still need to develop additional antiviral drugs. We need more drugs, more treatment options to treat people who are severely ill and hospitalized with influenza. And we need to do a better job with our diagnostics as well. We need to make sure the diagnostics are in the hands of the people who need them so they can get treated sooner and they can take responsible actions to reduce the spread of that virus. All of that work is yet to be done.

In the context of still sustaining what we've built, we have to sustain the infrastructure, that is our response capability for pandemic in our Nation. So in the context of sustaining and filling the gaps, that's how we would support and use those funds.

Mrs. Brooks. And in my 47 seconds left, can you talk about the importance of sustained and robust funding? Sustained being the critical word here, and why is that so critically important?

Mr. Bright. The sustainment of the funding, because we rely on these facilities of these companies to be available and producing a vaccine that is warm based, so when we need it, we need it quickly, that they have the staff in place and the capabilities in place, and that the FDA is able to continue reviewing and approving that facility.

It's important that we don't let our eye off the ball for sustainment. If the factories close, we have no response, we gain nothing. At the same time we must sustain our momentum in conducting

and supporting the phase two and phase three clinical studies for additional recombinant-based technologies for vaccines, for the platform-based technologies in the regional manufacturing process across our country so we can rely on those quickly when he would need them for a pandemic.

Mrs. Brooks. Thank you. I yield back.

Mr. Harper. The gentlewoman yields back. The chair will now recognize the gentlewoman from California, Mrs. Walters, for 5 minutes.

Mrs. Walters. Thank you, Mr. Chairman. California was hit particularly hard this year by the flu season. In my home of Orange County, especially suffered with well over twice the number of flu cases compared to last year. Orange County had at least a dozen influenza-related deaths in individuals under the age of 65. Yet, we all know that seniors are particularly susceptible to the flu. The CDC states that at least 75 percent of flu-related deaths occur in people 65 and older.

My district is home to a large retirement population so I am especially concerned about the health of this group during flu season. While the overall flu vaccine effectiveness rate for this year is 36 percent, the effectiveness rate can vary depending on age group. For instance, last year the overall effectiveness rate was 40 percent, and the effectiveness rate for seniors was only 25 percent.

One would suspect the vaccine effectiveness rate is lower for vulnerable populations like seniors, but I notice that the 2016-2017 vaccine effectiveness rate was much more effective for children, another vulnerable population. Some of my colleagues have asked what accounts for the variability in flu vaccine effectiveness among age groups, what can be done to improve vaccine effectiveness for seniors?

Dr. Schuchat. I can begin. There have been efforts to develop different influenza vaccine products, particularly for seniors and others with weaker immune systems. One such approach is a high dose product that has been licensed. Another approach is adjuvanted. A key strategy that we have at CDC is to make sure that patients and clinicians know that people at high risk for complications, including seniors, get promptly treated with antivirals if they do get sick. But the immune system does age, and we think that the frailer, elderly have a poor response to many vaccines, including flu.

Dr. Fauci. Whenever we have a situation, for example, when we are making a vaccine for a possible pandemic, we always test it not only in healthy adults, but we also test it in the elderly to make sure that the dose and the regimen that we have gives a comparable response that a younger person would have. So that's part of the testing. And as Dr. Schuchat said, the two major areas or the higher dose, which is recommended for seniors, it's a much higher dose than the dose that

you give to a healthy young person, as well as using adjuvants, which is a product that is not a vaccine but boosts the response to the vaccine.

Mr. Bright. If I could add, too. This is a lesson from pandemic influenza vaccine development that we can transition to seasonal influenza vaccine development. We know in a pandemic vaccine we have to have higher doses of antigen and we have to have adjuvants in those vaccines that makes them immunogenic and effective across all age groups.

I recently in the last two weeks visited the senior leadership of each of the licensed influenza vaccine manufacturers for the United States, and talked to them about this challenge about what their thoughts and strategies and how we can improve the effectiveness of our existing vaccines while we wait for the universal flu vaccine. Each of them is poised and strategic in thinking about ways to add the adjuvant and increase the dose of their vaccine. They are all partnered and interested in utilizing cell-based and recombinant-based vaccines as well to try to improve the effectiveness over the egg-based vaccines.

Dr. Gottlieb. I'll just comment very briefly, Congresswoman. We're actively looking at data as to the relative effectiveness of the vaccine with the MF59 adjuvant and the high does vaccine in elderly

patients relative to the normal vaccine, the regular dose vaccine with the 15 micrograms of antigen.

I think if we do observe differences between the high dose vaccine -- the efficacy of the high does vaccine or the vaccine with the adjuvant in it relative to the regular seasonal flu vaccine. It could offer some clues as to why the vaccine overall was less effective against H3N2. We will have that data available, hopefully, shortly. We're working very closely with CMS to drive those results and we are going to make it available as soon as we have it.

Mrs. Walters. Okay. And, Dr. Schuchat, in 2009, the FDA approved a high dose version of the flu vaccine for elderly individuals. There is a study that indicates the high dose vaccine was 24.2 percent more effective in preventing the flu in adults aged 65 and older, as compared to the standard dose vaccinee.

Can you elaborate on whether the high dose vaccine would significantly reduce flu-related deaths among seniors?

Dr. Schuchat. Even a 20 some percent superior response is still not, you know, 100 hundred percent, because of the weaker immune response that seniors get. We have the market of the higher dose product has been increasing since it became available. CDC doesn't recommend preference for the high dose over the regular dose vaccine. One of the things we found is that the vaccine that they have at the

doctors' office or the pharmacy is the one that you should get because there may not be the other product if you're looking for it.

But I think the additional studies that FDA is doing with CMS, and we've done with CMS in the past, has helped us build this evidence base of what's the best way to protect seniors.

Mrs. Walters. Thank you and I'm out of time. Thank you.

Mr. Harper. The gentlewoman yields back. The chair will now recognize the gentleman from Texas, Mr. Green, for 5 minutes.

Mr. Green. Thank you, Mr. Chairman. Thank you and the ranking member for allowing me to wave on. I am an alumni of this subcommittee. And thank you for allowing me to be here. I want to thank the chair for holding this hearing on the current flu season.

The 2017-2018 flu season has been one of the worst in recent years, resulting in tens of thousands of hospitalizations, and likely thousands of flu-related deaths around the county. There has been some advances in both vaccine technology and in antiviral drugs, which hopefully can both reduce the number of people who get the flu and help those who do get it to recover more quickly.

I understand there's a new vaccine production method based on recombinant protein technology that makes it less likely for a vaccine to mutate, as it is being grown. Dr. Bright, BARDA has supported development of several vaccines based on this technology, as well as

the development of cell-based vaccines and antigen sparing vaccines. Can you explain why BARDA has chosen to support research on these vaccine production methods rather than the egg-based production methods?

Mr. Bright. Thank you for that question. We primarily focus on supporting those new modern technologies to be able to respond faster and more effectively to a pandemic response. We know that we can cut out steps necessary to make a vaccine in the egg. You don't need a virus to grow -- to produce vaccines in the recombinant system. You can start from a gene sequence and rapidly go into production of your vaccine. This affords us great flexibility and great speed compared to egg-based vaccines.

We're learning now that investments in those new technologies might also offer advantages of a potentially more effective flu vaccine. What's critical to know about this, too, is it's one thing to license those vaccines and make them available, but if they're not available in sufficient supply and don't have the capacity to produce it, then they are not penetrating the marketplace, and those companies are frail and are vulnerable, at risk of going out of business after huge investment, if that vaccine is not used.

Mr. Green. Thank you. Commissioner Gottlieb, preliminary data suggests that some of the newer vaccines such as high dose vaccines

may offer greater protection. Is there enough data on these vaccines for the FDA to recommended these vaccines over others? If not, what type of data would the FDA need to make such a recommendation?

Dr. Gottlieb. Congressman, we're still evaluating, at least from this season, some of the data relative to the high dose vaccine and the vaccine with the adjuvant to see its relative effectiveness against H3N2. And when we start to speculate around different theories around why the vaccine overall -- and vaccines historically might be -- have been less efficacious against H3N2. One of the theories that you would put on the table, certainly, is perhaps you might require a higher dose of antigen in order to have an adequate immune response against H3N2.

So it's something that we're going to need to consider among many other possibilities on why historically we haven't seen a robust immune response from the -- against H3N2 from vaccines generally, when we look back around past seasons. The one thing we did observe so far this season was that the vaccine produced in cells, the cell-based vaccines, we had about 20 million doses produced in cells this year. Those do appear to be -- to have provided more protection on a relative basis of around 20 percent than the egg-based vaccines. And, again, we aren't sure of the reasons why, but it does lead to some hypotheses around why maybe generally speaking we haven't seen as much -- as robust

response against H3N2 historically as we'd like.

Mr. Green. I know there are a number of new antivirals in the pipeline, including some that may treat the virus at the beginning of the life cycle. Dr. Bright, can you explain why these drugs differ from those currently on the market, and how they might help us treat the flu in a new way?

Mr. Bright. Absolutely. I think that's important to recognize. The one class of drug that we have that's effective on the market today is called a neuraminidase inhibitor. It binds to an active pocket of a surface protein of the virus and it really blocks the virus after it's already replicated from breaking away from an infected cell and going on to infect other cells.

These new antiviral drugs are working on the replication cycle of the virus before it reproduces itself and buds away. Because they work in a different part of the virus life cycle, they also can be effective if the virus mutates and becomes resistant to the single class of drug that we have available in the market today. So it's critical that we have these different approaches to antiviral drugs.

Mr. Green. Thank you. Mr. Chairman, I know I'm out of time and your courtesies, I have some other questions that I'd like to submit if it's allowed.

And thank our panel for being here today. We're looking for that

light at the end of the tunnel, and I just appreciate each of you all partnering with each other to deal with it. Obviously, the flu is terrible, but you know there are a lot of other bugs out there that we'd like to deal with, too. Thank you, Mr. Chairman.

Mr. Harper. The gentleman yields back. And I will remind members that they do have 10 business days to submit questions for the record, and I ask the witnesses to agree to respond promptly, should you get additional questions in writing.

I want to thank you for your time being here today. It's very informative. And, Dr. Fauci, I enjoyed the slide presentation, I felt like I should get some college credit for that -- to see that.

Dr. Fauci. You got it.

Mr. Harper. But to visualize that and to see how it's better to attack the stem instead of the head, and actually give you a good visual was very informative. And, you know, one day we'll be in here and we'll be discussing that effective universal flu vaccine that we know we all desire to see. And I was going to say, I hope we continue to take steps, even if they are nanoparticle steps, to get to that conclusion. But, again, thanks each of you for being here. The subcommittee hearing is adjourned.

[Whereupon, at 12:35 p.m., the subcommittee was adjourned.]