

NATIONAL PRESS CLUB HEADLINERS LUNCHEON WITH
DR. ANTHONY FAUCI

SUBJECT: DR. FAUCI WILL SPEAK ABOUT THE PROGRESS MADE THUS FAR, AND THE CHALLENGES THAT LAY AHEAD AS EACH STRAIN GROWS DEADLIER AND PUBLIC TRUST IN VACCINATIONS WANE

MODERATOR: ALISON FITZGERALD KODJAK VICE PRESIDENT OF THE NATIONAL PRESS CLUB

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ALISON FITZGERALD KODJAK: Good afternoon, everybody. Welcome to the National Press Club, the place where news happens. And we hope it will happen today. I'm Alison Fitzgerald Kodjak. I am the health policy correspondent at NPR and also the Vice President of the National Press Club. Thanks everybody for joining us today.

Before I introduce our speaker, I just want to remind our in-house audience to silence your cell phones, once again, and invite everyone who's watching or listening to today's program to follow the discussion live on Twitter, using the hashtag #NPCLive. You can also send us questions. Anybody here in the audience who wants to direct a question to our speaker, you have cards on your table. If you pass them to whoever is closest to you at the head table, they will pass them up toward me.

It's my pleasure to introduce our distinguished head table guests today. If each of you could stand briefly when I say your name, I'll ask our audience to please hold your applause until everybody is introduced. To my far left is Joyce Frieden. She's the Washington Editor at MedPage Today. Beside her is Ferdous Al-Farouque. He is a senior reporter at Medtech Insight and a member of the National Press Club's Board of Governors. Next to him is Bob Eisinger, Special Assistant for Scientific Projects for the National Institute for Allergy and Infectious Diseases.

Skipping over the podium to my immediate right, I have Lisa Matthews. She is an assignment manager at the Associated Press and the Co-Chair of the National Press Club

Headliners Team, and a member of our Board. Skipping over our speaker for a moment, I have Steve Usdin, Senior Editor at BioCentury. Dina Fine Maron, Associate Editor for Health and Medicine at Scientific American. And finally, Suzanna Luthi, who's a reporter at Modern Healthcare. Thanks everybody for being here.

[applause]

Excuse me. My pages are stuck together. I'd also like to acknowledge some members of the Headliners Team responsible for organizing today's event, Betsy Fisher Martin, Laurie Russo, Tamara Hinton, and the Press Club staff, specifically Lindsay Underwood, Laura Coker, and our Executive Director, Bill McCarron.

The flu and flu vaccines are probably the last thing on your mind in the middle of the summer. But I have some bad news for all of you. We're just a few months away from the start of flu season. According to officials, the US just went through one of the most severe flu seasons in more than a decade, driven by a nasty bug that tends to cause more hospitalizations and deaths, particularly among the elderly.

As the world marks the 100 year anniversary of the Spanish flu pandemic, which killed an estimated 50 million people worldwide in 1918, the push for the development of a universal flu vaccine that can suppress future pandemics is gaining ground. Leading that research is our speaker today, Dr. Anthony Fauci.

Dr. Fauci is a physician scientist who directs the National Institute of Allergy and Infectious Diseases at the National Institutes for Health. He oversees an extensive research program that includes infectious diseases such as HIV/AIDS, influenza, Zika, Ebola, and much, much more. And he's a key advisor to the White House and the Department of Health and Human Services on global infectious disease issues.

In his own research, Dr. Fauci has made several important discoveries related to HIV/AIDS. He's one of the most cited scientists on that issue. And he's one of the principal architects of the President's Emergency Plan for AIDS Relief partner PEPFAR. It's a program that's saved millions of lives throughout the developing world.

So with the start of the 2018-19 flu season just around the corner, Dr. Fauci stopped by to join us, to speak about the progress made to date on a universal vaccine, and the challenges that lay ahead, as many flu strains are proving more dangerous and public trust in vaccines is, in some cases, faltering.

Please join me in welcoming Dr. Fauci to the National Press Club.

[applause]

DR. ANTHONY FAUCI: Thank you very much, Alison. It's really a pleasure to be here with you this afternoon to talk a little bit about influenza and its multifaceted components of influenza. And then we'll have some time for questions. But as we mentioned

inside, you could ask me questions about anything besides influenza if you like. But let's focus on influenza for the time being.

I think Alison made a good point in describing why influenza is really different than almost any other common viral infection that which we are confronted with in our lifetime. It's a virus that is historically and evolutionarily not a human virus. It's a virus of water fowl that, over centuries and beyond, adapted itself to humans, so that influenza viruses are out in the environment above and beyond the human species.

So the idea that we're ever going to get rid of influenza is a nonstarter. So the question is, how do we prevent infection with influenza? Again, differently from other viruses, there are two major types of influenza, when you think about it. It's the seasonal flu that, you know, when we talk about influenza, virologists and infectious disease people like myself often say, the only thing that you could predict about influenza is that it's unpredictable. But the fact is, the one thing that is predictable about influenza is that we're going to have an influenza outbreak every single winter for sure.

A more unpredictable issue is the issue of a pandemic. So what's the difference between seasonal influenza and pandemic influenza? Seasonal influenza occurs every winter. What happens is that the virus, because it's an RNA virus that tends to mutate readily, it changes generally a little bit. We refer to that as a drift, from season to season, which is the reason why we recommend that you get a new updated vaccine each season. What other disease do you know of, that we would recommend you get a new vaccine every year? There isn't any.

For example, measles essentially never changes. So the measles that I got infected with—I'm old enough to have gotten infected with measles when I was a child is exactly the same measles that's in the vaccine that I vaccinated my children with. And that's decades later.

So when it changes, it drifts. In contrast, every once in a while, it changes so much we refer to that as a shift. And the reason why that's generally a major public health problem, is because there would be no background immunity in the population to prevent a major outbreak. Whereas, with seasonable flu, even if no one got vaccinated each season—I say that and I get heartburn, because I want everybody to get vaccinated. But even if no one got vaccinated, there would be enough residual immunity in the community so that each season, it would never be a catastrophic outbreak, because enough people would be protected from the previous year.

So having said that as a background, the burden each year of flu is serious. In the United States, there are anywhere between a low of 12,000 deaths to a high of 56,000 deaths. There are hundreds of thousands of hospitalizations. We tend to get immune to that in the sense of metaphorically immune, because it happens every year. But as you know, there are several tragic deaths each year. Most of the vulnerable people are the ones that are at highest risk, elderly, people with underlying disease, pregnant women, infants. But also, otherwise well people can be impacted.

Now you heard Alison just mention that we had a very bad influenza season this season. It was the worst that we had in well over a decade, and maybe in any time of being recorded. And I'll get to that in a moment. With regard to pandemics, the mother of all pandemics was 1918, when 50 to 100 million people were killed in that year, globally. We've also had a few other pandemics that were a problem, but not that serious, 1957, 1968, and then 2009, the first pandemic of this century.

Now one of the problems that we have with influenza, and this is something we have to just be aware of, given the nature of the fact that it changes from season to season, we don't do very well with vaccination. Now that's a tough public health measure. And I always have to parse my words carefully, because our influenza vaccines are not nearly as good as vaccines against other infections. Let me explain what I mean.

There are three parts about influenza vaccine that are problematic. The first is that the current seasonal flu vaccines are not consistently affected. What do I mean? On a bad year, either because it's mismatched with the vaccine, or we made a vaccine that was well matched. But, by the time we made it, over a period of six months, it changed. On a bad year it's maybe 10 percent effective. Compare that to measles, which every year, is 97 to 98 percent effective. On a good year, it might be 40 percent effective. That's a good year.

Now one of the problems—actually 60 percent on a really good year. So let's say between 10 percent and 60 percent efficacy. We've got to do better than that. What's the next problem with influenza vaccines? Pandemics occur. And every time we try to chase after a pandemic, we're generally too late. Now there's a very recent example of that. Let me explain. Some of you may remember, in 2009, at the end of the season in 2009, just like you always see the number of infections in March went way down.

But then, at the end of March, we noticed some new infections in California and Mexico that were very different from the influenza that we had seen. We generally look to the Far East and think all pandemics start in China or the Far East. Well we got fooled this time, because the 2009 pandemic actually started in California or Mexico, not quite sure. California people say it started in Mexico. The Mexicans say it started in China. But somewhere around that area of this country and our hemisphere it started.

Now we knew about it in April. So we generally make vaccines by growing them in eggs. That's a problem. And I'll get to that in a second. Because from the time you decide what virus you're going to put into the vaccine, to the time you get enough of it to vaccinate people, is at least six months. So in 2009 we said, "Well, it's April." In fact, I testified before the United States Congress, telling them that I thought we would be able to get vaccine before the peak of the pandemic that we knew was going to occur. We were absolutely certain we were going to have a pandemic that winter, because the virus was already out there.

So April, May, June, July, August, September, beginning of October, flus generally peak in January. So we thought we'd have a few months of leeway. Not so. What happened?

As soon as the children came back to school, the influenza outbreak peaked in September and October. So by the time the doses were available, everyone who was going to get infected actually got infected. So that's the second thing. One, we chase pandemics, and we're usually late.

The third thing is that we make a major investment in trying to anticipate what the next pandemic is. You remember the H5N1 bird flu that really started in 1997, kind of went under the radar screen, and then came back in 2003. We invested hundreds of millions of dollars to try and get a stockpile of vaccine to improve our factories, to go from egg to cell-based, to be able to respond better. H5N1 never came.

Then 2013 arrived, and there was H7N9, another threat, bird flu, which was jumping from chickens to humans. It wasn't very efficient in going from human to human. But in the humans that did get infected, it was very lethal. And for that reason, we felt we needed to, again, mobilize and make a vaccine for the stockpile. So we invested again hundreds of millions of dollars to do that.

And yet, even though it was the right thing to do, we haven't had an H7N9 pandemic. So what's the solution? Well, the solution is, we have got to get what we refer to as a universal influenza vaccine. What do we mean by that? So if you look at the influenza virus, and that's the reason why I took a few minutes to explain to you about the difference between a drift and a shift, there are parts of that virus that, because of their tendency to mutate, generally change from season to season. And then every once in a while, a big change, when you get a pandemic.

The body makes a good response against that. And a vaccine can protect against that. But it's no good if it changes the next year. So the strategy is to get a vaccine that would induce the response against that part of the virus that doesn't change from season to season. And only within the last 10 or 15 years, using structural biological techniques and good structure-based genetic design, we were able to show that there are parts of that virus that essentially are the same, or very similar, from season to season, and even from pandemic to pandemic.

So there's an extraordinary amount of work right now that's geared at making a vaccine that will actually make a powerful response against the part of the virus that doesn't change. And I always get asked, "Okay, what does that mean? When are you going to have a universal flu vaccine?" It's not going to be next year or the year after, because it's going to be an iterative process.

If you look at kind of the framework of influenza, there are two big groups, group one and group two. And within each group are these multiple subtypes that we could be infected with. So my prediction—and I think it's pretty reasonable to say that it would be a rather correct prediction. I may be off by a few years—is that the first iteration would be a universal flu vaccine that isn't truly universal, but that covers multiple variations of a single virus, such that H3N2, H3N2 was the virus that is generally predominant. It was predominant this year,

the year before, etcetera. That if you could get a vaccine that would protect against all H3N2s, that would be like, I would refer to that as universal flu vaccine 1.0.

So what would universal flu vaccine 2.0 be? It would be one that would protect not only against all H3N2s, but maybe all H1N1s, which is the other major influenza that's we're confronted with. So that over a period of years, we would hopefully ultimately have a vaccine that we can give to children who are six months of age or older, that would essentially immunize them and protect them against any variation of influenza, and then maybe every several years—I don't think there's going to be a one shot forever—but perhaps every several years, boost them so that they're going to ultimately be protected.

So, you know, in summary, influenza is a serious disease, despite all our technological advances, we have not been able to get a vaccine that is given in a form where it can essentially protect you against all the natural iterations that happen merely because this vaccine, this virus has the capability of mutating.

So that's really the reason why some of you may know or remember, I called a workshop about a year and a half ago. Actually, it will be two years this summer, in which I brought all the experts of influenza from the United States and throughout the world up by the NIH, just north of the NIH in Rockville. And we put down a strategic plan and research agenda to do some of the things that I'm talking about now, to marshal the best and the brightest in the virology and influenza community, to be able to get on our way to develop a universal flu vaccine. And in fact, we have just funded, about two months ago, a phase two trial of one of what will likely be several candidates for a universal flu vaccine.

So why don't I stop there. And I'd be delighted to answer questions about this or any other subject you'd like. Thank you.

[applause]

ALISON FITZGERALD KODJAK: So that we don't have to dance back and forth, I'll stand here.

DR. ANTHONY FAUCI: You stand here, and I'll dance up here, right.

ALISON FITZGERALD KODJAK: So the first question is a little bit skeptical. It says, academic scientists have predicting, since the 1990s, a universal flu vaccine was just around the corner. So what makes you think that you're going to succeed?

DR. ANTHONY FAUCI: So who were these academic scientists that predicted it was just around the corner? Please stand and identify yourselves. [laughter] No. Actually, I don't mean to be facetious. But whoever said that was a little facetious. No, you could never say—certainly not in the 1990s, that a universal flu vaccine is right around the corner. There are so many complicating issues that relate to getting a vaccine that would truly be universal, that I think it would be folly for anyone to give you a year's prediction to tell you when you're going to get it. When you're dealing in the realm of discovery, it's very difficult to say

how long you're going to get to a place. If you're asking me about building a bridge from Staten Island to Brooklyn, I can tell you it would likely be, you know, the Verrazano Bridge in X number of years. But you can't do that when you're having science and discovery.

ALISON FITZGERALD KODJAK: So with that said, what are the biggest hurdles to developing that vaccine? I know you talked in general about the challenges, but what—

DR. ANTHONY FAUCI: Okay, I can give a succinct answer to that. There are two major hurdles. The one is getting the immune system to respond to something in a powerful way that it generally does not respond to in response to natural infection. The other really complicating thing, so I'll lay this out, I was going to give it during the formal remarks, but I didn't want to complicate the issue. But, now that you've asked, I'll complicate the issue a little bit.

There's a thing called imprinting, that with influenza, if you get infected with a certain strain of influenza, and then years later you get infected with another strain, your immunological memory will selectively make a more powerful response to the first one that you were exposed to as opposed to the one you're exposed to now.

So let me give you an example of why I think the success story will be, when you vaccinate children before they get imprinted with anything, so that the first influenza they see is a universal influenza. So that, if I were, for example, when I was one year old, was exposed to an H1N1 influenza, and then when I was 35 years old, there's an H3N2 influenza around, so I get vaccinated with an H3N2, I will make a distracted response as much against the H1N1 that I would make against the H3N2. So your body tends to revert back to the first type of influenza you responded to. So that complicates the issue. So the best responders for a universal flu vaccine, when we get a universal flu vaccine, will likely be the children who are vaccinated at a very young age.

ALISON FITZGERALD KODJAK: Okay, so this person asks, would a universal flu vaccine eventually fail because the influenza virus will ultimately produce a mutant strain? I mean would that part of it that you're saying it fights change?

DR. ANTHONY FAUCI: That's a good question and a fair question. So it is certainly possible that, even though you make a vaccine against that part of the virus that doesn't readily mutate, over years, if you are protected by making a response against that part, that the body and the virus, which is a smart virus, will ultimately mutate to even escape that. Which means that, over years, you might have to upgrade your universal flu vaccine. But it's not an unreasonable question to think that the virus is smart enough that ultimately, it will try to evade even a universal flu vaccine.

ALISON FITZGERALD KODJAK: Okay, this one seems a little bit—well, I don't understand this question, but I'll throw it out there anyway. What is your assessment of the Shionogi flu vaccine? Do you know this? Sorry.

DR. ANTHONY FAUCI: I better not comment, because I'm not sure what he's talking about.

ALISON FITZGERALD KODJAK: Okay, neither do I. Okay, here's a more simple one.

DR. ANTHONY FAUCI: They may be referring to a most recent one. I don't know if it's that. There's an interesting thing at press conferences. If you don't know what the question is, don't answer it. [laughter]

ALISON FITZGERALD KODJAK: That's why I threw it to you. All right, well here's one that you will understand. Why is there a flu season?

DR. ANTHONY FAUCI: Good. So why is there a flu season? Well flu is around all the time, so it isn't as if flu completely disappears in the summer months. But flu tends to have an outbreak when certain conditions are favorable. And it happens in the winter. When we get our flu season in December, January, and February, Australia gets their flu season in July, August, and September, because that's their winter. So if you go to Australia or to Argentina, in the southern part of Argentina, and you go there in our summer, it's their winter.

And during winter, what happens? You stay indoors. You close windows. There's not very good aeration. So anything that's respiratory spreads very easily. The other thing is, that during the winter, things are much more dry than they are moist. In the summer you have humidity, you have moisture. Viruses spread and do much, much better in a nonmoist environment. That's the reason why.

ALISON FITZGERALD KODJAK: I'm going to ask one or two more about flu and then we maybe move on, because we have a lot of topics here that people want to talk about. Why has the flu mist been less effective than the injectable flu vaccine?

DR. ANTHONY FAUCI: The question is, why was the flu mist less effective than the injection? There was one year when one of the components of the flu mist was not very well matched. And it did not protect. They pulled it off the market and said they wouldn't recommend the flu mist. But it's back in action again. So in fact, for some individuals, even for, for example the children, the flu mist is actually even better than the injected form. But there was that one year or so where they pulled it out because it wasn't as good. And people are perpetuating that concept that it isn't as good. And that's really not the case.

ALISON FITZGERALD KODJAK: But now it's okay again?

DR. ANTHONY FAUCI: It's okay.

ALISON FITZGERALD KODJAK: Okay. Is there any evidence that some individuals are more resistant to influenza infection? And are there genetic markers for that?

DR. ANTHONY FAUCI: Well, I'll answer the second part first, and then the first part I'll follow up. There are no real standard clear genetic predisposition to influenza. Some people are more susceptible, as they say. Because, as I like to say, somewhat tongue-in-cheek, all of life and all of biology is a bell-shaped curve. You know, there are some people who get sick every year no matter what happens. There are some people who never get sick. And then there's the bell-shaped curve, where most of the people, every once in a while, get sick.

So it isn't as if people are susceptible. It may be that their immune system is a little bit more vigorous. They more readily make an immune response. There's a lot of reasons for that. It's complicated. There's not a single uni-dimensional response to that. There are a lot of different reasons.

ALISON FITZGERALD KODJAK: So this person then asks, should there be more emphasis placed on strengthening the immune system overall of our population? And this person says they use a lot of vitamins to do that. Is there any way to do that?

DR. ANTHONY FAUCI: I'm going to make a lot of people unhappy now. [laughter] So let's go for it. [laughter] In general, a healthy lifestyle, a good diet, exercise, things that keep you in general good health, without a doubt, make you much more likely to resist infection than others. Artificial grams of different vitamins, etcetera, in general, have really no impact. It's a good placebo effect. It'll make you feel good. But it doesn't really have a biologically important effect.

__: Purell.

DR. ANTHONY FAUCI: Purell. Well I wouldn't drink Purell. [laughter] Yes. Washing—That's a very good—I'm glad you brought that up. In the flu season, it's amazing how something as simple as frequently washing your hands can protect you, because it's a respiratory-borne illness, not only with droplets, but with aerosol, which can get on hands. You know, people cough and sneeze. They shake your hands. You know, people have done a study about how many times you, we touch our own face on a given day. It's astounding how many times you rub your eyes or rub your nose or rub your mouth. So washing your hands, fine. And then the Purell question is, often, you're not near a sink, and you really can't do that. And that's the reason why getting one of those artificial ones, and when you're in a situation where you're shaking hands a lot, just squirt a little and do that. So it works.

ALISON FITZGERALD KODJAK: Okay. We're going to move on from the flu vaccine to vaccines in general now. So vaccines—This questioner says, vaccines are under assault throughout the western world. Italy is backing off vaccination requirements. President Trump and HUD Secretary Carson have suggested connections between vaccines and autism. Vaccination rates are declining in Europe and in pockets of the US. What are the consequences to society of the retreat from vaccinations and science in general?

DR. ANTHONY FAUCI: Well I think, you know, history gives us the answer to that. Clearly, if we really backed off significantly, and in some parts of the country we are

actually doing that, and some countries throughout the world they're doing that, it could really lead to serious health consequences. One of the problems today is that we are, in some respects, victims of our own success, in that we've been so successful in eliminating and, in some cases, eradicating like smallpox, but eliminating, like we've done with so many important diseases by vaccinations, that we get into the complacency of thinking, clearly incorrectly, that the risk of the vaccine is more than the risk of the disease. And that's just not the case. And that is fueled and propagated by misinformation.

The most egregious of that misinformation was what came out of England years ago, that the MMR, measles, mumps, rubella actually is associated with autism. Which was not only completely incorrect, it was fraudulent data for which the person who put out that data lost their medical license in England. And yet it's still out there that measles and other vaccines cause autism. And there is absolutely zero evidence that that is the case.

ALISON FITZGERALD KODJAK: So what kinds of incentives should governments create to make vaccine development for emerging diseases more viable? The questioner asks about issues regarding biotech companies having the proper incentives, because sometimes diseases come and go before a vaccine is ready. And they've put a lot of money into it.

DR. ANTHONY FAUCI: Well, there's sort of like a two-pronged answer to that question, when you say government. Well government can do things like financial incentives, tax incentives, incentives to get people to develop something, and you'll make it easier for them to get an accelerated license for another. Those are all things that government can do. But government, in the form of what we do at the NIH, I think, is a major incentive to get companies to get involved into development of vaccines and other countermeasures. It doesn't only have to be a vaccine for a disease that's of public health significance, but not of projected economic significance for the company.

And we've dealt with that recently, with Ebola, with Zika, with West Nile, in which a company doesn't see that they're going to make a lot of money by investing the several hundreds of millions of dollars to perhaps a billion dollars per product. So what the federal government, in the form of the NIH, the CDC, the FDA does, is we do what's called derisking the process for the company. Let me explain briefly, because it's an important concept.

When a company knows that they're going to have a blockbuster drug, they don't really need anybody else. I mean they need the NIH to do the basic research for the concept, but they will start and do the early development, the preclinical, the early clinical, the medium advanced, the advanced development on a product, because they're going to make billions out of that.

When they see that there really is not a very good chance that they're going to make a significant amount of money back from their investment, they're hesitant to do all that. So what the federal government does, like the NIH, is that we invest in the concept development, the preclinical, the animal models, the phase one, the phase two, and we get the

product to the point where there's very little risk in the company now investing, because they know, almost certainly, it's going to be a success. Because a lot of the failures are in the upstream part. Whereas downstream, once you're in advanced, you're pretty sure what you're going to get.

And we've done that. In fact we, right now, and there's a really good example of that, the NIH right now, and a couple of other biotech companies, but I'll speak just for what we're doing, we are bankrolling the entire Zika vaccine trials now that are taking place in South America, the Caribbean, Mexico, Florida, and Texas. The NIH made the product. We're now financing the trial. If it looks like, which it will be successful, we are counting on then a pharmaceutical company coming in and saying, "Okay, we'll take over for now and produce it." Which means they will have to make relatively little investment. That's what's called derisking it for the pharmaceutical company.

ALISON FITZGERALD KODJAK: So on that issue, there was some controversy last year, specifically about the Zika vaccine, because while the government took all the—you know, derisked it efficiently and put all the upfront money in, there were no conditions on the pricing that the private companies would sell the drug for. And I know there were several state level officials who were concerned about that.

DR. ANTHONY FAUCI: Yeah. I think that was a misguided concern, because what it was, what you're referring to, you're getting a little bit too specific about price control. It wasn't really price control. It was an exclusive license. So when the government develops a product, and we own it, we have the patent, you have to license it out to a company. And companies who are going to make major investments generally want an exclusive license. So they're going to say, "If we're going to take the responsibility, we want to have an exclusive license so we develop it."

With that is the assumption, often incorrect, that once they get an exclusive license, they're going to make the price ridiculous that nobody else could afford it. That generally is not the case, particularly for something like Zika. But what happened, is that in the specific incidence, which we won't give any names that I know, Alison, you're referring to, is that we got exercised, we the American people, about giving an exclusive license to the company, and saying, "Well, you're going to just price us out if you do that." And the company said, "Thank you very much. I'm not going to be involved. And you don't have any company that's going to do it." So that's the risk of not giving an exclusive license, is that you won't get a company that's willing to invest.

ALISON FITZGERALD KODJAK: Okay. So now we have several questions here regarding tropical diseases. There's questions whether—What's the status of a vaccine for Ebola? Are there vaccines on the way for Chikungunya or Dengue? And then, a separate question regarding anthrax. So people want to know about all the vaccines that are in the works out there.

DR. ANTHONY FAUCI: Okay, let's go through the list. Ebola. So an Ebola vaccine was developed as a VSV product, which is a vector that has an insert to express the

important protein for Ebola. That was developed originally by the Public Health Agency of Canada. Merck took it over now. The NIH is doing the clinical trials. We have an ongoing clinical trial of that vaccine and another vaccine made by the Yanson[?] Company, which is an ADNO 26 vector. It's in trial in Guinea, Sierra Leone, Liberia, and Mali.

Now since there are no Ebola cases, it's going to be kind of tough to prove that it works in the field. But if you gain enough immunogenicity data, namely that it induces the kind of response that you would predict would be protective, as well as safety data, you can then negotiate with the regulatory authorities to essentially approve it on an accelerated approval by linking it to the animals. That's Ebola.

Next Chikungunya. Chikungunya, as you know, first came to the Western Hemisphere in 2013. It's a very important infection in the Caribbean and South America. We are now in a phase 2B trial of a Chikungunya vaccine that, again, we developed at the NIH. But we're not the only player in town. Don't let me give you that impression. There are a number of companies that are also doing it. But we are advanced into a phase 2B trial.

Dengue. There are several Dengue vaccines that have been utilized. It was a little controversy about one, in the sense of increasing seriousness of disease if given to someone who hasn't had a previous infection. There were maybe two or three really good Dengue candidates that are now being pursued. I predict, with pretty good confidence, that we will have a good Dengue vaccine within a reasonable period of time. So those are the three you asked about.

ALISON FITZGERALD KODJAK: All right, great. Thank you. So this person asks, there's a close correlation between extreme poverty and infectious diseases. How important is poverty alleviation in developing countries, and in the US, as a tool for combating infectious disease?

DR. ANTHONY FAUCI: That's a very good question. And in fact, the bottom billion in the world are the ones that have most of the—Those are the people who are the poorest. They clearly are highly disproportionately afflicted with infectious diseases of any and all type. But particularly some of the infectious diseases that we never even think about. They're called NTD, neglected tropical diseases, diseases that are just very esoteric. We never really hear about them in our wealthy country. But the people who are the poorest are the ones that suffer the most.

So the answer to the question is, poverty is really bad for you when it comes to infectious disease. It's bad for you for a variety of other reasons. But infectious disease is paramount among them.

ALISON FITZGERALD KODJAK: So the International AIDS Conference is next week. With that in mind, what's the biggest need in the area of HIV prevention and treatment? Is anything happening with the development of longer-acting medications?

DR. ANTHONY FAUCI: So I'm going to be leaving on Friday evening to go to Amsterdam to make a few presentations at the International AIDS Society Meeting, which occurs at a different place each year. The question is, what about prevention of infections? We have the capability today, within our own resources, in the sense of our scientific discoveries, if we implemented it to its ultimate, you could probably end the AIDS pandemic as we know it right now. Because we have treatments that, if you treat an individual with an antiretroviral drug, and bring the level of virus to below detectable level, not only do you save that person's life, but you make it virtually impossible for that person to infect anybody else because the level of virus is so low. That's referred to as treatment as prevention.

So just think theoretically. If you could treat everybody in the world that was infected with HIV, you could stop the epidemic tomorrow. We also have a thing called preexposure prophylaxis, which is shown that, if you have someone who's practicing high risk behavior, that if you give them one pill a day that contains two antiretroviral drugs, you can essentially, again, decrease by more than 95 percent, the likelihood that they would acquire infection. So if we only implemented the public health tools that we already have, we can actually end the epidemic.

So one of the big discussion items that's going to happen in Amsterdam is, how do we accelerate the access to people who are in special populations that don't have easy access? They don't have a good healthcare delivery system. They're living in places where stigma makes it very difficult for them to come forward to get the kind of help that they need. So lack of health systems and stigma are the two major obstacles to preventing HIV infection.

ALISON FITZGERALD KODJAK: So interesting you bring up stigma, because we have two questions related to HIV and hepatitis C and the opioid epidemic. And one person says, several common hallmarks with HIV and opioids, including stigma, hidden populations, the inability to locate people and get them treatment, what can we do about opioids and infectious diseases in there?

DR. ANTHONY FAUCI: Well that's a major problem that we're facing in the United States. You don't need me to tell you that. That's all over the media right now, that with the explosion of the opioid addiction problem in the United States, you know, there's a sort of a direct road that could go from opioid addiction to HIV. And you scratch your head, how does that happen? Well opioid addiction leads to then injection drug use, heroin, or even other drugs that you inject intravenously. And when you have intravenous drug use with sharing of needles, that's how you get outbreaks of HIV. We saw the big outbreak in Indiana a couple of years ago. We're starting to see it now in those areas of the country where you have a high opioid use.

So we need to pay attention to that. How do you access? It's very difficult for the people who are in that, populations that you don't easily access with the healthcare system. So if we had a much improved healthcare system in this country, we would probably do a much better job.

ALISON FITZGERALD KODJAK: Are there lessons from the sort of destigmatization of HIV that can be broad across?

DR. ANTHONY FAUCI: Of course. Whenever you treat a disease as something that is—I'll coin a word here—stigmatizable, then you really get in trouble. We had that situation with HIV, when the early populations were gay men, injection drug users, commercial sex workers, which are generally individuals who are disenfranchised populations, that even in the best of all worlds, are stigmatized against.

You super-impose upon that a disease which makes everybody shutter, and you have a double whammy stigmatization. So the idea of addressing stigma, and realizing that these are diseases, addiction by itself is not a crime, it's a disease. Injection drug use is a disease. HIV is a disease. When we start thinking in those terms, then hopefully the stigma associated would alleviate somewhat.

ALISON FITZGERALD KODJAK: So we're going to change the subject one more time. How is the relationship between NIAID, NIH, and President Trump? And has he taken any interest in any particular things that the agency is working on?

DR. ANTHONY FAUCI: Well, the President and the administration obviously has a keen interest in the opioid epidemic. So I would think that the relationship between—You wouldn't necessarily say the White House itself. But certainly, the President is interested and has clearly manifested that in the opioid epidemic. But it's mostly the Department of Health and Human Services, which is an integral part of the institute, of the administration. And we deal very closely with HHS on all of the things that I've been speaking about today, with Alex Azar, who is the Secretary, who's really quite an extraordinary person. So we're good.

ALISON FITZGERALD KODJAK: A controversy arose a couple weeks ago, actually perhaps more recently, about the US and its disagreement at the World Health Organization regarding the promotion of breastfeeding. How is the US relationship with the WHO, were there any things that came of that, that were positive or negative?

DR. ANTHONY FAUCI: You know, I really can't answer that question, Alison. I don't want to be evasive. But I wasn't in the discussions, except I can make a statement that breastfeeding really is a good thing. [laughter]

ALISON FITZGERALD KODJAK: This person asked, is it difficult to attract and keep the most promising young scientists in the United States now due to current funding constraints and cultural environment?

DR. ANTHONY FAUCI: It is difficult. The biomedical research enterprise, over the last, oh, I would say, at least 15 to 17 years, has been a bit unstable. If you look, and if you use the NIH as the prototype of that, that if you have instability in knowing what your budget is going to be the following year, if you have a flat budget or a cut budget, the incentive for bright young people to go into the fields of biomedical research is really dampened a bit. And we've seen that.

The NIH, prior to, I'd say, the last 17 or so years, had a steady growth, from the very beginning of the NIH, an average of doubling about every ten years, which means about a seven or eight percent increase each year. From 1998 to 2003, which overlap between the second term of President Clinton and the first term of President George W. Bush, the NIH budget doubled in five years. Which means about a 13 to 14 percent increase. That was the real, you know, heavenly years of the NIH. But then, that was the good news.

The bad news is that, from 2003, literally straight through 2016, the budget was flat. And when the budget is flat, and you're dealing with a two to 2.3 percent inflationary index each year, you do the math, and at the end of those years, you have a 23 to 24 percent decrease in purchasing power for the NIH. It was during those years that there was a great degree of, I wouldn't say depression, but not exactly joy among the biomedical research community. And young individuals who were thinking of going into this career in science were a bit disincentivized to do that.

The last couple of years, the Congress has been really generous with us, in the sense of making sure we don't get cut, and giving us a couple of to \$3 billion dollars increase. And that's mostly with the elitists in Congress now, people like Senator Roy Blunt, and Congressman Tom Cole, and others, who are the Chairs of our appropriations subcommittees.

ALISON FITZGERALD KODJAK: Okay. And on another subject. The National Academies of Science underscored how prevalent sexism continues to be in science professions, with a particular focus on what they called gender harassment. How can we address this problem?

DR. ANTHONY FAUCI: We're doing a wide range of questions here today.

ALISON FITZGERALD KODJAK: We are.

DR. ANTHONY FAUCI: Yeah, okay. Well, you can address it—I was going to say easily. It isn't easily. But there is something that is absolutely essential to address it, and that's zero tolerance of it, period, with no exceptions. And I think that's the thing that we're starting. People are coming around. Different institutions are now coming around that, what was sacrosanct, you don't go near it, because that's the way it is, no longer flies. And you know not only in universities, but in some of the scientific organizations, that the way you address this is by zero tolerance. If there's any of that, you get rid of the person who's doing it, period. That's it. Case closed.

ALISON FITZGERALD KODJAK: It's hard to get rid of the person who's at the center of a major lab though.

DR. ANTHONY FAUCI: Well, you can. You think not, read the newspapers, read the media. There are people who—And I don't want to mention names, because I don't want to bring it to them. But there's a very prominent scientist on the west coast that was a big—

you know, made a lot of attention, who had a history of sexual harassment, who essentially was forced to step down. And there are many more of those that you're seeing now.

ALISON FITZGERALD KODJAK: Okay. I'm just going to bring it back to our discussion about opioids for a minute, because somebody raised a good question, which is, you just said, if we had a better healthcare system, we'd do a better job. So what better healthcare system do we need? Like what do we need to change?

DR. ANTHONY FAUCI: Well, we need to have the availability of affordable healthcare for everyone. That's simple. I mean that's really a short answer to a very important question.

ALISON FITZGERALD KODJAK: Okay. Would you put something like community health workers out there, like we do in developing countries?

DR. ANTHONY FAUCI: Well, you know, we can do better. I mean first of all, available, affordable healthcare for everyone. But the system of how you do it, there are different countries that do it different ways. I mean I think there's probably a lot of people in the room who might have gotten caught in having something wrong, and finally getting to the right physician to really listen to what you have to take care of you, isn't always the easiest route in the world.

ALISON FITZGERALD KODJAK: Okay. Now I have this pile of questions, in case you thought we were jumping around before, this says broad. So that means a lot of different questions. What do you think is the greatest challenge facing medical research today?

DR. ANTHONY FAUCI: You can't answer that question as the greatest challenge, because there's just too many. I mean in my field of infectious diseases, if we could get an HIV vaccine, we could essentially eliminate one of the most negatively impactful events in our memory. I mean there have been 77 million people who have been infected with HIV, 37 million deaths. There are 36 million people living with HIV. So even though this is one of many, many challenges.

The other is the challenge of prevention. I think that there are lifestyle changes that could prevent an enormous number of infectious diseases. I mean if you want to get out of my field, but something that I'm acutely aware of, if you just look at the obesity epidemic in this country, and what the negative ramifications of obesity in the form of diabetes, heart disease, stroke, kidney disease, a variety of other things, that if we could essentially mitigate the obesity epidemic, that would be a major, major challenge. And I could go on and on for each subspecialty.

ALISON FITZGERALD KODJAK: Recently, there's seemed to be an increasing number of food-borne illness outbreaks. Is this due to better tracking and detection? Or are there actually more problems today with food?

DR. ANTHONY FAUCI: You know, I think it's a combination of both. Certainly, the tracking is better, because we're more aware of food-borne illnesses. But the diversity of locations with which we get food, and the amount of imported food that is not directly under our supervision, is growing each year. And that's clearly contributing. In addition to the fact that we're noticing it more.

ALISON FITZGERALD KODJAK: Okay, we're back to the flu. Aside from Tamiflu, do we have hope for a new antiviral flu treatment?

DR. ANTHONY FAUCI: Yeah. There is a new one that just came out, that may be the Shionogi one that they're talking about. Yeah. There's a new flu vaccine—excuse me, a flu therapeutic that just came out. And I think that is that company. I think that's what they—now that I remember, I think that that's what they were referring to. It works in a different part of the virus replication than Tamiflu does. It works earlier in the replication cycle. And it works with a single dose given once, whereas Tamiflu is five doses over five days. So it is alleged to be, and it's still early on in the proving, even more potent and effective than Tamiflu, and more convenient, because it only requires one dose.

ALISON FITZGERALD KODJAK: Okay. Johns Hopkins University issued a report on the most likely candidates for the next global pandemic. And they were all respiratory-based viruses.

DR. ANTHONY FAUCI: Right.

ALISON FITZGERALD KODJAK: I want to know why that is. And this person wants to know, what types of preparations are being made to combat these new disease outbreaks?

DR. ANTHONY FAUCI: Okay. I'll answer the second question first. I just gave a lecture on it, pandemic flu. Okay. So you ask any person in infectious diseases what's the thing that keeps them up at night. And they will either say a pandemic flu or more generically, the way I do, is a respiratory-borne illness that is spread by both droplets and aerosol, that has a high degree of morbidity and potential mortality. And the reason respiratory illnesses are the ones that are the most problematic, is that they spread so easily.

Whereas other really serious diseases, like everyone you remember a few years ago, with Ebola, two nurses got infected by taking care of an Ebola patient in Dallas. And the entire country went into a panic, that we were going to have an Ebola outbreak in this country. There is no chance in the world that we would ever have a disseminated Ebola outbreak where there are hundreds of thousands and millions of people getting infected, by the nature of how Ebola spreads.

Ebola spreads when you're in direct contact with someone where there's body fluids all over the place. I hate to say it at a luncheon. Urine, feces, blood, secretions. That's how you get infected. And that's the reason why we—and I myself, when I took care of a couple

of Ebola patients at the NIH, I had to get dressed up in a spacesuit to take care of them, that's not the kind of disease that readily spreads.

A respiratory disease, if we had a flu right now, and people were in this room coughing and sneezing on each other, you'd have several people who get infected. Whereas with a disease like Ebola, that wouldn't happen.

ALISON FITZGERALD KODJAK: Okay. So I'm just going to turn to this one question before we start to wrap up. Under President Obama, the US government launched the Precision Medicine Initiative, with the aim of collecting genomic data on a million Americans. Do you think that project will affect the way we respond to infections? And if so, how?

DR. ANTHONY FAUCI: The answer is likely, but not nearly as much as the precision medicine associated with other infection. precision medicine, I always have a little good natured bantering with Francis Collins, the Director of NIH, because the most precision medicine imaginable is infectious disease. You get a microbe. You either prevent it or you treat it, period. End of case. As opposed to the more complicated metabolic and other issues. So the answer to your question is yes, precision medicine is very, very, very much involved with infectious disease. Get the correct microbe, and treat it. That's about as precise as you can get.

ALISON FITZGERALD KODJAK: All right, so you're way ahead of the times.

DR. ANTHONY FAUCI: Yeah, we passed you a long time ago.

ALISON FITZGERALD KODJAK: Okay. All right, before we get to the last and final question, I just want to mention a few upcoming events at the Press Club. On July 24th we have Gretchen Carlson and Regina Hopper here. They will talk—Now I've lost the topics. Excuse me. But Gretchen Carlson has a new book out. Oh, okay. Thank you. I lost the thing. It disappeared again. Sorry for the gracelessness. The piece of paper I had these on disappeared.

DR. ANTHONY FAUCI: Modern technology.

ALISON FITZGERALD KODJAK: On July 26th Gil Klein, who's a former President of the National Press Club, will talk about his book *Trouble in Lafayette Square*. And on August 13th, we have Sean Spicer here to talk about his new book, *The Briefing*. And August 14th, former Secretary of Education, Arne Duncan will give a talk about how schools work. So please join us for some of these upcoming events.

And for Dr. Fauci, I would like to present to you the commemorative and very exclusive National Press Club coffee mug.

DR. ANTHONY FAUCI: Thank you.

[applause]

ALISON FITZGERALD KODJAK: The very exclusive club of people who get this.

DR. ANTHONY FAUCI: It's less than \$50 dollars isn't it?

ALISON FITZGERALD KODJAK: Absolutely. And for my last question, we would just like to know, do you ever sleep?

DR. ANTHONY FAUCI: No, not very much at all, actually.

ALISON FITZGERALD KODJAK: You've got a lot on your mind.

DR. ANTHONY FAUCI: I wouldn't recommend it, my lifestyle, for other people.

ALISON FITZGERALD KODJAK: Okay. Thanks for being here, very much.

[applause]

END OF INTERVIEW