

# Ending the HIV/AIDS Pandemic

[Announcer] This program is presented by the Centers for Disease Control and Prevention.

[Peter Drotman] Hi. I'm Dr. Peter Drotman, editor-in-chief of the *Emerging Infectious Diseases* journal. I'm talking today with Dr. Anthony Fauci, director of the National Institute on Allergy and Infectious Diseases at the NIH. He is located today in his home office, Bethesda, Maryland. He's one of the most prominent and well-known clinicians, researchers, and public policy leaders in the field of public health infectious diseases over the past several decades. He and Robert Eisinger have an article in the March 2018 issue of the *EID* journal and it has the rather optimistic title of "Ending the HIV/AIDS Pandemic." The very first sentence of the paper says that ending that pandemic is theoretically achievable. What makes you optimistic about this?

[Anthony Fauci] Well, the reason I'm optimistic that it is possible—I'm somewhat reserved on how we're gonna get to the end game—but the reason for the optimism is that we now have the tools, which have been proven in a variety of clinical trial settings, that actually can give you the ammunition, if implemented in an aggressive and sustained way, to actually turn around the trajectory of the epidemic. So, let me just very briefly explain a couple of those tools. So, we know that we have adequate therapy, more than adequate, we have superb therapy that, if taken as directed and consistently, can decrease the level of virus in an individual to below detectable level. So, you could essentially save the life and prevent illness in the individual person. We also know that, when you decrease the level of virus to below detectable level, it makes it virtually impossible for that person to transmit the virus to someone else. We call that treatment as prevention. We also know that we have very interesting and efficacious means of preventing infections in high-risk individuals, such as by pre-exposure prophylaxis with a single pill, if taken, again, religiously, the way one should. The efficacy of that is well over 95 percent and maybe even approaching 97 or more percent. So, theoretically, if we could identify all the people who are infected—and I know that's a prodigious task—get them on therapy, decrease the level of virus to below detectable levels, and get those individuals who are at high risk to take pre-exposure prophylaxis, if you do mathematical models of that, you can actually turn around the trajectory of the epidemic. The difficulty is that it is quite complicated to universally implement that throughout the world, in various regions where there may not be the adequate health care infrastructure to do that. But you can certainly do it in select places. So, that's the basis for the optimism, that it *can* be done. But what we have is what I call an implementation gap. We have the tools, but we really have not been able to fully implement them to the degree to get the effect that we want.

[Peter Drotman] And your article goes into many of the challenges that various practitioners and leaders around the world who are working on this issue face. One that is not specifically covered in your article, and it's not a coincidence that this article is in the March issue of the journal, 'cause that is annually our World TB Day issue, is in fact, tuberculosis. HIV and TB overlap in epidemiologic and other ways. How do those two serious public health problems interact to influence each other?

[Anthony Fauci] Well, they—that's an excellent point—and TB and HIV interact and interdigitate with each other in a very profound and impactful way. Because, as we know, the statistics are really rather stunning—that tuberculosis alone, in and of itself, is the leading cause

of infectious diseases death in the world. That's number one. And, if you look, particularly in regions of the world, such as sub-Saharan Africa, a substantial proportion, 30 percent or more, of the individuals who die with HIV infection, die of tuberculosis. So, if you're in southern Africa, let's, such as in Kwazulu Natal in South Africa, the major issue you have in HIV is tuberculosis. So, whenever you talk about HIV, particularly in settings of the developing world, you have to be considering tuberculosis, and vice versa.

[Peter Drotman] Now, we are having this discussion in 2018, which happens to be the 100-year anniversary of one of the worst events in human history, the 1918 influenza pandemic. I have heard you speak in previous venues about how the 20<sup>th</sup> century was sorta bookended by influenza at the beginning and HIV/AIDS at the end. What is your take on what lessons that we should be learning from those two epidemics, to prepare, perhaps, for the end of HIV and to avoid the next influenza pandemic?

[Anthony Fauci] Well, Peter, I'm glad you've brought that up, and you've brought it up in a very appropriate way about bookends for the 20<sup>th</sup> century. And, I think, if you look at these individually, they represent a common denominator of a emerging infectious disease, which is challenges that we've always had, we continue to have, and we will always have. But they're very different in how they emerged and their impact. So, if you look at the 1918 influenza pandemic, it was a very abrupt, it was very cataclysmic, and it was devastating. Historically, for the single year to year-and-a-half in which we had the death and devastation of the 1918 pandemic, it clearly is the most devastating single infectious disease event. I mean, we have infectious diseases over history—malaria, smallpox, measles—that devastate over years, and you have cumulative morbidity and mortality. But with the pandemic of 1918, it was an explosion of death and suffering in a very confined period of time.

Now when you look at HIV, HIV as we all know who have been there from the very beginning, was a very insidious, or at least insidious in its recognition, emerging infectious disease, where we had a brand new disease which essentially crept up on us, to the point where when it reached its fullness, it turns out again, like the pandemic of 1918 to be one of the most important, I would say less than a handful of the most important, infectious diseases, emerging diseases, in the history of our civilization. But they occurred in very different circumstances, with very different populations that would get impacted by it, and would get very different results, both from the standpoint of the type of disease, but the length of time it took to realize the full impact of the disease. And yet, they are both truly emerging infectious diseases.

[Peter Drotman] One of the topics that is raised in your HIV, ending the pandemic paper is prospects for and progress toward developing an HIV vaccine, which we don't really have yet. Whereas, for influenza, we have a zillion vaccines, it's just that they're not all that good or long-lasting. Can you tell us about progress in either one of these vaccine research efforts?

[Anthony Fauci] Okay, so let's start off with probably the most problematic, very briefly, HIV vaccine. One of the issues with HIV is that, unlike other infectious diseases for which we have developed highly effective vaccines—small pox, polio, measles—the human body, when it gets infected with these, you may have morbidity, you may have mortality, but at the end of the day, the body clearly proves to you and essentially establishes a proof of concept that it is capable of ultimately suppressing the virus, eradicating the virus, and rendering on the person the immune response that protects them from getting infected with the same pathogen again. That's the

fundamental basis of proof of concept that a vaccine, the right type of vaccine, can induce a response that ultimately would be protective. And I think that's the reason why we were confident that sooner or later we would get vaccines for smallpox, for polio, for measles, and other pathogens.

With HIV, it's a different story, because for reasons that are very complicated, many of which we don't understand, the body does not make a very good immune response against HIV that's protective. It certainly makes an immune response, but it doesn't, on its own, suppress the virus, it doesn't certainly eradicate the virus. So, I remember when I was in medical school, my mentors and teachers used to say, when you're making a vaccine, the best thing to do is to mimic natural infection, without hurting the patient. That's exactly what you don't want to do with HIV, because if you mimic natural infection, you'll get a response that's inadequate, just the way the response to natural infection. So, we have a major challenge with an HIV vaccine, is to make a vaccine that would be doing even better than nature could do, to prevent whatever antigens we present, or immunogens to the immune system, to induce a response that's even better than what natural infection induces.

Now, in contrast, with influenza, as you mention correctly, the influenza's a different story. Because we know the body can make a good response against influenza, because the body's immune system clears influenza, every time you have a person who gets infected with influenza, with few exceptions, those who go on to have very serious disease and die from it, but most of the people who get influenza, their immune response ultimately rescues them, as it were. That's the good news.

The sobering news is that influenza, being an RNA virus that mutates a lot, changes and drifts from strain to strain, from season to season. And it also sometimes changes dramatically, and that's why we have a pandemic. Which leads us to a different kind of challenge that we have with developing a flu vaccine than we do with developing a HIV vaccine. And the challenge with the flu vaccine is to develop a vaccine that induces a response against that part of the influenza that doesn't change from subtype to subtype and doesn't change from season to season. We've been referring to that as the universal influenza vaccine—"universal" because it covers all iterations of influenza. Now, we've not been able to do that thus far, and in fact, as you mention correctly, the responses or the efficacy to influenza vaccines are certainly not optimal. On a good year, it's about 60 percent effective. And on a poor year, it can be anywhere from zero to 10 percent effective. We must do better than that, and I believe we can, by getting the body to make a response against the part of influenza that doesn't change from season to season.

[Peter Drotman] So, will you be writing a paper on ending future pandemics of influenza?

[Anthony Fauci] Well, I think we're going to hold off on that, Peter, until we get a really good universal flu vaccine. I don't want to get ahead of ourselves here.

[Peter Drotman] Okay, thank you for summarizing that. It's a very big topic area. I did want to ask you about one other thing, 'cause one of the great friends of the *Emerging Infectious Disease* journal was the late Dr. Joshua Lederberg, and for our younger listeners who don't recognize his name, he won the Nobel Prize for Medicine 60 years ago this year, when he was only 33 years old, for pioneering work in molecular genetics. And he became a advisor to presidents, a prominent member of the Institute of Medicine, and in, almost single-handedly, but with others,

established the field that we call emerging infectious diseases, and that is the name of our journal. He died ten years ago of pneumonia, in 2008. Now, I think that you knew him and worked with him. Do you have any thoughts that you want to share with our younger listeners and readers about the, his pioneering work and any inspiration he provided to researchers at NIH?

[Anthony Fauci] Oh, I'm happy to do that, Peter, because as you indicated, I did know Josh very well. You know, he was obviously of a different generation than I, but he was very interested in younger scientists and cultivating younger scientists, which back then, I was a very young scientist when I first met Josh. But the influence that he had on me is that he was talking about the dangers and the inevitability of emerging and reemerging infectious diseases, long before it became fashionable to do so. And I'll never forget that about Josh, because every time we used to talk about infectious diseases, which was often, he would say you really have to realize that we live in a world of microbes, and we will have emerging and reemerging infectious diseases that are unexpected, unanticipated, some of which will have a profound impact on the global health. And he used to say that at every chance he could get. And some people, understandably but certainly incorrectly, thought that he was being hyperbolic and he was exaggerating. But if Josh were alive today, and had seen what we're going through now with emerging and reemerging infectious diseases, you know, with HIV, with the resurgence of yellow fever, with Zika, with Ebola, with chikungunya, with West Nile, with plague in certain countries, he would be nodding his head and probably say "I told you so!"

[Peter Drotman] Thank you so much for these comments. We appreciate it and it shows that we're just going to have to keep working, keep publishing this journal, and keep soliciting more research reports of the sort that you have been so instrumental in providing.

[Anthony Fauci] Thanks, Peter, it's a pleasure to be with you.

[Peter Drotman] So, I've been talking today with Dr. Anthony Fauci about the March 2018 article on Ending the HIV/AIDS Pandemic. Listeners can read the March 2018 article on ending the HIV/AIDS pandemic. The article is online at [cdc.gov/eid](http://cdc.gov/eid).

I'm Dr. Peter Drotman for *Emerging Infectious Diseases*.

[Announcer] For the most accurate health information, visit [cdc.gov](http://cdc.gov) or call 1-800-CDC-INFO.