

Mayo Clinic Q and A - Dr. Michael Barry - YouTube Audio - 07...

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SPEAKERS

Dr. Halena Gazelka, Narrator, Dr. Michael Barry

- D** Dr. Halena Gazelka 00:01

Coming up on Mayo Clinic Q&A. While there are effective injectable vaccines to fight COVID-19, drug makers are creating vaccines that will be easier to store, transport and administer. Currently, Mayo Clinic is developing a new nasal vaccine platform that may have advantages in blocking the Coronavirus.
- D** Dr. Michael Barry 00:22

The goal is to make protein from the Coronavirus to have the immune system see it, and then if you actually got infected to reject the virus.
- D** Dr. Halena Gazelka 00:31

Welcome, everyone to Mayo Clinic Q&A, I'm Dr. Halena Gazelka. Thanks for being here today. The COVID-19 pandemic has brought public awareness to vaccines and how vaccines work in a way that we've never seen before. A vaccine is an agent that causes the immune system to remember a specific disease-causing entity. In the case of COVID-19, that's a virus, of course. And then when the body sees that entity again, or that virus, it remembers it and helps to prevent future infection. At Mayo Clinic, decades of research

have led to the development of a new vaccine platform, a single cycle adenovirus nasal vaccine. This is now being tested in Phase 1 clinical trials for COVID-19. Well, I'm excited today to have Dr. Michael Barry with us. Dr. Barry is the director of Mayo Clinic's Vector and Vaccine Engineering Laboratory, and he's going to explain to us about these vaccines today. Thanks for being here today.



Dr. Michael Barry 01:34

Thank you. It's great to be with you. And I'll do my best to try to explain and translate from scientists to everyone else.



Dr. Halena Gazelka 01:43

Well, I think that's fantastic, Mike, because I have about 10 questions just after reading the intro that I could ask you about. First of all, starting with how to say Vector and Vaccine Engineering Laboratory quickly.



Dr. Michael Barry 01:56

Well, it's easier if you say it slowly.



Dr. Halena Gazelka 02:01

Well, tell us about this, Mike. What is the single cycle adenovirus vaccine?



Dr. Michael Barry 02:06

Yeah, well, so maybe I'll take a step back and kind of talk, you gave a great background on what vaccines are, you know, to take a step back from that, you know, most of what we are is made up of proteins. And the same thing goes for the virus. So, actually when most of the vaccines that are being deployed, and many of you have gotten, are actually the goal is to make protein from the Coronavirus to have the immune system see it, and then if you actually got infected to reject the virus.



Dr. Halena Gazelka 02:41

That's really interesting, Mike. So, the thought is that, or the concept is that our body should know what belongs to us, and when it sees things that don't belong to us, it will recognize it as something that's bad. So, having more of that protein isn't a bad thing, in that it makes the body recognize it even better and mount a better response? Would that

be fair to say?

D Dr. Michael Barry 03:04

Yeah, so in theory, and at least in practice, when we test these, if we put, you know, equal amounts of our vaccine versus like a regular adenovirus vaccine, that same amount, ours will drive, you know, a much stronger immune response. And so, the level of protection is higher. The other potentially cool thing is that, if ours is really 100 times more potent, then maybe if we make a batch of an adenovirus vaccine, we could make a batch of the ones that are out there, the batch of ours, we might be able to squeeze out 100 times more doses out of the same batch. So, you know, that could be very important on a global scale, you know, for COVID, or for other sorts of pathogens.

D Dr. Halena Gazelka 03:51

Oh, yeah, that's a wonderful point. What does it mean that it's single cycle, Mike?

D Dr. Michael Barry 03:56

Well, it's sort of a vector, you know, jargon sort of thing. But it basically has to do with that multiplication. So, when the adenovirus puts the gene in the cell, the ones like the Johnson & Johnson or Oxford one, that one gene that \$1 bill goes in, and it just remains in that state. And it makes a lot of the spike protein, but ours will go in and it will copy that gene many times so that the more copies of the gene, the more protein you produce off of it. So, the single cycle means it's basically going through part of its cycle and making a lot more protein.

D Dr. Halena Gazelka 04:36

Okay. And, Mike, what is the difference between a platform and a vaccine, or are they the same thing?

D Dr. Michael Barry 04:43

Well, so you could call if it was, you know, you made a vaccine, and it was sort of what one might call a one-off if you made it once and it only applies to that pathogen. A platform means that you can kind of plug and play or cut and paste. So, before we did the SARS virus, we actually did a bunch of other things like HIV, influenza, Zika, Ebola, clostridium difficile. So, and it's pretty simple because you just basically cut and paste the gene for the protein you want to target into the virus, and then you can target different pathogens.



Dr. Halena Gazelka 05:27

That's really interesting. So, you can, well, this has to be specific for the virus or the pathogen that you're trying to fight, you can make this specific for different uses?



Dr. Michael Barry 05:39

Right. Yeah. And so over the years, you know, when I was a baby, a baby scientist, about almost 30 years ago, we used things called gene guns, you know, so it was literally something you would shoot the genes in, and that, you know, and you could plug and play whatever you wanted with that, but it was not very efficient. And so, we evolved over, you know, the past few decades moving towards these adenoviruses because they're very robust evolutions, done all the heavy lifting for us to be efficient and getting genes in there. But also, you know, as you mentioned, one of the sort of the strategies is to actually try to vaccinate not in your muscle, but intranasally. Because, you know, and almost never does a virus enter your body in your muscle. And so, one would say that maybe that's not the place you should put your vaccines, and it ends up that you're you know, your body is well evolved to try to repel things that come up your nose or in your eye, or what are called mucosal surfaces. So, it has engineered all these cells and antibodies to be up at that mucosal barrier to try to protect you. And so, there's data even with this, our vaccine that you know, there is an advantage of actually vaccinating not in the muscle but intranasally, particularly when you're talking about a respiratory virus like SARS, that's actually a pretty good strategy.



Dr. Halena Gazelka 07:16

Isn't that interesting, Mike. I had never literally never thought of that. I had just, I think of things, you know, I'm a pain physician, so I think of things in terms of how does the body absorb them or whatever, or how can you make it bio-available to you like a drug. But with a vaccine, maybe it's more targeting the area where the virus or the pathogen would live?



Dr. Michael Barry 07:39

Yeah. And it sort of comes down to sort of trafficking, you know, like, if you learn and if you grew up in your neighborhood, you're going to tend to come back to your neighborhood. The same thing goes with your immune system, if you learned in your nose or your lungs, you're probably going to come back there more often. And so therefore, if you get exposed to a respiratory pathogen, the likelihood of you seeing it and doing something about it is much higher if you're constantly driving by the old neighborhood.

D

Dr. Halena Gazelka 08:12

Mike, one of the things that has been astounding, I think, to anyone who works in a science, or any research area, is how quickly science has changed over the course of COVID-19 and how fast information has been shared, etc. When you talk about this vaccine platform, does that mean, and about plug and playing for different pathogens in the future, does that mean it will be much faster even to develop vaccines in the future as we see new pathogens?

D

Dr. Michael Barry 08:44

Yeah. And I think we're seeing that with the messenger RNA vaccines, and to some degree, the adenovirus vaccines, you know, the fastest vaccines, you can make are DNA vaccines, and every other vaccine technology, including ours, at some point starts off with DNA. And so, if you want to make messenger RNA vaccine, you use first make the DNA and then you use it to make the messenger RNA. And then we also use DNA to make our virus. So, the fastest ones can be DNA and messenger RNA. The viral ones are a little slower, because you have to make the viral vector, but the payoff is they're a lot more potent, generally, when you kind of run them head-to-head against each other. So, I think the response rate is really fast. Then technologically the, you know, the slower part is the regulatory process of you know, so how long, you know, you have to do the clinical testing to make sure things are safe. And I think some of the groups that went forward like Moderna, and some of the other ones had some advantages because they'd already worked on SARS-1, you know, the original SARS virus, so they could kind of use that to give them a foundation to jumpstart quickly.

D

Dr. Halena Gazelka 10:07

Say, Mike, we have talked quite a lot about COVID vaccines in the past and how those who are immune compromised may not respond as robustly to them. And there are some vaccines, I think that are not necessarily safe in those who are immune compromised, perhaps with live pathogens, etc. Is there any reason that this sort of a platform would work better for those who are immune compromised?

D

Dr. Michael Barry 10:33

Yeah, I think they will, just because they're more potent, it's kind of pound for pound, you know, but we haven't tested that in like, particularly, I think it will be interesting to see how well they do in older people, you know.

D Dr. Halena Gazelka 10:49
Oh sure.

D Dr. Michael Barry 10:50
As you get older, you know, your immune system becomes a little bit less robust, and it may take a harder poke to activate it. And so, you kind of see that with the current flu vaccines that they tend to give higher doses, more protein, in older patients to try to get the immune system up. So, the, you know, the immune compromised people sort of depend on exactly how they were compromised, but our vaccine and the others are engineered to not, you know, cause problems. So, I think they should be more potent.

D Dr. Halena Gazelka 11:26
But are intended to cause a more intense response of the immune system, hopefully overcoming that, if there was just a minimal response, you may not be covered against the pathogen?

D Dr. Michael Barry 11:39
Yeah, and I mean, the other thing we've tried to do is kind of make it hard on ourselves is to try to see how good we could do if we just immunized once. And that's kind of a measure of potency of, you know, if you have to come in and boost with your vaccine, then you're probably not as potent as one that can come in once. And so, we just are completing a study in experiments where we immunized once and then challenge with the SARS virus, 10 and a half months after that one immunization and you know, we saw good protection, you know, after that very long period of one immunization, so, yeah.

D Dr. Halena Gazelka 12:22
And besides the fact that the immunization is more robust, or the responses more robust, I think of the global improvements in being able to administer vaccines if you only had to reach each individual in the world once.

D Dr. Michael Barry 12:39
Yeah, and actually, that's a whole other thing that we could talk about of like, some of the things that we work on is, how can you make these more easily to deliver? You know, so within at certain times, we've done things like take the vaccine and put it into capsules, so

you could just swallow it and then be immunized. You know, so that the idea would be you could potentially ship, you know, the vaccine off to other countries, and it should be pretty stable at normal room temperature. But then, you know, rather than have needles and syringes all over the place, you know, something you put on your tongue, it could be quite good.

D Dr. Halena Gazelka 13:24

Not to mention the freezers, the medical grade freezers that have been needed for some of the vaccines that we're using now.

D Dr. Michael Barry 13:31

Yeah, and I mean, that's the adenovirus vaccines have actually, I think something on the order of a half million people, particularly military people, have gotten adenovirus vaccines that were freeze dried, and then given as a pill.

D Dr. Halena Gazelka 13:46

Interesting.

D Dr. Michael Barry 13:48

To protect against adenovirus itself.

D Dr. Halena Gazelka 13:51

Wow, that is really interesting. So, we talked about this being in Phase 1 trials. What does that mean to our listeners? How close is this to being available for use in humans?

D Dr. Michael Barry 14:02

Technology was licensed to a company, and they are taking it into humans. And so, the first thing you have to do is make sure it's safe. So, since this is the first time the single cycle platform has been tested, the Phase 1 is the first test, and, you know, even with the pandemic, you know, that then all the, you know, already pretty good, great vaccines that we have, you know, the, you know, how far we've come and how far along we get with the testing, and the Phase 1, 2, and beyond. It's hard to say. But now with the new variants popping up, you know, it's kind of persisting the pandemic, I think, and so, there may, we may be able to get pretty far along with testing it. But that's sort of up to the company

that's licensed.

D

Dr. Halena Gazelka 14:53

Wow, that's great. And Mike, we talk so much about how in the silver lining of COVID has been this rapid dissemination of research and information. But actually, these vaccines, not just the one that you and I are talking about today, but the ones that are in emergency use authorization now were decades in the making, would that be correct? How long does it take to work on this? And how long have you been working on this project?

D

Dr. Michael Barry 15:19

Well, like I said, you know, I think 28 years ago I was shooting vaccines with gene guns. And so, you could say it's been 28 years, this particular platform has evolved, I think we've been working on about 13 years. And this was work done by, you know, really talented graduate students and technicians at Mayo Clinic. So, you know, these things may benefit, you know, people, but it's also like, we're also educating and building up the people for the next generation of okay, what's coming next. And so, you know, if there are people out there who have interest in pursuing, you know, higher degrees, or PhDs or MDs or master's program degrees in the area of gene therapy, or vaccines or oncolytic viruses, Mayo is a great place to come. So, I would encourage you to check it out.

D

Dr. Halena Gazelka 16:21

Oh, that's wonderful. One of our three shields, patient care, education, and research, and all so important to have combined together. Say, Mike, I have a question for you. We've heard so much about vaccine hesitancy, so people saying, oh, they just cranked this vaccine out too quickly, we don't know if it's safe. What would you say to that? Is it really? Have the vaccines that we are seeing in use now for COVID-19 really been put forth that quickly that they haven't been tested properly? Would you have concerns about that?

D

Dr. Michael Barry 16:55

No, and I've been vaccinated. So, I think the cost benefit is, you know, huge if I don't want to end up in the hospital, you know, with SARS. So, I definitely think it's worth it to do, I mean, as I said I've been doing this stuff for almost 30 years. And so, these vaccines have been, some of them have been around even longer than that. So, and they have been tested on a number of different diseases like HIV, or like, in 2014, when the Ebola sort of potential pandemic was percolating in Africa. You know, one of the two vaccines that

went into human testing was an adenovirus vaccine. And so, these have been around, it's just, you know, we've never immunized so many people with them. And you know, about a half a million people have gotten the military vaccine as an oral vaccine so it's a little different. I think there may be, you know, like we were talking about the intranasal and I mean, your body is engineered to deal with viruses on respiratory surfaces. And so, it may be that, you know, those types of routes of oral or intranasal may have some safety advantages as well, but we won't know until we test.

D Dr. Halena Gazelka 18:20

So, basically, we could say they've been decades in the making, these vaccines?

D Dr. Michael Barry 18:24

Yes, exactly.

D Dr. Halena Gazelka 18:26

Mike, I find it absolutely fascinating this conversation with you, and one of the thoughts that I've had, because you know that I've done some work with Dr. Greg Poland, who also works in has worked in vaccine research, etc., and does at Mayo Clinic. But, you know, vaccines are something that we take for granted. I have adult children, now I have grandchildren, we just expect that kids get vaccinated, and that we don't have some of the horrible diseases that plagued our forefathers and the generations that came before us. What is it like as a vaccine researcher to finally see people excited about vaccines and talking about vaccines?

D Dr. Michael Barry 19:08

Well, it's great. I mean, sort of, like you say, if vaccines work, they're kind of boring, you know, I mean. So, it's kind of very interesting that, you know, like, I teach in our virology and gene therapy courses, and so, it's like, now the vaccines have become a big chunk of those lectures. So, that's very exciting. And, you know, the vaccine hesitancy is, you know, I think it's a matter of what information people are consuming. And you know, and Dr. Poland is a great communicator on this topic, and many of us scientists are not that good at, you know, talking to the lay public because we sort of exist in the state of, you know, we have facts now and then we you know, we're kind of wishy washy, we almost never like to say always or those types of things. And that's, you know, doesn't help us, you know, telling people, if you talk to, you know, most scientists will have been vaccinated. And there's a good reason for that.

D Dr. Halena Gazelka 20:12
I'm just delighted to get to talk to you, because I loved what you said that vaccines can be kind of boring. But people have no idea, the work that goes in, the decades and decades of research that goes into seeing the success in the end. And so, how wonderful to be able to log that a little bit today.

D Dr. Michael Barry 20:30
Yeah, that's very exciting. And, you know, actually, I've been at Mayo, 15 years, and actually, Dr. Poland recruited me, you know, because I try to make vaccines and he does a lot of the testing actually in patients. And so, you know, it was a nice bridge there. So, just been nice to not have a pandemic drive it all.

D Dr. Halena Gazelka 20:50
That's right. We can do without that can't we. But it certainly has gotten you working hard over the time, I'm sure.

D Dr. Michael Barry 20:57
Oh, yeah.

D Dr. Halena Gazelka 20:59
Any last words you'd like to share with us? What else would you like our listeners to know today, Mike?

D Dr. Michael Barry 21:04
Well, it would be great if everyone would get vaccinated. And, you know, I think it's, you know, being vaccinated is the best way to be protected. And, you know, I don't think any of us want to end up in the hospital with this disease. And so, it's just a good way to go.

D Dr. Halena Gazelka 21:26
I couldn't think of a better ending myself. Thank you so much for being here today, Mike.

D Dr. Michael Barry 21:30

Thank you.



Dr. Halena Gazelka 21:32

Our thanks to Dr. Michael Berry, Director of Mayo Clinic's Vector and Vaccine Engineering Laboratory. Thank goodness, there are people like Mike doing the work that they do each and every day. We're so grateful for that. We thank you our listeners as well for being here today. I hope that you learned something. I know that I did. And we wish each of you a wonderful day.



Narrator 21:53

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