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A Snapshot of mRNA Vaccines: Achievements, Challenges, & Next Questions

Announcer:

Welcome to *VacciNation* on ReachMD, sponsored by Moderna. Here's your host, Dr. Jennifer Caudle.

Dr. Caudle:

While the development and roll-out of vaccines marked a turning point in the battle against the COVID-19 pandemic, it's important to take a look at mRNA technology outside of this context—and there are some key things to consider.

Welcome to *VacciNation* on ReachMD. I'm your host Dr. Jennifer Caudle, and joining me today to discuss mRNA vaccines is Dr. Charles Vega, a Clinical Professor in the Department of Family Medicine at University of California, Irvine.

Dr. Vega:

Well, I'm happy to be here, Dr. Caudle. Thank you very much for the invite.

Dr. Caudle:

Of course. Well, we're excited to hear your comments about mRNA vaccines. Let's start by taking a look at the advantages of the mRNA vaccines. What do you think are some of the biggest benefits from your vantage point?

Dr. Vega:

Well mRNA vaccines are not new, so the technology's been around since the 1990s. But certainly, we've never seen them employed on such a large scale; there's billions and billions of these vaccines being distributed around the world. So I guess the number one advantage I would look to right now is just efficacy. We know that these vaccines are effective against COVID-19 and I have to say that first because there's still some doubt as to how effective the vaccines are. But when we look at the original trials looking at the two available mRNA vaccines, we saw efficacy in the prevention of COVID-19 along the lines of 94%, 95%. And as you move further into the pandemic and we have the delta variants, there's relatively new data that includes information from the time when delta was in circulation saying maybe they're not that effective at preventing hospitalization with Moderna's vaccine still pretty effective, 93%, but the Pfizer BioNTech 88%, and that wains a little bit after 120 days; this is among folks who don't have immunocompromising conditions. But still, just very effective. Other studies, 94% effective in preventing hospitalization among older adults. 94% effective in preventing infection among healthcare workers. These are really important populations, and we're really able to bend back this pandemic as a result of the use of these vaccines.

Dr. Caudle:

And if we zero in on their speedy manufacturing, let's go to that for a moment, how might this impact the development of vaccines for other infectious diseases?

Dr. Vega:

Well, it's been a wake-up call and I will say that I personally think that Operation Warp Speed is a miracle. Like it's a miracle they were able to sequence, share information, develop these vaccines, and produce them broadly, certainly with hiccups and there were problems along the line, but considering the scale of what was being attempted with a relatively untested technology at that scale of production, it's just a real strong success. Overall looking at the big picture here, I think it will make a difference very strongly in terms of public health. But in the future, this technology will help us to respond to the next pandemic. And I think we'll talk about it. It can be not only applied to infectious disease, but potentially other conditions including cancer. That could really make a broader difference in terms of public health longevity, morbidity over time.

Dr. Caudle:

For those of you who are just tuning in, you're listening to *VacciNation* on ReachMD. I'm your host Dr. Jennifer Caudle, and today I'm joined by Dr. Charles Vega.

So Dr. Vega, now that we've examined the advantages of mRNA vaccines, let's take a look at this on the flip side. What are some of the biggest drawbacks regarding mRNA vaccines?

Dr. Vega:

Well as I mentioned, we've been building this airplane as it's been flying and so I think most broadly speaking, the most difficult part with the introduction of these vaccines has been a fair amount of resistance in the broader community to their application. And science, as you know, is not linear. So we have to move back and forth a little bit; recommendations have changed as more information has come out during a crisis and that's opened the door to a lot of disinformation. Right now I am trying to employ flu vaccine, and I just see so much vaccine fatigue. It's just, folks are tired of it, and folks who are dead-set against the mRNA vaccines and really think that there's an agenda and there's a conspiracy behind it now I think are turning not just against vaccines in general into much stronger anti-vaccine advocates, but they're actually just turning against healthcare overall. So they're not going to be coming in for their annual checks, they're not going to be getting colorectal cancer screening, breast cancer screening, and I'm really worried about that in terms of a negative trend that's possible in our public health right now. And so I think the key solutions there are just persistence. Good education, making it personal, listening to folks with empathy. I think those things will win out over time, but it's going to take a broad-based effort to counter this trend and keep people safe, honestly.

Dr. Caudle:

You mentioned some really excellent points there. And you've kind of already answered the next question, but I'm going to ask it anyway. Are there any solutions in the works to really help overcome these disadvantages? We'd love for you to expound if there's anything else you'd like to add to ways we can sort of deal with some of the drawbacks that you mentioned.

Dr. Vega:

Yeah. It's been an interesting experience and I'm sure a lot of your audience will understand that it's tough going in and having that fifth conversation about the COVID-19 vaccine and why it's important to an 88-year-old with six chronic illnesses that are all high-risk conditions. It is important and it's something that I do because I still get breakthroughs, and I find that those successes are really important. So as a family physician, I do have a personal relationship with my patients and so I'm using that, I'm talking about my family who is vaccinated, and it's just interesting to see. I have a lot of high-risk patients so many of them have received monoclonal antibodies and I've never had one patient refuse monoclonal antibody, whereas I've had a lot of folks who don't want the vaccine. And when you think about it, there's no scientific reason that one should be so universally accepted, and the other one frequently refused. But that's just the state we live in and there's obviously a lot of factors that go well beyond my relationship with the patient that affect that. But I'm trying to do my part, and we should all be doing our parts to push against those trends and keep folks safe.

Dr. Caudle:

And if we dig just a little bit further into this, Dr. Vega, what are some of the potential side effects of mRNA vaccines that are currently being investigated? What do we know so far?

Dr. Vega:

Well, I stick mostly to what we know with the vaccines that are out there because we have a lot of data now with the billions of doses worldwide as to the safety of the vaccines. I mean, the side effect profile here is no joke when it comes to over 50% of folks who have some kind of systemic type of reaction, usually after the second dose of vaccine. So that kind of opens up the door to some doubts, as well. But in terms of serious risk and long-term risk, there was a scare regarding venous thromboembolism, but that really doesn't seem to be related to the mRNA vaccines specifically found with the viral vector vaccines in a very, very low risk. And then there's this risk of myocarditis. The Pfizer BioNTech vaccine was associated with a rate of about one case in every 50,000 doses in one study. The risk is higher after the second dose. It seems to be more prevalent among young men, but there is also another study recently that came out that looked at children/adolescents with COVID-19 in the hospital; 0.15% of them were found to have evidence of myocarditis and that risk ratio for having myocarditis with a COVID-19 infection for these young people versus no COVID-19 infection was 37, so it appears that you're much, much more likely to receive myocarditis from COVID-19 infection versus getting it from the mRNA vaccine. It's always about perspective and balancing risks and potential benefits with the vaccine. And I can say that whether we're talking about VTE or myocarditis, your risk with the infection is significantly higher than any risk that you might get with the vaccine. And it's worth mentioning that even those cases of vaccine-induced myocarditis, the vast majority are mild and just resolve with time.

Dr. Caudle:

Right, that's an excellent point. And now before we close, Dr. Vega, I'd like to bring all of this together and really look ahead into the future. What do we need to keep in mind moving forward when it comes to mRNA technology?

Dr. Vega:

So, the technology was difficult to really apply in vivo, but it was the delivery of those mRNA into the cell. But once they figured out recombinant mRNA technology and using these liposomes to help deliver the mRNA, that really changed the game. And so now we're looking at the potential application; there's already trials under way for looking at the HIV vaccine, which is absolutely been something that's been chased for decades and we have not gotten very close. So this is exciting. Versus rabies, versus influenza because we know those vaccines are very important but currently far from perfect in terms of efficacy. But then opening the door to even other types of infection, like malaria or tuberculosis.

And then finally, I mentioned briefly that there's interest for using the vaccines in terms of treatment for genetic conditions, such as cystic fibrosis, but also cancer as well. So these really could be game-changing vaccines. So we are seeing this sort of, messy roll-out by necessity because we're in a crisis, but there's also some science going on, maybe behind the scenes, at this point because we are so laser focused on the pandemic, but that could yield some very, very important results in the years to come.

Dr. Caudle:

Well there's clearly a lot for us to consider when it comes to mRNA vaccines, and I'd like to thank Dr. Charles Vega for joining me to share his perspective on this topic. Dr. Vega, your points were excellent and it was great speaking with you today.

Dr. Vega:

Thanks very much for having me.

Announcer:

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