**A Genetics Expert Helps Us Make Sense of COVID-19 Vaccines**

Speaker 1:

Today's episode of the Genetic Counselors and You podcast series is brought to you by PerkinElmer Genomics, a market leader in biochemical and genomic testing solutions. In line with its mission to increase accessibility to rapid and high quality diagnostic testing, PerkinElmer Genomics leveraged its diagnostic testing expertise and industry leading workflow solutions to aid in the fight against COVID-19. In 2020 alone, PerkinElmer Genomics launched an in-house COVID-19 testing solution, as well as partnered with the state of California and the United Kingdom to open brand new, state-of-the-art laboratories to help meet their testing needs. Visit perkinelmergenomics.com to find out more about their other available testing solutions, including exome and genome sequencing. That's perkinelmergenomics.com.

Deepti Babu:

I'm Deepti Babu, certified genetic counselor and NSGC member. A quick hosting note, I'll be turning over the reins as host of the Genetic Counselors and You podcast this year. It's been a great experience, and I'm excited to share that genetic counselor, Kenny Wong, will be taking over.

Deepti Babu:

Kenny has a wealth of experience helping consumers understand and integrate genetics into their lives, so you'll be in great hands. Every two months, we'll continue to bring experts in to help break down complex topics in genetics that are making people curious, with the goal of turning that curiosity into knowledge that you can apply in your own lives. If you have an idea for a topic that you'd like explored, please email the show at nsgc@nsgc.org.

Deepti Babu:

Welcome to our next episode of the Genetic Counselors and You podcast. News about the COVID-19 vaccines is rapidly changing and growing. Suddenly, we're hearing terms like mRNA and DNA everywhere. For some of us, we haven't thought about these concepts or topics since high school biology, and now we have to make health decisions based on these concepts, which brings up questions that can't be fully answered in a press release. How exactly do these COVID-19 mRNA vaccines work? How risky are they? And can they change our DNA? We'll speak to a genetic counselor, someone with advanced training in genetics, to make sense of what's going on around us. As always, we suggest ways that you can navigate things as they apply in your life.

Deepti Babu:

And a quick note, we're recording this episode on March 18th. Since this is a fast-moving topic, some facts may change or be updated by the time that you hear this.

Lydia Higgs:

A lot of the technology is really information that genetic counselors are poised to share and explain. Because we talk about DNA and RNA and what it means for our bodies every day in our work, that was really the catalyst for my offer to friends, to family. Which was just, if you've got questions, don't hesitate. Please reach out. Find someone who's got an answer and can explain something to you if it's confusing.

Deepti Babu:

We're talking with Lydia Higgs, a licensed certified genetic counselor at Carilion Clinic in Roanoke, Virginia, where she helps patients and families understand concepts in genetics and health every day. So we feel like we're in very capable hands. Lydia was also named a 40 under 40 by The Roanoker Magazine. Welcome, Lydia, and thank you for joining us today.

Lydia Higgs:

Thank you so much for inviting me. I'm so happy to be here. I do want to acknowledge that I have no financial conflicts of interest, and all of the opinions I'm going to share with you today are mine alone.

Deepti Babu:

Well, let's get into it. I'll bet that you talked about DNA and RNA pretty often even before the pandemic, just given the nature of the work that you do and the training that you have. But honestly, most of us did not. So maybe we can get started at the very beginning and kind of build from there. Let's start by breaking down some of these concepts. What is DNA and what is RNA? And I'm sure that you have some really nice, concise explanations that you repeatedly use, that you can fall back on.

Lydia Higgs:

I think you're right. Those topics are rusty for a lot of us. But DNA, if we think all the way back to high school biology, is actually all of the genetic material that we'll need throughout our entire lifetime to grow and develop and have our body do what it needs to do. It's actually a pretty big molecule. It's double-stranded and tightly coiled and stuck in every cell of our body inside a component called the nucleus.

Lydia Higgs:

The RNA though is a lot smaller. It's a single-stranded structure that's made based off the DNA, but it's only a small section of it. And while it's made inside the nucleus, it doesn't actually work there. It travels back out into the cell for the rest of the machinery to do what it needs.

Deepti Babu:

Thank you. That helps to kind of frame that. I wanted to ask you as well, what is mRNA, because that's sort of the basis and the mechanism for some of the first vaccines that have come out for COVID-19.

Lydia Higgs:

mRNA is a specific type of RNA. The M actually stands for messenger. And so it takes a small section of the information from the DNA out into the cell to teach it how to build a particular protein. Those proteins are what are actually going to be doing work inside of our cells.

Deepti Babu:

Got you. So if we bring that back to, let's say, the COVID-19 vaccine, and we're talking about the virus and the spike protein is something that we hear about a lot, can you kind of connect the dots for us about how mRNA might be useful to target and mount a defense for the body against that?

Lydia Higgs:

Absolutely. The mRNA itself that's contained in these vaccines actually shows the cell how to build that spike protein that you mentioned. When we think about how the COVID virus actually works, it is a virus that is coded in a particular type of protein, and that protein is unique to it. It's not like any other virus or any other thing that would be inside our bodies. So the mRNA actually teaches our cells how to make that unique structure called that spike protein that's on the outside of this COVID virus. The great thing about the vaccine is that it is teaching our cells how to recognize that protein, how to see it, without us ever having to be infected by the virus itself.

Deepti Babu:

Right. It's kind of, I guess, helping us recognize it so we can be ready to fight against it if and when we are exposed to the virus in actuality.

Lydia Higgs:

That's exactly right. If the mRNA that's given to us in the vaccine is able to show our cells what this protein looks like, our cells are actually able to build some of that protein to trick our immune system into learning how to get rid of it. And if our immune system knows how to get rid of that protein that it's going to see if the COVID virus is ever something that it runs into, it's going to be able to mount a defense much quicker and actually allow us to get rid of that virus hopefully before it ever makes us sick.

Deepti Babu:

Right. When we first heard about all of this in, I guess, the public conversation, maybe it was the Pfizer vaccine and then Moderna, and those two kind of using this method of the mRNA approach, is that something new? Because that felt, to me, like the first time we were hearing about it. And yet, as I was reading a little bit, it seemed like actually this technology has been out there. It's just that it's maybe new to our consciousness.

Lydia Higgs:

I think you're exactly right. These two vaccines are the first ones to be sort of publicly approved for use, but actually, mRNA technology and the potential of a mRNA-based vaccine has been well studied for a number of decades.

Deepti Babu:

Okay. That's actually really helpful context and maybe will help people feel a little bit more comfortable with the fact that this is being used. The other thing that I feel has transpired is it's all happened so quickly. We just marked this year milestone of the pandemic really hitting North America to where we have had it impact us in our daily lives. And yet, I never imagined that a few months later, we'd be talking about vaccine clinical trials. And then actually now, people I know are getting the vaccine and it's getting into arms of people that I can say I know. So did that all happen really quickly, or is it just me? And can I trust that?

Lydia Higgs:

I think we can trust that, because when we think about the process of building a vaccine and actually going through the FDA approval process, there are some pretty strict steps to make sure that these products are effective and that they're safe prior to actually being distributed to the public. These vaccines were not any different from ones that came out previously. They underwent those same very stringent requirements, and they met them across the board. So from a safety standpoint, we feel very confident in them.

Deepti Babu:

Okay, and that's helpful too. And I feel like the rollout of these and the study of them was also accelerated because there were international collaborations that kind of have never really happened before, to my understanding. I'm not super steeped in this. And then also, just the amount of people that it was impacting was so high that clinical trials, they could find people for them a lot easier than, let's say, clinical trials for people with rare disease, which is a space that you and I are in. In genetics as genetic counselors, it's so hard to find people in order to get that power between the volume of individuals so you can make statistical claims about it.

Deepti Babu:

And of course, the mRNA kids are not the only game in town now. Could you talk a little bit more about that, sort of the typical ones that we might encounter with the flu vaccine or something that we get every year?

Lydia Higgs:

Absolutely. And I agree with your assessment. The process was fairly quick, start to finish, to create all of these vaccines, and that was truly because of all of the groups that were working together.

Lydia Higgs:

When we think back to when this virus was first identified, it was largely in China. So there were scientists working on discovering this virus, understanding it better right off the bat. And as soon as they were able to completely sequence the information contained within the DNA of that virus, there were companies all over the world that were ready. They were prepared to take that knowledge and begin this process of creating a vaccine that was going to work for this novel virus that we were seeing.

Deepti Babu:

Yeah, and I think that was all so helpful as we all came to learn about things as they were kind of happening to us locally. You use that term, sequencing. Of course, that's a very common phrase for us in genetics because that's a way to analyze genes. And then we also have the terminology of variants coming up now with variants of concern with the coronavirus. And I think about how many of those things we, as genetic counselors, talk to families and patients about in a different context. Are you finding that it actually helps with the work that you're doing because people have some familiarity with these terms, or is it just more confusing?

Lydia Higgs:

I think a lot of it does overlap. People are hearing about these words maybe for the first time in the context of this vaccine study and this virus, but they're able to do some really impressive reaping and figuring out how it applies in other areas of their life. And absolutely I think we're seeing the crossover in the genetic counseling world.

Deepti Babu:

Yeah. I mean, one of the reasons that we wanted to invite you to speak on this podcast episode is that you have been out there on social media, trying to dispel some myths and sort of set the facts straight to help people understand as the vaccine is rolling out, not just in the US but across the world. And I kind of wanted to tie that in a little bit. There's some things that have worked very well. There's some things that have been a challenge. This is a bit of a situation of we're building the plane as we fly it, which I feel is 2020 and 2021 in this space. But we also have to recognize that these things are shifting and we have to adjust. That's hard because we think we kind of figured it out, and then now we're pivoting and turning and trying to adapt. Can you tell us a little bit about what you've seen that has been working really well in terms of vaccine rollout?

Lydia Higgs:

I think when we really look at this information, you are correct, all the way back to the beginning of our conversation today, that a lot of the technology is really information that genetic counselors are poised to share and explain because we talk about DNA and RNA and what it means for our bodies every day in our work. That was really the catalyst for my offer to friends, to family. Which was just, if you've got questions, don't hesitate. Please reach out. Find someone who's got an answer and can explain something to you if it's confusing. I think that's really what I'd like to do here is help to dispel some of the myths that have been circulating with all of this information.

Deepti Babu:

Yeah, I would definitely want to get to the myths as well, because we're going to spend some time trying to bust some of those together. But I wanted to just circle back to that international experience really quickly just because we are learning some really interesting things, kind of unexpected challenges like once you get a vaccine, then maybe you're issued this passport type of document that says, "I got the vaccine. I'm good to go," so I'm basically quote, unquote, "allowed" to be in this place. And maybe kind of the feeling that that could be discriminatory and/or are we placing people in different classes without realizing it in society, and creating more dividing lines between the people who are vaccinated and the people that aren't? What are your thoughts about that as we kind of move towards hopefully more vaccinations and eventual herd immunity?

Lydia Higgs:

I think here in the US, the statistic I heard at the beginning of March was that about 22 per hundred people, so about 22% of the population has been vaccinated at this point, which is not a gigantic number. What I am seeing is that the rollout is being largely managed by our state departments of health here in the US, and that each state is creating a triage list, for lack of a better word, trying to prioritize the people who are at the highest risk, who would have the most significant impacts should they actually become infected with COVID-19. And as that rollout is happening and we're vaccinating more and more people, I think that it is emphasizing some gaps. Sometimes that is as simple as technology.

Lydia Higgs:

Here in Virginia, for example, the Virginia Department of health has asked people to actually register on a website so that they can be notified when they are eligible for a particular vaccine clinic. For some populations, that's really easy, but there are plenty of other groups that maybe don't have ready access to the internet, or maybe can't drop everything the second they get an email to jump on and sign up for the clinic that they were eligible for. So I do think there are populations that are waiting, and we're going to have to find better ways to reach them before we get the big numbers that we're wishing for.

Deepti Babu:

Yeah, and certainly the pandemic has uncovered so many disparities within the healthcare system, and I just worry that this is going to compound that. So I hope that the people that are making decisions about this are being inclusive in their approach and thinking about ways to really, really reach out and access people where they are, even if it's awkward and different and not convenient. So thank you for mentioning that.

Deepti Babu:

All right, let's do some myth-busting, which you've done quite a bit of already. This first question is, "Can the mRNA COVID-19 vaccines," just those specifically, "change our DNA?" And I'll just mention that Victoria Forster did an article in Forbes Magazine on January 11th that went over this, in which NSGC president, Sara Riordan, was interviewed. We'll include a link to that in our show notes. But I feel like this question is still coming up. Lydia, I don't know if you can help us understand the answer of whether these can change our DNA.

Lydia Higgs:

The short answer is no. The reason I feel so confident in boiling it down to a single word is that when we think about our bodies, we are actually naturally every day using our DNA within the nucleus of our cell as a template to build RNA that goes out into the cell to do its work, to actually build the proteins that our bodies need to do things. When the vaccine is given to us, that vaccine is giving us mRNA that enters the cell, but it never goes into the nucleus. So the mRNA is never going to interact directly with our DNA. So there's not an opportunity for it to make any changes.

Deepti Babu:

They just never cross paths.

Lydia Higgs:

Exactly.

Deepti Babu:

Got you. Another question that has come up a bit is, "Can these vaccines reduce a woman's fertility?"

Lydia Higgs:

There's no data to suggest that they do. When we think about all of these studies for safety and for efficacy to develop a vaccine, the vaccine itself was first tested in animal studies. There were animals within those studies that were pregnant or became pregnant shortly after they were part of the trial, and none of them suffered any type of adverse effect.

Lydia Higgs:

As we can all imagine, pregnant women were not particular subjects in the human version of that study, so our data is somewhat limited at this point about exactly what might happen in the human population. But given the modeling and what we know from the past, we would not expect to see any type of reduction in fertility for a woman.

Deepti Babu:

That's great news. And I mean, I think that the data is increasing in terms of the number of pregnant people that are getting the vaccine. And kind of a follow-up to that is is there any data about safety and efficacy of these vaccines during breastfeeding.

Lydia Higgs:

So the same idea as the question about whether or not it can infect our DNA. mRNA itself is injected, and our bodies use that to build these proteins, to teach ourselves how to combat them, and then the mRNA itself is destroyed. So it's not kept in our cells forever. So in that way, we don't think that the mRNA has any opportunity to affect a baby that would be breastfeeding. And when we think about kind of immunities and vaccines as a whole, we actually recommend vaccines in a lot of populations, pregnant women, women who have just delivered a baby, so that both mom and baby are getting the benefits of those antibodies that that mom can create to try and avoid illnesses.

Deepti Babu:

Mm-hmm (affirmative), like secondary immunity. So if someone's already had COVID-19, because unfortunately, a lot of us have, do we still need to get the vaccine?

Lydia Higgs:

The recommendation is yes. People who have had COVID-19 and recovered from it should still consider getting a vaccine. They do encourage you that if you were treated through things like convalescent plasma, that you wait at least 90 days from your last symptom. But the real reason that they're recommending it across the board that yes, that should be something you're considering, is that we don't actually know how long our natural antibodies will last. We recognize our body has fight off COVID-19, but we may not be immune from it forever.

Lydia Higgs:

We do have good data suggesting that mRNA-based vaccines actually mount a stronger immune defense. So encouraging people, who may no longer be naturally immune, to utilize these mRNA and other technologies to have a stronger defense, should they ever come across the virus again in the future is what we think might be safest.

Deepti Babu:

Yeah, that's helpful. There's just so much we don't really know about how this particular novel coronavirus works. Are there other things that you have heard that you wanted to take this opportunity to kind of bust?

Lydia Higgs:

I think that pregnant women and women who are considering pregnancies are the myths I hear most often. I think one of the most encouraging phrases that I've heard people discussing is one that you'll probably hear a lot in news media, which is the idea that the vaccine that you're able to get is the best one for you. People are trying to make decisions about the different models, and that's a little bit tricky, and perhaps a myth that doesn't exist and doesn't need to.

Deepti Babu:

Yeah, thank you for just kind of proactively attacking that one, because I feel like we are so conscious about these manufacturers and the details of these vaccines, including perhaps concerns. I do increasingly hear like, "I'm not sure I want to go to that pharmacy, because they're giving X vaccine and I want Y because it's 96% efficacious versus," whatever, "98 or 90%." And really, they're all 100% keeping us from dying from coronavirus. So in the state of a public health emergency, I think that's where the rationale comes back to what you just said, which is the best vaccine to get is the one that they are putting in your arm if you're able to and want it.

Lydia Higgs:

Exactly. I think when we think about the three currently approved vaccines, each one of them was developed at its own time, and so the studies were performed in different populations and with different countries contributing. But the take-home message from all of those studies is that people were not hospitalized if they did get COVID-19, and they did not die of it if they got COVID-19. So we think that these vaccines are all increasing our safety from that standpoint.

Deepti Babu:

Yeah, which is why they're so universally recommended. And I guess as we wrap up, are there any resources or tools that can help? I mean, you have helped us understand the building blocks of these fundamentals, so now there's going to be some of us that want to dive deeper with that knowledge in hand. So are there places we can go that are trustworthy?

Lydia Higgs:

I think the current website that the CDC has released about the COVID-19 virus and about the available vaccines is a really excellent one. They've broken down some specific frequently asked questions, so it may be something that you're thinking that could be answered exactly on that page.

Deepti Babu:

Yeah. As you said, the guidelines as well about like what does a vaccinated person do, what can they do or not do now, because we're still learning. So we're not out of the woods here yet. So as much as we want to kind of go back to the before times, we have to keep that in mind as we interact with folks that are not vaccinated or maybe don't want to be, and that all of that will kind of play into it. Are there other places that you would think of to direct people?

Lydia Higgs:

I think that is the most up-to-date one I've found. Though certainly, I encourage folks who are reading popular news sources just to ensure that the data that's being pulled is up-to-date. As you mentioned, all of this has been evolving, we've been gathering more knowledge as time goes by. So looking at an article from six months ago isn't going to be so helpful today.

Deepti Babu:

Right, right. And then reading only the headline from the press release is not going to be the way that you get the most complete answer. So science by press release definitely is dangerous as well.

Lydia Higgs:

Absolutely.

Deepti Babu:

That's why we need people like you to help us understand it. So is there one thing that you'd want people to sort of take away from this as they're learning about this?

Lydia Higgs:

I think that people should feel comfortable asking questions. Certainly, we want everyone to understand what they're considering and what they're agreeing to before it's done. But I think that in my reading and research, the data really supports the safety of each one of these vaccines, and that as a population, the more people who are vaccinated, the better off we're going to be.

Deepti Babu:

Yeah, that's a great place to leave it. Thank you so much, Lydia, for sharing your knowledge and your expertise to help us make better sense of this.

Lydia Higgs:

Thank you for having me.