What is a virus?

Here's the thing about viruses – they are weird. In fact, most scientists don't even consider viruses to be technically "alive." A virus is not a cell and is not made of cells, it doesn't make its own energy, and it doesn't have to respond to its environment the way a cell would. Think of viruses almost more like little machines that are made to stick to healthy cells and inject the instructions to make more viruses. These instructions take over the healthy cell, trick the healthy cell into being sick and making a bunch more viruses, and then releasing the viruses where the process starts all over again.

What is a vaccine?

When a human person gets infected by a virus, the immune system eventually learns that the invading virus is making it sick and figures out how to fight it. It does this by producing antibodies, which are a kind of protein that either makes the virus unable to work or signals to other cells that "hey, this is a virus and we need to get rid of it." These antibodies are the best defense against viruses and work better than the body's other defenses (like fever, which triggers good cells to start working and tries to kill the bad cells by overheating them).

Scientists and medical doctors figured out that they could weaken a virus or break it up, inject it, and that the injection would still cause the immune system to make antibodies for when a real virus might attack. And, frankly, it seems more than a little insane – inject dead or weak viruses into a person to protect them? But that's how it's worked. You can look up Edward Jenner, Louis Pasteur, and Jonas Salk if you want to read more about vaccine development.

Like pretty much everything else in medicine, vaccines don't have a perfect history. The first polio vaccine in 1935 was administered to 10,000 children. 5 died and 10 became paralyzed in the arm where they were injected. While this is tragic, it is important to note that the reaction against this was so strong that it was another 20 years until the first effective and safe vaccine came out in 1952. Even in 1935, scientists and doctors were very, very, very careful that vaccines do not cause disease, injury, or harm.

The first vaccine was against smallpox, which could kill up to 30% of the people infected by it. It also left disfiguring scars, including on the first Queen Elizabeth which left her face scarred!

How were they able to make the vaccine so fast?

Let's get to the good stuff. The vaccines that we currently have for things like polio, measles, and tetanus took years to develop. The most common objection to why people don't want to take the vaccine is because it was developed so quickly. And we should also be honest with each other - we are also in a very tense political environment where everyone is fighting all the time. This vaccine has become politicized. It shouldn't be because there are very clear reasons why they could make an effective vaccine so quickly.

The first is the most understandable reason – money. One reason it takes so long to develop a vaccine is because of all the costs of research, testing, and applying for approval. Governments and

private companies around the world provided billions of dollars to research and develop the vaccine because it had such a global impact. That helped to make the process faster. It also helped that the wide spread of the disease created many test cases to determine if the vaccine was effective.

The second and third reasons are more important, though. The second reason that the vaccine could happen so quickly is that COVID-19 is in a family of viruses (called coronaviruses) that already have had a great deal of research done on them (SARS-CoV and MERS-CoV). Scientists weren't starting from scratch with COVID-19 and already understood a lot more than they normally would have about how the virus worked; including how the virus enters healthy cells and begins to take over.

That brings us to the third reason – new technology. Here we have to go back to biology class. It goes like this - DNA is the blueprint of the cell and DNA provides the instructions for how things should work. Cells know that and they don't want to ruin the DNA because if that goes bad, then everything gets screwed up. Under normal circumstances, cells make small copies of DNA called RNA and sends them out to the rest of the cell as little pieces of instruction. These small instruction pieces are called mRNA where the "m" stands for messenger.

Viruses cheat this process by injecting their own DNA and causing the cell to start using the new instructions to make viruses instead of doing normal cell stuff. The new technology that was able to make this vaccine so quickly makes pieces of mRNA that are similar to a specific part of the COVID-19 virus instructions. The mRNA vaccine gives instructions to a few cells to start making a specific part of the virus called the "spike protein" because that's the part of the virus that is used to enter normal healthy cells. But the mRNA vaccine only tells the cell to make that spike protein and no other part of the virus. When someone gets vaccinated with the mRNA COVID-19 vaccine, their body learns to identify the spike protein as the problem and makes antibodies to fight against the real virus. The body's immune system goes from being "blind" to the virus to being able to "see" the dangerous part and can attack it to get rid of it.

What is so crazy about this new technology is that it doesn't need a weakened or "dead" virus to cause the reaction that makes antibodies and cause immunity. No one can get COVID-19 from the vaccine because it doesn't use the whole virus, only a tiny piece of the virus. These mRNA vaccines do not even use the live virus at all to be made. The two other leading candidates for vaccine approval, Johnson & Johnson and Oxford-AstraZeneca, don't use this exact mRNA process but a similar one where a part of the virus DNA is placed in a common cold virus. This process is called "non-replicating viral vector" meaning that they are using a "vector" (a common cold virus) to deliver the COVID-19 DNA and that it is not able to copy itself.

The key thing for both of these processes is that it is impossible to get COVID-19 from them. To get COVID-19, a person needs to be infected with the whole virus and that's not happening in either case. When someone gets sick or has a reaction from a vaccine, people tend to think that they are experiencing a milder case of the illness. That's not possible with these vaccines because the whole virus hasn't been injected. The few people having reactions to the Pfizer vaccine are having allergic reactions to the materials in the vaccine itself, not anything having to do with the virus. It's like getting prescribed a new medicine and having a bad reaction to it. It's just how some people respond to things.

How many vaccines are being developed?

There are currently over a dozen coronavirus vaccines in development around the world. The first one to be approved by the Food & Drug Administration in the U.S.A. was by Pfizer and the second one, which is expected to get approval shortly, is by Moderna. There are two others who are important to remember as well and one of them has important benefits that the Pfizer and Moderna vaccines don't have. The details are below but the problem with all of these things is production – making enough of the vaccines for everyone to get access.

Here are the vaccines:

Pfizer: The Pfizer vaccine is an mRNA vaccine that was approved in December of 2020 and is currently being administered to frontline healthcare workers in Elkhart County. This is mainly going to be people who work in hospitals. This vaccine requires a first shot and then another shot 21 days later in order for immunity to reach its fullest effect. The challenge with this vaccine is that it needs to be stored at -94 degrees Fahrenheit, which isn't easy for many medical places to do.

Moderna: The Moderna vaccine is an mRNA vaccine that is expected to also be approved in December, 2020. This vaccine also requires a first shot and then another 28 days later. This vaccine just needs to be refrigerated and does not require the extreme cold that the Pfizer vaccine does.

Oxford-AstraZeneca: The Oxford-AstraZeneca vaccine is a viral vector vaccine that is expected to request approval by the end of January, 2021. This vaccine also requires a first shot and then another 28 days later. Much like the Moderna vaccine, it does not require extreme refrigeration.

Johnson & Johnson: The J&J vaccine is also a viral vector vaccine that is expected to request approval by the end of January, 2021. The real benefit of this vaccine is that it only requires one shot, which would mean that J&J could produce a great deal of these vaccines more quickly than the competitors. It also only requires refrigeration and not the extreme cold of Pfizer.

How soon will a vaccine be available?

This website will provide information about vaccine availability as soon as the information is released. Please check back often! But the current timeline looks something like this:

1.) Elkhart County frontline healthcare workers are currently receiving the first Pfizer vaccine and these people are considered the first round of vaccinations.

2.) The second round of vaccinations will go to healthcare workers in general in addition to people at higher risk from having severe or lethal COVID-19. These people are likely to receive the Moderna vaccine when it is approved, which could be as early as December 18th.

3.) The third round of people to get vaccination will be those in close living situations where the risk of transmission is high. That would be people in group homes, nursing homes, homeless shelters, and prisons. The hope is that these populations would begin vaccination by

February or March, but that is all subject to vaccine approval and how quickly vaccines can be produced.

4.) The final round is for the general public. The hope is that the vaccine will be accessible to the general public by April or May, but again that is all subject to vaccine approval and how quickly vaccines can be produced.

How long does immunity last?

The best evidence right now suggests it will last at least six months and the hope is that it lasts at least a year, if not longer.

Why can't we get to herd immunity naturally?

Herd immunity sounds like a very appealing and natural response to COVID-19. The idea behind herd immunity is that the disease should just be allowed to spread so that enough people become infected and get the antibodies to make it harder for the disease to find new people to infect. It's like all humans are working together and building each other up to protect one another. But there are reasons why it cannot be relied upon in this case.

This is because it looks like people get different levels of exposure to the virus and then have different levels and lengths of immunity. Basically, this means that some people get a ton of the virus all at once, their immune system makes a great deal of antibodies, and then they have these antibodies that gives them protection for a while. Other people only got a little bit of the virus so their body develops some antibodies but there are less antibodies and they fade more quickly. We know that some people have already been reinfected from coronavirus but fortunately that appears to be pretty rare. That's a good sign that coronavirus gives at least some lasting immunity. But it still means that immunity fades over time.

So if immunity fades over time, then a bunch of people have to get sick at once for herd immunity to happen. The amount of people needed to get to herd immunity depends on how quickly the virus spreads. COVID-19 spreads easily but not so easily that it infects everyone all at once. Estimates for the herd immunity needed for COVID-19 tend to settle on around 60-70% of the population. So let's say we tried to achieve that naturally. What would that even look like? Bring everyone together and share water bottles? Share blood? Cough together? Even if there was some way to get everyone sick at once so that people got antibodies at the same time, we know from our local hospital systems that around 15-20% of people who get infected require at least some hospitalization. If we attempted this, then a great many people would die from not being able to be hospitalized because there would be no room and other people who need the hospital for non-COVID-19 reasons (car accidents, other sickness, etc.) would die because they couldn't get access either. To be blunt - many people would die from attempting herd immunity and it is unlikely to even be achieved in any lasting way.

The way to get the highest amount of people with antibodies with the least amount of people getting seriously sick is the vaccine because it 1) creates the antibodies, 2) does so with a large amount of people in an effective way, and 3) does so in the safest way possible.

Can I trust the vaccine?

Even with all of the information that is available and has been presented here, most people's concerns remain around the side effects of the vaccine. If it was developed so quickly, how can scientists know the long-term effects? The straightforward answer to this question is that the vast majority of effects from vaccinations occur within days or weeks of getting a vaccine. A vaccine isn't meant to hang around the human body for a long time but to cause an immediate reaction so that the immune system makes antibodies. Even with the FDA's emergency approval of the vaccine, the FDA still required that everyone who was vaccinated be monitored for two months after the last shot was received. There were no significant safety concerns reported.

But let's get real here – this is up to you. We have provided an explanation for how this vaccine could be made so quickly, what it does, and what it does not to. The key things to know are that is impossible to get COVID-19 from the vaccines and that there are very good reasons to believe there are no significant safety concerns. When someone gets sick or has a reaction from a vaccine, people tend to think that they are experiencing a milder case of the illness. That's not possible with these vaccines because the whole virus hasn't been injected. The few people having reactions to the Pfizer vaccine are having allergic reactions to the materials in the vaccine itself, not anything having to do with the virus. It's the same as getting prescribed a new medicine and having a bad reaction to it. It's just how some people respond to things.

But at the end of the day, it is up to each person to decide about the vaccine. We provide some reasoning below but all we are asking is that you don't rule out getting the vaccine in the next year. If you are uncomfortable, talk to your doctor or someone you know in the medical field or someone who has gotten the vaccine. See how they felt and what they think.

Here's the real issue - there are going to be consequences whether you decide to take the vaccine or not.

If you take the vaccine, the people who developed the vaccine reported that people feel a little to sometimes pretty sick the next day. As people take the vaccine locally, we will do our best to get people to give honest reports on how they feel after taking it. But it is also been shown that people recover quickly and that they then have antibodies that drastically reduce symptoms and effects of the coronavirus. There have been some severe allergic reactions to the vaccine in England which means that, if you have severe allergies, you need to talk to a doctor before getting the vaccine. These responses are generally like when you take a medicine you haven't had before – there is a small chance you can react badly.

If you don't take the vaccine, there are still consequences. This is especially true if the people around you don't take the vaccine. First, you can get infected, you can get sick, and you can possibly get very sick. Everyone already knows this. You can also make other people around you sick and, if they have bad health for whatever reason, they are more at risk of getting seriously sick.

Here's the part that's even worse – if you don't take the vaccine, the virus keeps circulating, hospitals keep having increased numbers of patients who are sick, and we have to keep being careful with restrictions like social distancing and mask wearing. It's not more or less complicated than that. No one thinks that this virus is perfectly going away or that the vaccine is going to solve everything. But what will happen if the majority of the people take the vaccine in a relatively short period of time is that we can go back to normal. Or whatever "normal" might look like after 2020.

Will the Elkhart County Health Department mandate this vaccine?

No, no, no, and then more no. The ECHD has already started having conversations with business and community leaders about vaccine roll out and has made it explicitly clear that, just like all other vaccines, they will not mandate that anyone take this vaccine. Local businesses will have to make decisions about what they are going to do as the vaccine becomes available to more people, but none of that is the responsibility of the health department.

Finally, it's important to note that this vaccine will not be given to people under the age of 18. The vaccines were not tested on children because they have very mild or no symptoms at all. The vaccines will be tested on children at some point in the future but they simply were not the health priority because the impact on them is so minimal.

Vaccines and People of Color:

The COVID-19 pandemic has been widely documented as hitting communities of color particularly hard. Sadly, it is likely the strength of these communities relationships and connections that have contributed to the spread of the disease. Because people of color tend to have stronger family relationships and friendships and tend to meet more regularly, there is an increased chance of spreading COVID-19. This is been shown in Elkhart County where both the Latino and African-American/Black communities have higher rates of infection. Notably, the Amish community also has higher rates which are likely due to similar reasons.

The vaccine is particularly important to help protect these communities but those communities have sadly experienced prejudice in the medical field as well. This is not about being sensitive to certain remarks or language but about longstanding, factual experiments that were carried out on African-Americans without their knowledge and/or consent. One infamous example of this includes J. Marion Sims who operated on enslaved black women without anesthesia. Another example is the Tuskegee Syphilis Study (1932-1972) which deliberately deceived and never offered treatment to nearly 400 black Southern men who were infected. 128 men died from the disease or related complications. The study was only stopped in 1972 when a whistleblower called attention to it.

There have been African-Americans who are prominently involved in the development of these vaccines, people like Dr. Kizzmekia Corbett who worked with Moderna on their vaccine. However, there is no short or easy answer to overcome the distrust that historic mistreatment has caused. We hope that honest and direct conversations with health officials, doctors, and community leaders can

help build trust in the vaccine. Please reach out to the Elkhart County COVID-19 hotline for more information (574-523-2106).

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