Should You Get an Antibody Test?
A user’s guide to the immune system

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The road to ending social distancing is less contentious than it may seem. Many priorities are clear: Invest in comprehensive testing for the coronavirus, in effectively treating the disease, and in vaccine development and production. Invest in research to understand transmission of the virus, and precisely how to prevent it.

The fundamental mystery to solve is how people develop immunity, the key to which will be testing for antibodies in the blood. Identifying antibodies will help inform contact tracing; determine the effectiveness of vaccines; and clarify who may be susceptible to re-infection, and at what point, and why.

Antibody tests (sometimes referred to as serology) have begun rolling out across the country, to much fanfare. Last week, New York Governor Andrew Cuomo announced an “aggressive” deployment of tests—and early numbers have suggested that about 15 percent of people in the state have antibodies to the coronavirus. Some pundits and armchair immunologists have implied that high rates of antibodies mean that cities could reopen quickly. Some take the apparently high number of asymptomatic cases of COVID-19 to mean the disease is not that bad, and that social-distancing measures have proved to be an overreaction.

This is false hope, going beyond what science can yet say. The basics of immunity—mechanisms most of us haven’t thought about since high-school biology, if ever—have suddenly been politicized to the point that they seem much more confusing than they actually are. So I thought a basic FAQ might be of use.

What is serology?

The study of serum. It mainly involves adding sero to the beginning of words (seroprevalence, seropositivity, seroprotection). These words are going to be a part of our lives for the next year or two, and they may sound technical, but basically all you have to do is subtract sero to understand them. Prefixes like that are a trick that doctors use to sound smart and justify our student loans, but basically it means “we’re talking about antibodies.”
What does it mean if I have antibodies?

If you have antibodies to any virus, it means you’ve been exposed to that virus (or a vaccine for it). Your body remembers that exposure and will recognize the virus if you get exposed again. But having antibodies doesn’t necessarily mean you’ll be able to fight off a second infection. For that, you need sufficient numbers of antibodies, and they need to be effective antibodies. We don’t yet know the degree to which people with coronavirus antibodies are protected from getting COVID-19 a second or third time.

Do antibodies kill the virus?

Antibodies are proteins that float around in your blood and, essentially, look for things that are not right. If a virus has invaded and hijacked your cells to make thousands of clone viruses, for example, that’s not right. But the abnormality can be tricky to identify, because viruses can hide within our own cells. When a new, unknown invader proves difficult to distinguish, the body sometimes gets desperate and calls out the entire immune-system military—and also the National Guard, and the Boy Scouts, and anyone who has a pitchfork or a torch. The process can be fatal. Antibodies help prevent this by detecting the virus, or virus-infected cells, and binding to their surfaces, signaling the immune system to destroy only them. This allows for a precise, targeted killing that doesn’t do too much harm to healthy organs. The next time we see the virus, essentially, we just send out the Navy SEALs.

Will everyone develop antibodies?

Most humans have antibodies to the four coronaviruses that cause common colds, and it’s expected that antibodies to the new coronavirus will reliably develop in most people who are exposed to it. The question is how long they will last, and how consistently they’ll be effective at preventing a second case of the disease (if they are effective, they’ll be considered “neutralizing antibodies”). Typically you start producing some antibodies shortly after getting a virus. One kind, known as IgG, has reliably shown up on antibody tests in the second week of a COVID-19 infection. If this coronavirus is like other coronaviruses, another kind of antibody, known as IgM, will show up around the same time. The as-yet unanswered question is how long the y will stick around.

How long do antibodies last?

We don’t know, but other coronavirus antibodies tend to last a few years. After the SARS coronavirus outbreak, in 2001, one study found that only 9 percent of people had antibodies six years after getting sick. They take time to develop, and they form only after you’ve been exposed to the virus. They are your blood’s unconscious memory of past infections. With most viral outbreaks, at least some of us have some degree of prior exposure—and, therefore, protection. But none of our immune systems has that memory this time around.

Do I have to get sick from the coronavirus to get antibodies?
No. This is the principle behind vaccination, whereby we try to create a situation that exposes you to enough of a virus that you develop antibodies, but not enough that you get sick. But it’s not clear that every exposure to the coronavirus will lead to antibodies. Though the amount of the virus that people are exposed to does seem to affect how sick they get, we don’t yet know how much the virus needs to replicate inside you before you develop antibodies.

**How reliably do antibodies fight off the coronavirus?**

This is the central question to answer in the coming months. Usually antibodies work very reliably, but in some cases they barely help, and in certain diseases having some antibodies is worse than having none. This is known as immune enhancement, a phenomenon that may or may not prove relevant with this coronavirus; it is worth keeping in mind when people suggest that antibody tests are currently painting a clear picture of who is totally protected from the disease.

**Can I use someone else’s antibodies?**

There is a lot of hope that this could be a useful treatment for people who get sick from COVID-19, or for very high-risk people who get exposed to the virus. We inject people with antibodies to prevent diseases like tetanus, so the idea isn’t unprecedented. Those antibodies instantly help neutralize the toxins in your blood after you step on a rusty nail, so you don’t have to endure two weeks of severe muscle spasms and lockjaw while your body makes its own. The approach is being studied now for this coronavirus; Tom Hanks even donated some of his antibody-laden plasma to the cause. But injected antibodies don’t stay with us long. For lasting protection, you need to make your own antibodies.

**Should I get an antibody test right now?**

I would recommend it, but only if you’re part of a research study where your results are contributing to an understanding of what results actually mean. Otherwise, it’s generally not advisable to get tests unless we know what to do with the results, and we don’t yet. We don’t even know if most of the tests that have come on the market are accurate. There are now more than 150 tests, most of which have not been approved by the Food and Drug Administration.

**Why does FDA approval matter?**

The FDA is maybe best known for its role in helping make sure that drugs are safe and effective before they go to market. But the FDA does the same for tests, too. That includes nasal-swab tests to detect the coronavirus during an infection, and blood tests to detect antibodies after an infection. The approval process slows down the availability of tests, but the idea is that patients and doctors should have some assurance that the tests they’re using are at least somewhat accurate. Even the coronavirus antibody tests that are “approved”
right now by the FDA are only being used under a special “emergency use authorization,” for which standards are looser than usual. The others could be total scams. You can sell almost anything and call it a coronavirus antibody test right now; the market is operating mostly on an honor system.

What makes one antibody test better than another?

The two key features are sensitivity and specificity. A test has to be sensitive enough not to miss the antibodies if they’re actually present, but specific enough not to accidentally show a positive result.

How could a test be positive if I don’t have antibodies?

These tests work like magnets that attract antibodies, trying to pull them out of a small sample of blood. But the magnet needs to be precise. When it’s not, other antibodies could stick to it, and you could get a false positive result. This is one of the things that is typically vetted during the FDA approval process. False positives could compromise a test’s ability to guide life-and-death decisions about how to reopen society.

Can a test say whether I have enough antibodies to be protected?

This is measured in a specific type of antibody test known as a titer, which doesn’t just determine whether you have antibodies but counts the number in your blood. So the key questions will be what level is adequate to confer immunity, and under what conditions do people develop that adequate level? How reliably can we assume that if you have any antibodies, you are immune? That would mean you’re not only seropositive but seroprotected.

Why are we putting so much emphasis on antibody testing if the results don’t necessarily mean I’m superhuman?

Right now, the antibody tests are being used to help map out where the coronavirus has spread, like tracking the footprints it has left. Combined with other types of research, this information will eventually help identify who is most susceptible to infection, and why. Even if we can’t tell individuals that they are totally protected, we could theoretically begin to allocate scarce resources away from a city where 50 percent of people have antibodies to one where only 5 percent of people do.

That means if we have a lot of positive antibody tests, we can stop social distancing?

One day, yes, hopefully. But the tests aren’t good enough yet, and we don’t know how many people with antibodies are truly protected from the coronavirus. Antibodies wane over time, and not everyone has the same, lasting response to disease or vaccination—as we’ve seen
with diseases like measles and hepatitis B. We don’t know how reliably people who are infected by the coronavirus develop effective antibodies. Figuring that out requires longer-term studies of who gets sick twice, and what sort of antibody response is needed to prevent that.

**What percentage of people would need to have antibodies—effective ones, in effective amounts—to completely reopen society?**

That comes down to the concept of herd immunity. With a disease like measles, not everyone has complete immunity by way of vaccination (because people’s antibody response to the vaccine waned over time, or because they have refused vaccination in the first place). But except for occasional, local outbreaks, we still collectively have enough antibodies that the virus can’t take hold and cause a pandemic. In the same way, the annual flu season ends as we approach herd immunity to that year’s strain of influenza.

The percentage of people required to reach herd immunity varies based on the virus. For a more contagious virus, we need higher percentages of the population to be immune. Determining that percentage comes down to the “basic reproductive number,” or R0, which is the average number of people who will catch a disease from any given contagious person. There’s still disagreement about what that number is for the new coronavirus, but at the moment many experts estimate that it’s between two and three. In any case, one basic approximation of herd immunity is when you multiply the R0 by the proportion of the population that is not immune and the result is less than one.

**Does all the mask-wearing and social distancing mean we’re going to take longer to get to herd immunity?**

Those basic measures can and have helped to lower the R0. If we keep doing them, we could have a relatively low percentage of immune people and still open businesses back up, because the disease would effectively be less contagious. People would get COVID-19, but we wouldn’t be flirting with catastrophic exponential growth.

**What’s the best estimate for the percentage of immune people across the United States right now?**

Given the caveat I keep repeating—that it’s truly impossible to say—the best guesses are all in the single digits. The rate of positive antibody tests varies widely from place to place. And those tests are limited and we don’t know what they mean. In Chelsea, Massachusetts, a small, early study appeared to show a roughly 30 percent positive rate, while in Santa Clara County, California, the positive rate was about 3 percent. In either case, there’s no evidence that we are near herd immunity. And, again, these studies weren’t meant to measure immunity; they were only meant to measure exposure. Measuring immunity will mean seeing how many of the people with antibodies end up getting sick again.
Should we give up for now on coronavirus antibody tests? I’ve lost hope.

No, this is how immunity works in most infectious diseases—it involves uncertainty. There are always questions about exactly how many antibodies are required to prevent an infection, and how long they last. We act based on averages and best estimates across populations. But at an individual level, none of us is suddenly rendered invincible. We may only ever be able to say that, for example, 80 percent of people who have a positive coronavirus antibody test are truly adequately protected. But when the prevalence of disease falls—because so many of us have been sick, or get vaccinated, or simply practice good hygiene—that number becomes enough to effectively protect us. In keeping with the recurring theme of this pandemic, we’re all in this together.

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