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Reader Q&A

Your questions answered

From immunity to vaccines and face coverings, Jessica Hamzelou, Graham Lawton, Michael Le Page, Donna Lu and Adam Vaughan have the answers

WE HAVE now been living with SARS-CoV-2, the virus that causes covid-19, for the best part of a year. In that time, our knowledge has expanded dramatically, but there is still so much we don’t know – and even when we think we know things, the science can change fast.

On 24 September, we held a live Q&A event online for subscribers about the pandemic and were inundated with questions. On the following pages, our reporters tackle some of the most common.

Transmission

How does the coronavirus spread through the air? Is aerosol transmission a possibility?
The coronavirus definitely infects people via the air. The rather confusing debate among experts is whether it is only carried by large droplets that rapidly sink to the ground or whether people can also be infected by smaller droplets that can remain airborne for hours, known as aerosols.

It is very hard to establish exactly how people have been infected, but the overall evidence does suggest that aerosol transmission is happening. To give one example, a study looking at how a passenger on a flight between London and Hanoi in Vietnam infected up to 15 others concluded: “The most likely route of transmission during the flight is aerosol or droplet transmission.”

What about aerosols indoors? I’m wondering if I brave a museum visit.
The risk is thought to be greatest in crowded, poorly ventilated spaces where people don’t wear masks and shout or sing, such as some pubs. In a spacious museum that isn’t crowded and where everyone is wearing masks, as currently required in the UK, the risk should be lower. However, the risk also depends on the odds of encountering infectious people. If case numbers are rising, these odds rise too. How you travel to the museum will also matter.

And how about outdoors?
The risk will vary enormously depending on circumstances, such as how windy it is, how many people are around you, how close they are and if any are infectious. Time is also a factor: you might have to stay in close proximity to an infected person for some time to breathe in a high enough dose of the virus to infect you.

How long does the virus remain active on surfaces?
After reviewing the scientific literature, Emanuel Goldman at Rutgers University in New Jersey concluded that the risk of infection from surfaces is tiny for most people. “The focus should be on masks, social distancing and doing things outdoors as much as possible,” he says. “Inanimate surfaces are a very minor player in all this.”

Don Schaffner, also at Rutgers, says he has found only one case providing evidence of transmission via surfaces, or fomites, in the peer-reviewed literature. It was for two individuals who sat in the same seat in Singapore. But he says by all means mitigate the risk by using hand sanitiser and washing hands regularly. “I’m not telling people to not worry about surfaces,” he says. “I’m saying worry first about other people.”

A paper published on 7 October found that SARS-CoV-2 could remain stable for 28 days at 20°C on non-porous surfaces, such as glass touchscreens, stainless steel and paper banknotes.

“The focus should be on masks, social distancing and doing things outdoors as much as possible”

The Australian team behind the research agreed that the virus spreads mainly through aerosols and droplets in the air, but concluded that surfaces may be an important route too because the virus “can remain infectious for significantly longer time periods than generally considered possible”. However, real-world differences in temperature, humidity and sunlight – the virus samples were tested in a lab in the dark – mean the results don’t reflect real-life situations.

Are masks an effective measure? Is there a need to wear one outdoors?
A growing number of studies suggest that face coverings reduce your chance of getting infected, make infections less severe if you do get infected – by reducing the amount of virus you are exposed to – and stop you infecting others if you have caught the virus. No single study is conclusive, but looked at as a whole, the evidence is convincing. Even when there is no requirement to wear face coverings outside, it is still a good idea in crowded places where you cannot avoid being close to others.
Vaccines

What is the progress on developing a universal coronavirus vaccine? Never before in vaccine history has so much progress been made in such a short time. Several vaccines are already in phase III trials to see if they actually work, and dozens more potential vaccines are being developed. Vaccine manufacturers are also being paid to prepare for making billions of doses. Hopes are high, but even if several vaccines prove effective, it will take years to roll them out worldwide.

Will the first vaccines benefit the most vulnerable? Older people have a lower immune response to vaccines and so flu vaccines for them contain added components called adjuvants that boost the immune response. We don’t know whether this will be necessary for the coronavirus, but the Novavax vaccine already in phase III trials contains an adjuvant, and several other vaccines with adjuvants are in earlier stage human trials.

If several strains of the new coronavirus emerge, can we expect any vaccine to be completely effective? There are many reasons why vaccines might not be 100 per cent effective, unfortunately. For instance, they might not produce a strong enough immune response. The differences between coronavirus variants are small, so the hope is that any one vaccine will work against all of them. If this doesn’t prove to be the case, however, it should be possible to tweak vaccines so they protect against multiple strains, just like flu vaccines typically do.

How much time would have been saved in the development of a vaccine by doing challenge trials, versus the traditional approach? With challenge trials, healthy people are given the coronavirus to test a vaccine’s efficacy. These might be able to give results in weeks instead of months or years — at least for young people. No one is proposing challenge trials involving older or vulnerable people, though, so they wouldn’t tell us how well any vaccine works for these key groups.

A health worker in Brazil gives an injection as part of a coronavirus vaccine trial from people who have recovered from the disease will work. And several small, early studies have reported promising results. But we need to wait for the results of large trials because the complexity of biology often confounds expectations. For example, it has just been discovered that a tenth of people with severe covid-19 produce antibodies to a key antiviral molecule made by their own bodies – a kind of autoimmune response. Plasma donated by these individuals could make the disease worse.

Treatments

With improvements in treatment, how has the fatality rate for covid-19 changed? We have a good idea of how many people have died in richer nations. What we don’t know is how many have been infected, as the number of reported cases isn’t the full story. So there is no definitive way to calculate the infection fatality rate (which estimates the proportion of deaths among infected people) or how it is changing – estimates still vary widely. Figures from the UK’s Intensive Care National Audit & Research Centre suggest that 83 per cent of people admitted to intensive care units after 1 September are surviving compared with 60 per cent before this date, but these numbers must be treated cautiously. Intensive care units might have turned away more borderline cases during the first peak due to a lack of resources, for instance, making the apparent death rate higher then.

Is plasma therapy likely to be effective? In theory, there is every reason to think that treating covid-19 patients using blood plasma taken...
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as the pandemic’s ground zero. So the virus could have crossed the species barrier there, from a bat or a pangolin into a human.

But it is also possible that the market was merely the venue of a superspreader event, not where the virus jumped species. One scenario that cannot be ruled out is that a progenitor virus acquired from bats was circulating in humans for months causing only mild symptoms, but then mutated into SARS-CoV-2 and began spreading in the market.

“If the immune response fades rapidly, we would expect to have seen more cases of reinfection”

Wilder scenarios are that the virus accidentally escaped from a laboratory or that it was deliberately engineered as a bioweapon – both of which are exceedingly unlikely.

Why are bats the reservoirs for so many viruses?

Bats are clearly trouble: they also gave us the original SARS virus, plus Ebola, Nipah and more, and are by far the most prolific source of zoonotic viruses, ones originating in animals. Bats can tolerate extremely high virus loads, meaning that they are an efficient incubator of novel viruses. Humans also come into contact with bats relatively frequently, especially in parts of the world where they are a source of meat and traditional medicines.

Immunity

At least one person who had covid-19 a second time had a more severe illness. Could we have issues vaccinating people who have had it? Fortunately, it is now becoming clear that exposure to the virus provokes a classic immune response that protects people against reinfection. However, we don’t know how long immunity lasts. It may only be months.

There are a handful of confirmed cases of reinfection, but nowhere near as many as would be expected if the immune response always fades rapidly. It is possible that the people who got reinfected had an unusually weak response the first time or encountered a mutant virus that was biologically different enough to evade their so-called immune memory. The test results could also have been false positives.

At least one person who had covid-19 twice is reported to have become more severely ill, which raises the spectre of something called “disease enhancement”. This is where a second bout of an infectious disease is worse than the first. A few viruses, most notably dengue, are known to do this, but it is too early to say whether SARS-CoV-2 does too.

There is a similar phenomenon called “vaccine-enhanced disease”, where a vaccine not only doesn’t protect against infection, but also makes the symptoms of the disease worse. Vaccine developers are well aware of this risk. Thankfully, it hasn’t been spotted in any of the experimental vaccines so far. This also suggests that reinfections won’t typically be worse.

It appears that the recent “second waves” of the virus are in different areas from those hit hardest initially. Does this suggest that there is some degree of immunity in those places? Antibody surveys are probably not picking up the true extent of immunity to the virus. These tests look for circulating antibodies, which are known to fade quite rapidly after an infection or are hardly produced at all. One survey, for example, found that among UK doctors who had tested positive for the virus, 12 per cent had no detectable antibodies.

The T-cell response, which is the arm of the immune system that kills infected cells, seems to be much more robust. Immunologists think that if we did population surveys of T-cells, we would see higher levels of immunity. This so-called cryptic immunity may be why the second wave is hitting different areas to different extents. But we can’t be sure.

Can I predict my personal risk for covid-19?

All sorts of factors, including age, race and pre-existing health conditions, determine your risk of becoming severely ill. Because it still isn’t clear who will develop an asymptomatic case of covid-19, it is difficult to predict the risk to an individual who hasn’t yet caught the virus. But once symptoms start, it should, in theory, be possible for an individual to calculate their own personal risk of experiencing a severe or potentially fatal case, says Tim Spector at King’s College London. There isn’t yet a “personal risk calculator” available, but Spector’s team is working on ways to predict risk based on early symptoms and data collected from the COVID Symptom Study app.

At the moment, however, there is no way to predict who is at risk of “long covid”, where often debilitating symptoms can last for months.

Environment and animals

How is the pandemic related to over-exploitation of the planet?

The role our destruction of nature plays in infectious diseases spilling over into humans is something we have only begun to grasp fully in the past two decades, says Peter Daszak at the EcoHealth Alliance. He says the drivers include: rising human population density; encroachment into and road building in forests; and hitting thresholds of contact between wildlife, humans and livestock at which a disease emerges, then spreads through trade and travel networks.

Global analyses have found that the risk of zoonotic diseases emerging is highest in tropical areas where land use is changing, such as forests being cleared for cattle farms.

Daszak also says that the wildlife trade in China readily mixes legally and illegally captured and traded animals, and involves
domestic and international commerce – and that viruses exploit those pathways.

However, it would be wrong to think that people in the West aren’t also to blame. “The encroachment of people into high biodiversity regions is a global driver of emerging infectious diseases and it’s largely done to supply our overconsumption in richer countries,” says Daszak.

Is it possible for pets to carry and spread the coronavirus? SARS-CoV-2 has been detected in a number of animals, including tigers, lions and rabbits. Ferrets, hamsters and cats have been shown to be able to pass the virus to others of the same species, and transmission between mink in the Netherlands has led to outbreaks at more than 40 mink farms.

However, cases of pets catching the coronavirus from their owners remain rare, and research indicates that most pets with confirmed infections only show mild symptoms.

Whether animals can pass the virus back to humans is less clear.

Pandemics

How long do pandemics normally last for?
Covid-19 is the second pandemic of the 21st century. The H1N1 influenza outbreak of 2009-10 sickened and killed far fewer people than covid-19 already has.

You could argue that there is a flu pandemic every year, yet the World Health Organization (WHO) saves the term for novel flu viruses, not slightly mutated seasonal ones.

The H1N1 pandemic lasted about a year-and-a-half, but that is no guide to how long the current pandemic or future ones will last. The duration of a pandemic depends on the biology of the disease and the measures that are used to control it. There is also the ongoing pandemic of HIV that began in the 1980s.

Other relatively recent pandemics include the 1918 flu, the flu of 1957-58 and 1968-69 and the cholera pandemic of 1961-75. However, history is littered with them, including the worst of them all, the Black Death of 1331 to 1353, which killed up to 200 million people out of a global population of about 450 million.

By comparison, we could consider ourselves lucky.

Is there really any hope that the coronavirus will be defeated or will we have to live with it forever?

Many infectious disease experts believe we will have to learn to live with it. Global social inequalities and air travel imply that so long as the virus exists in people somewhere in the world, its easy transmission means it will spread.

Even if a vaccine is developed, it doesn’t mean that the world is likely to “beat” or eliminate the virus. “What will a vaccine do? It certainly won’t stop it becoming endemic,” says David Heymann at the London School of Hygiene & Tropical Medicine. “We don’t understand enough about immunity to understand what that vaccine might be and if herd immunity can be established.”

Do you think experience of this pandemic will help better prepare us for future ones?

Despite a decade of warnings from the WHO that a new pandemic was a certainty, covid-19 caught the world napping. Experts say there will be another pandemic sooner or later, but we are unlikely to be any better prepared for it despite our current predicament.

Face coverings have become part of daily life for people using public transport in the UK.

PLEASE NOTE

We urge you to keep up to date with and follow your local guidelines. If you sent us a question that wasn’t answered here, take a look at our website, where you can find a longer and more in-depth version of this article.