

Covid chapter updates

Covid-19 Mutations

Somebody said that people in many rich countries have got used to thinking that they've conquered all infectious disease, and so there's this hubris about that, and I think that we found that hubris was more profound than we realized. We felt far too safe, and there was really quite a great degree of hubris in there. [Then] an old colonialist-thinking legacy [arose], discounting Asian science and experience, and that's a large part of what this whole theme is. Just that assumption that you are Americans or Europeans and know best over and over again. If this pandemic has taught us anything, it should be not to think that anymore, and yet, people keep on doing it. Hilda Bastian

Like all microbes, and most especially viruses, Sars-CoV-2 is a master of mixing its genome; it is highly adaptable. Viruses, when they move into large populations of people, enter a new ecological territory. They, as we do, learn the new terrain and adapt to it. Viruses are immeasurably older than we are; they have a great deal of experience altering their genomes to better survive in new ecological niches. It's become common among researchers to speak of viruses as having trouble reproducing identical copies of itself. They say the viruses make "typos" or "copy-and-paste" errors or even that they engage in bad "proofreading." This makes the viruses seem rather stupid: "Oh, the poor things. Can't even copy themselves correctly." The

truth is very different.

What is more ecologically accurate is that viruses are a form of swarm intelligence – the individual members are not the entity, the swarm is. One of the primary adaptation patterns it uses is to generate millions of slightly different offspring very quickly in order to produce more highly adaptable forms. The viral swarm also possess the capacity to create new genomic forms through highly sophisticated examination and analysis of their new hosts' ecologies. They *respond* to our responses to them. And they do this in a number of ways.

Analysis of SARS-CoV-2 has found that it took up residence in a number of immuno-compromised people around the world, learning a great deal from them in the process. The virus then recombined its genome, creating more adaptable forms that are better able to live within us. In one Boston hospital a 45-year-old severely immuno-compromised man remained ill with the infection for five months. Doctors sequenced the virus from the beginning and found that more and more mutations occurred, twenty-one by the end. The virus was experimenting with alterations in the spike protein to find the ones best suited to evade immune responses. After the man was given a new antibody drug, the virus immediately developed alterations to evade it. This exact same process occurred nearly simultaneously in countries throughout the world. As molecular epidemiologist Emma Hodcroft commented, “It becomes almost like a training course for how to live within the human immune system.”

The virus has a plethora of other ways to create variations. Sometimes the virus utilizes the genomes of more adaptable “typo” forms, recombining several different once in order to create better survivors. The virus also shares genomic sequences with other coronaviruses (such as the corona cold virus) that have already adapted to the human body. (This is especially

worrying in that there are thousands of unknown coronaviruses that live in wild ecosystems. Developing a spike protein adaptation that allows easy human infection will, if shared, allow other members of the genus to infect us.) And our medical responses to them, including vaccines, also stimulate adaptation.

These are the main reasons that similar-to-identical variants have emerged, essentially simultaneously, throughout the world. When these variants meet each other in new hosts they innovate again. They share genomic information, creating even more adaptable variations. This is a very ancient viral adaptation strategy. All microbes, despite what we were taught in school, are highly intelligent and they have been surviving and adapting far longer than our species has existed.

There are a significant number of variations (so-called mutations) that have emerged in the early months of 2021. There is every reason to expect this will be a continuing problem. The first three variations of serious concern in 2021 were the UK, the South African, and the Brazilian. But others soon emerged as well: the powerful California variant, another in NY, one in Spain, and still another in Brazil. The genomic innovations the variants possess are not identical, though, at this point in time are fairly close. Nevertheless, each possesses an alteration in their spike protein (called N501Y). This alteration allows the virus to attach to ACE2 receptors more easily and more firmly which makes infection more likely.

The wild or initial form of CoVid-19 had a less sophisticated attachment method, the new ones are far more elegant. A bad analogy is that the virus (male) and the cell (female) form a kind of male/female attachment point. The fit wasn't perfect in the original form but it worked well enough. The immune system responded by creating an antibody that "capped" the spike on the

virus (the condom), making it more difficult or impossible for the virus to attach itself. But in time the virus adapted itself to the cap (the new variants), altering the spike's shape so that it could not be capped by the antibody. At the same time a much firmer, tighter fit to the ACE2 receptors occurred. Still other alterations made the virus significantly more transmissible. Viral loads in the infected are up to 1000-fold higher. Further innovations in the South African and Brazilian variants (the E484K mutation) make them even more capable of avoiding immune system antibodies. The California variant is now known to be extremely transmissible as well. Perhaps far more than the initial three variants. The variants are 40-70 percent more transmissible and some cause "much more severe illness."

More troubling, previous infection does not confer immunity to the new variants. People in some areas of Brazil, having already survived infection from earlier forms, are now succumbing to infections from the new variant. The same dynamic appears to be playing out in South Africa. Again: *Previous infection is not conferring immunity*. Nor does donor plasma seem to work against the new variants.

The new variants are unfortunately increasing "exponentially" in the human population. The UK variant, which initially had only infected one to four percent of the American public, had, within a month, surged to 30 to 40 percent. As Dr. Celine Gounder has said, "We are probably right now on the tipping point of another surge." Michael Osterholm commented in early March of 2021 that we are in the "eye of the hurricane." He expects a dangerous upswing infections between early summer and fall 2021. This process, an upsurge, then a downswing, then an upsurge is likely to continue indefinitely. Newer variants are going to emerge in an endless repeating cycle. The California variant is expected to make up 90 percent of infections on the

west coast by summer of 2021. It, like a number of the others, is far more contagious than earlier forms. As Paul Duprex at the Center for Vaccine Research at the University of Pittsburgh puts it, It was a mistake to “think that we are cleverer than evolution.” Kevin McCarthy, also at Pittsburgh, comments that: “We’ve been underestimating the capacity of the virus to evolve since the beginning of the pandemic.” The more people the virus infects worldwide, the more it learns, and the more successful variants it will create. Many researchers now believe that *herd immunity is unlikely*. Given the virus’s adaptability and its very fast learning curve, the best case scenario is that it may be more accurate to think of it similarly to the flu virus, which needs a different shot each year. As *The Washington Post* recently commented, “The pandemic continues. For how long? At this point, anyone giving a confident answer is guilty of hubris.”

SARS-CoV-2 is going to be with us for a very long time. The crucial question is, will we be able to adapt to it as well as it is adapting to us?

The Vaccines

[This same kind of arrogance is] happening with vaccines, especially thinking it’s all about the vaccines of a few big EuroAmerican multinationals galloping to the world’s rescue. One of the most fascinating stories is Cuba. I mean there’s this really interesting juxtaposition between Cuba and Canada, ironically. In Canada there’s been this debate about why did they let their capacity to produce vaccines dwindle away next to nothing Cuba had the exact opposite Cuba had to become self-sufficient at pretty well everything and that included producing drugs and producing medical teams. . . . They’re going to have a massive amount more

vaccine than they need. They're not going to have any trouble vaccinating their population with home-grown vaccines in 2021. . . . They're just going to be exporting masses and masses of vaccine. Hilda Bastian

The first thing to understand is that despite common assumptions COVID-19 vaccines are not vaccines in the way most people think of them, that is, something like the measles vaccine which prevents all future infection. More properly they activate the immune system to enable it to better respond to the virus if exposed. For some people this means they will not be infected, for others it means that they merely have a less severe infection. For others there will be less chance of death if they do become seriously ill. Regrettably, the vaccines that are now in use were designed for the original or wild form; they were not designed the newer variants. While they, at this point in time, do offer some protection, emerging reports of infection in the vaccinated are becoming common throughout the world.

There are (apparently) some 240 different vaccines in development, none which look likely to provide permanent protection to the coronavirus group. Six vaccines are officially approved/authorized in various countries, 22 are in phase three trials, 23 are in phase two trials, 18 are in phase one. The approved/authorized vaccines are: the Moderna mRNA-1273 vaccine, Pfizer-BioNTech BNT162b2 vaccine, the AstraZeneca AZD1222 vaccine, the Sinovac Biotech and Sinopharm vaccines from China, the GAM-COVID-Vac (Sputnik V) vaccine,, the Novavax NVX-CoV2372 vaccine, and the Johnson & Johnson/Janssen Ad26.COV2.S vaccine.

The Pfizer and Moderna vaccines are made using messenger RNA (mRNA). This delivers a bit of genetic code, the spike protein, into the body. This stimulates the immune system to

make antibodies to stop spike attachment. The Johnson & Johnson uses a different approach, creating what is called a viral vectored vaccine. A relatively benign adenovirus has been altered to carry the SARS-2 spike protein into the body which, again, stimulates the immune system to produce antibodies. Pfizer is for people 16 and older, the others for 18 and older.

The Novavax vaccine delivers the actual spike protein (bioengineered via moth cells) into the body to stimulate an immune response. It also has an additive that “soups up” the immune response – a saponin from the Chilean soapbark tree. (Technically it is considered to be adjuvanted recombinant protein nanoparticles). The Sinovac Biotech and Sinopharm vaccines use an inactivated virus. This is similar to how the flu vaccine is made. However, in this instance there is some concern about its safety, given the speed of the production, in that early trials with the dengue and RSV inactivated virus vaccines caused serious side effects in large numbers of people. The Sputnik V and AstraZeneca vaccines are what is known as vector vaccines similar to the Johnson & Johnson vaccine. (There is some evidence that vectored vaccines are more effective and longer lasting than the other approaches being used so far.) There is also a Sinofi/GlaxoSmithKline vaccine which is apparently somewhat similar to the Johnson & Johnson vaccine and which may be available in late 2021 in the U.S. And there are many others in use that just don’t show up on the media radar. There are five coming out of Cuba, one in Thailand, and another from UNICEF.

Efficacy vs Effective

As usual, academicians’ convoluted language (which the media endlessly repeats) has created confusion about how effective the vaccines are. “Effective” and “efficacy” are not the same

thing. Pfizer and BioNTech say their vaccines have a 95 percent *efficacy* rate; Moderna's is 94.5; Sputnik V is over 90 percent; Johnson & Johnson's single shot is (on average) is 66 percent (but 85 percent against severe disease); Novavax is 89 percent but only 50 percent against the South African variant. The media have often translated this improperly, as in "Moderna's vaccine is 94.5 percent effective." Most people assume that if a vaccine is 95 percent effective it means that five out of 100 people will get sick, 95 will not. But there is a difference between efficacy and effective and in the real world this makes a big difference.

Efficacy percentages are found through a very different process. Using the Pfizer vaccine as an example: There were 43,661 people recruited for the trials. (More on this in a moment.) They were split into two groups. One received a placebo, the other the vaccine. Then they waited for 170 people to become ill, that is, to show symptoms. (Yes, a strange number; I have not been able to find the rationale for it, it was apparently a suggestion from a statistician as being the lowest meaningful number.) Then they looked at who got sick. 162 received the placebo, eight received the vaccine. If people in the placebo and vaccine groups become ill in the same numbers, the efficacy of the vaccine is zero. If no people in the vaccine group get sick then the efficacy is 100 percent. The 95 percent number represents a relation between the numbers who got sick in the placebo and vaccine groups, that is eight divided by 162 which gives you 0.05 (close enough) which is five percent. In other words, the numbers of those in the vaccine group who got sick is five percent of 162, therefore the vaccine is 95 percent effective. This makes sense in the world researchers live in, not in the real world. It confuses people but more concerning is the fact that these figures don't actually have anything to do with the real world.

These trials worked with a very limited number of people. Hundreds of millions of shots

will be given (billions eventually, utilizing a variety of different vaccines). The larger group of people who get the vaccine will be much different in their health and genetic makeup than the volunteers in the trials. In consequence, the efficacy percentage (that is effectiveness) will be different in the real world; no one knows what it will actually be. Further, many people become infected who show no symptoms; this was true in the trials as well. But the trials only counted those with symptoms. This is going to alter both efficacy and effectiveness percentages.

Four further points: 1) The shots only reduce severity of the disease if you become infected, they do not prevent infections (e.g., as the smallpox vaccine does). They act more as a “dampener on the virus’s ability to replicate inside you.” Because severity is reduced there is the assumption that there will be less chance of dying. (No one knows as yet if this is true; this was not examined in the initial trials.) 2) The shots are into muscle tissue. This stimulates overall immune responses but it doesn’t necessarily stimulate immune responses in the nasal tissues where the virus first takes hold. 3) Most of the vaccines stimulate antibody production. Antibody production falls over time, so that, again, shots may be necessary every six months to one year. (No one knows this either.) 4) Unexpected side effects will also appear, often very different than those found during the trials. (This is true of *all* vaccines.)

Vaccine Side Effects

We never really grappled with what we’ve got, which is, although some people don’t seem to want to face it head-on, vaccines with potentially big differences in efficacy and adverse events. . . . The situation [has] turned out to be far more complex than the experts prepared us for. . . . Trying to convince people that

vaccines are all equal isn't going to work. People are making claims that go beyond the solid data we have, and that's a risky proposition. We're going to see the differences in rates of adverse events, for example, pretty quickly for ourselves once we know lots of people are getting vaccinated. Especially when the fear of major outbreaks subsides – prematurely – and we're trying to get younger people to accept vaccination, adverse reactions are going to matter to people. Hilda

Bastian

The major side effects of the vaccines (so far) appear to be pain (sometimes severe) at the site of the injection and overall feelings of having the flu for a few days (chills and fever, nausea, aches and pains, fatigue). People report that these are far more severe after a second injection (with the two dose vaccines). However, reports are emerging (as of March 2021) that the range of side effects is far broader than first imagined. Here's a list (which has been compiled from official government and pharmaceutical sources, media reports, and extensive personal communications): Mild to severe allergic reactions (anaphylaxis); tremors (both transient and permanent); immune thrombocytopenia (very serious); Bell's palsy; headache (transient and continuing); constipation; diarrhea; jitteriness; odd taste in mouth; alterations in menstrual flow and texture; dizziness; fatigue; high fever; severe joint pain; severe bruising and swelling at site of injection; chills; tachycardia; seizures; severe nausea; vomiting; bone pain; slurred speech; facial numbness; pressure behind eyes; paralysis of body or limbs (sometimes extreme and long lasting); mental confusion (sometimes severe); hearing loss; extreme abdominal pain; swollen lymph nodes (aka lymphadenopathy, sometimes severe); loss of sight (temporary); acute

appendicitis, passing out; mottling and cyanosis of extremities; acute pancreatitis; stroke; heart attack; angioedema; death; neurological deficits (various); death; hospitalization due to side effects. While some side effects present immediately, many physicians are reporting that there is often a delay between dose and side effects of up to eight days.

Side effects that have been reported to the government (there are more being reported all the time) can be found at CDC.gov, VAERS reporting-National Childhood Vaccine Injury Act, 2020. To access the data: 1) go to the website: [[https:// wonder.cdc.gov/vaers.html](https://wonder.cdc.gov/vaers.html)]; 2) accept disclaimers; 3) click on “VAERS Data Search”; 4) Group results by “Event Category”; 5) Select “COVID 19 VACCINE” and press “Open”; 6) Choose “All Locations”; 7) Press “Send”.

Regrettably, government spokespeople, medical researchers, and media articles continue to downplay vaccine risks (when what is true at this point is that no one can know how many there are or how severe they are going to be). As an example: Despite Bell’s palsy onset immediately after injection, some medical reports insist that because the number of palsy events is not larger than the normal percentage in the population, it has nothing to do with the vaccine. This is not doing anything to alleviate concern about side effects, quite the contrary.

It *is* true that only a small percentage of people are experiencing side effects when compared to the total number of doses given but the fact remains that some people are having very serious reactions, some of them permanent. That it is rare does not appear to help those who become very ill (“Sorry don’t do no good, does it?”). As with all things you put in your body (pharmaceuticals or plants), every person should carefully examine their own state of health, what is known about the substance and its possible side effects, their intuitive sense of the risks for them as an individual, and then decide for themselves how they wish to proceed.

I think when you have no commercial experience with a vaccine strategy and you're using that as a way to stop a new virus, there will be something of a learning curve. . . . I wish there was a little more humility from some of these companies. . . . You're only going to know about rare adverse events once these vaccines are out there, because even in a best case scenario, they are tested on 20,000 or 30,000 people, not 20 million or 30 million people. So you are only going to know about a rare adverse event post-licensure. . . . When do you know enough to say that a vaccine's benefits outweigh its theoretical risks? You have to also make sure people know what you don't know. You don't know how long protection is going to last. You're only going to know that afterwards. You don't know whether it causes a rare side effect. You're only going to know that afterwards. . . . I just think we have to be honest and transparent about what we know and what we don't know. Paul Offit, September, 2020.