TWiV 1340 Clinical Update

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Guest: Daniel Griffin

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Vincent Racaniello: *This Week in Virology*, the podcast about viruses, the kind that make you sick.

[music]

VR: From *MicrobeTV*, this is *TWiV*, *This Week in Virology*, Episode 1340, recorded on July 16, 2026. I'm Vincent Racaniello, and you're listening to the podcast all about viruses. Joining me today from New York, Daniel Griffin.

Daniel Griffin: Hello, everyone.

VR: How's the air out there, Daniel? Is it smoky?

DG: It's really bad, actually. Yes, there were - some of the camps were asking me what to do, but there's a system. We're going to talk about this, actually. Yes, it's bad.

VR: Here in New York, well, I haven't been out since this morning, but this morning, it was either that or I can't smell anything. I don't know.

DG: Yes, it's a health issue, but let's jump in, and we're going to start off with a quotation, which I will share with our listeners. Vincent ran it through AI. See what AI had to think about this. The quotation is, "Stupidity is the same as evil if you judge by the results." That's Margaret Atwood from *Surfacing*. You were telling me, what did AI have to say?

VR: I didn't quite understand it. It's a little obscure, but it basically means if a house burns down, it doesn't matter if it was because of evil or stupidity. In the end, it's a big problem. That's why she says it's the same as evil if you judge by the results. The 'judge by the results' got me. I think the quote could be better. You can't just say, like, "Oh, I didn't do it on purpose." That doesn't help. It's still the house burned down. What if the disaster might be so? I get it now.

DG: I'll let our listeners speculate about why this seemed appropriate, but OK.

[laughter]

DG: Got this little news section right up front. Why did this catch my interest? We have this statement from Senator Mitch McConnell. Why do I care? "To my fellow Kentuckians-" This is from Mitch McConnell. "When you elected me to a seventh term and made me our commonwealth's longest-serving senator, you did so trusting

that I'd keep showing up to fight for you every day. Over the past several weeks, Elaine and I

have appreciated both your well wishes, your honest questions about what was keeping me away from the Senate. You all know how folks of my generation often hesitate to share the vulnerability that comes with growing older. Even in the public eye, I feel that same instinct. I can't help it. At the same time -" it's where it gets interesting.

"I've had more than my share of experience with physical vulnerabilities. Surviving childhood polio meant spending my entire life with mobility challenges. They haven't exactly gotten easier to manage with age. Last month, I took a fall, which landed me in the hospital. My doctors have confirmed that I didn't break any bones or suffer a concussion. I didn't have a heart attack or a stroke. I didn't have any tumors or hemorrhages, but I was briefly unconscious and was taken to the hospital. While receiving excellent care over the past several weeks, I've also had to deal with a mild case of pneumonia."

VR: I just wanted to ask you, Daniel. I know you want to talk about post-polio. First of all, if it was nothing, why was in the hospital for several weeks, and is there such a thing as mild pneumonia?

DG: There's also a little bit of somehow he lost consciousness, but he didn't get a concussion. You get whacked hard enough in the head that you lose consciousness. Not all of it makes sense. This is a question I think that got me in a lot of trouble at one point, where I talked about illnesses in our elders are not something just to take in stride or to write off. Pneumonia in a person over the age of 65, which Mitch McConnell is, about a 10% mortality, one in 10 chance of not surviving, so "mild case of pneumonia." Pneumonia is infection of the lungs. It has a mortality associated with it. Nothing is so mild when we get older.

VR: This is just a little bit slimy, I think, still. I don't think he's being straightforward.

DG: The reason I like this statement is it brought post-polio syndrome into discussion. There was a CIDRAP discussion of post-polio syndrome. What is this? I have to say, post-polio syndrome, Vincent, you're probably steeped in this with your kind of world. Many providers, many individuals here in the U.S. are not familiar with post-polio syndrome. When I came through NYU School of Medicine, that august institution, no one had ever taught me, actually, about post-polio syndrome. I didn't really become acquainted with it until I started practice in Colorado.

VR: Then you saw some?

DG: I saw a lot of folks. It was a big outbreak there. Back during a time, a dark time in the history of Colorado, we had a Klan governor, if you can imagine that. Fort Collins was the home of the KKK newspaper. CIDRAP has this nice discussion. Let me just share a bit of that because I think this is really important when we're at risk or while we're starting to see these vaccine-preventable illnesses come back into the U.S.

Many people today know of polio, which paralyzed up to 58,000 Americans a year at its peak. Thanks to vaccination, the disease was eliminated in the United States in 1979 and throughout the Western hemisphere in 1994. Today, wild polio virus circulates routinely only in Afghanistan and Pakistan. I like the comment, "Why are we distinguishing between wild type and vaccine-derived?" Still paralyzing people with vaccine-derived polio. There's still polio virus circulating. People are still getting paralyzed. We're still putting oral polio, vaccine-derived polio, back into the environment anyway.

"Yet the polio virus continues to harm nearly 300,000 Americans-" 300,000 Americans, " in

the form of post-polio syndrome." I don't think people were familiar that there were hundreds of thousands of Americans still suffering from post-polio syndrome with an array of medical problems that occurred decades after the original infection. Now, no infectious virus has been covered from post-polio patients. The syndrome is thought to arise as a result of years, decades of additional stress work of the unparalyzed limbs.

"After years of health -" You notice they spelled limbs wrong. They spelled it with a P. I think they were thinking limp and limbs. "After years of health, 25% to 40% of polio survivors may suffer pain, renewed muscle weakness, fatigue, problem speaking, or swallowing." I just think that's something to really point out because people think of, "Oh, it's polio, you get it, nothing happens, or you're that rare person." We quote these numbers, one in 2,000, depending upon which type of polio we're talking about. This is huge. 25% to 40% of people that survived polio will go on to develop post-polio syndrome. We have hundreds of thousands of people in the U.S. still with that.

That's why so many of these senior folks got so upset with RFK's attack on vaccines and the polio vaccine. McConnell, the former Senate majority leader, has long had an unsteady gate, has fallen several times in recent years. He's often seen using a wheelchair to get around the Capitol. The United States, most polio survivors are in their 70s or 80s. The number of people with post-polio syndrome is declining as these folks age and pass away.

Now, around the world, the burden of polio is much greater with estimates showing as high as 15 million to 20 million suffering with post-polio symptoms. This is like people who've had polio when you look at the percent of people that have issues down the road. We may be doing what we're doing now, but there still are all these people suffering. If polio comes back, not only are you going to see the acute paralysis, but every time you have polio sweep through an area, you're going to have this quarter to a third or more folks end up with post-polio issues.

VR: Telling that polio continues, as you know. Now, it's mainly vaccine-derived polio, but it's still polio. It paralyzes. There will always be post-polio as long as there is polio.

DG: Yes. It doesn't matter if it's vaccine-derived.

VR: It does not. It's interesting that they called it post-polio and not long polio, and it's interesting that they called it Long COVID and not post-COVID, isn't it?

DG: Yes. It is interesting, right?

VR: Yes. This is basically - it's basically a long polio.

DG: I think it's long polio. Yes. I lump it together when I talk about people who have long flu, long polio, long chikungunya, long Ebola. There is this, I think now, hopefully, well-recognized issue with multiple infectious diseases where you have an acute illness, you have a period of time afterwards, and then you have this, it can be years of ongoing issues. This is the clinical update, right? Air quality issues, like you started to talk about, Vincent.

VR: It's totally relevant. Absolutely.

DG: It not only puts people in the hospital because of all the inflammatory issues, but people with underlying lung diseases. This puts them at risk. Right now, for those of you who are following this, those of you who are living in this, right now, we're sitting in a period with really poor air quality. There's a whole scale, basically based upon the amount of particulate matter in the environment, and there's even an airnow.gov where you can look

and see what's going on in my area.

Now, today, it got up into the 190s, which is really the upper limit of unhealthy, 201 is when you move into very unhealthy. There's all kinds of guidance about what to do when the air quality is this bad. Really interesting. It was a few years back when we had those really bad - again, it was similar. You had forest fires, you had unhealthy air. Maybe people at that point were a little more sensitive to the fact that they didn't want to harm themselves, their children. A number of the camps said, "OK, we're not going to do outdoor activities today." Yes. Today, the kids are all out there breathing in the smoke.

VR: Looking at this New York City air quality index, it's really very nice. It's going to go down tomorrow, and it's not going to be in the 190s, it's going to be like 60s and so forth.

DG: Yes. It's going to be back to moderate, and then hopefully we'll get back into the good air quality again going forward.

VR: This is the result of forest fires, right?

DG: Exactly. Them Canadians.

VR: Aren't there some out west also in the U.S.?

DG: Actually, yes. There's a fire, pretty big fire, out in Colorado. This is that time of year when we start having these fires, though. We finally got a health alert, *Cyclospora cayetanensis*. It's gotten to the point it's embarrassing. We hear about this in the mainstream media and the - what's the Twitter and that stuff? Social stuff? What do they call that?

VR: Social media.

DG: Social media. Then, after the fact, weeks go by, and finally it's like, "Oh, hey, by the way, we should let the doctors know. We should send out an alert." Yes, we already know, by the way, CDC. I even looked at the CDC data. It's not really up to date, which is a little disappointing, but I'm going to leave in a link actually to the Epidemiologist newsletter. That's by Katelyn Jetelina and Marisa Donnelly. I'm actually going to be doing a podcast with Katelyn Jetelina. Maybe I'll learn how to pronounce her name properly.

They have a nice newsletter. It's a nice map, reported cyclosporiasis cases. You can see, and this matches up when you go to the Michigan Department of Health, 2,640 cases. We've got dozens of people hospitalized. Ohio and New York, we're competing to have the most number of cases. Ohio's at 661, New York, 470. If you go to New York City, we have almost 400 of those cases just right in the city. We've got some on Long Island.

VR: Michigan has a ton.

DG: Michigan has thousands, and those are confirmed cases.

VR: This is a bit higher than last year. Apparently, three times higher.

DG: Yes. A lot higher in New York and much higher in Michigan.

VR: This happens often, but this year it's worse than usual, and we don't know why, right?

DG: That's what we're figuring out. The smoking gun at this point is lettuce. How do people get it? Just a primer. We talked about this a little last time. It's *Cyclospora cayetanensis*, only

human beings. You're getting this from an infected human being, feces, onto the hands, ends up on the vegetables, the fruits. It's not on the deep-fried food, so you can keep eating your deep-fried food. It's all good there. It's really usually not on frozen stuff because if you do that really aggressive freezing that they do, or even if you freeze it for a long period of time, you're going to kill the *Cyclospora*.

It's going to be fresh. Usually, the washed bag lettuce is what we're thinking. In the past, it was raspberries. In the past, it was basil. In the past, it was lettuce also. Yes, that's probably what it is, and we're just trying to pin down. There was a discussion about why is it taking so long, because when it takes long, people keep getting infected. The issue is that there's still - you start off with, you identify, "Hey, this is more than usual. It's worth investigating." Then you start talking to people about how might have you been exposed.

Then you can do genetic analysis on the people. At this point, it's pretty clear it's coming from some kind of a source. It isn't just sporadic and a little bit higher than normal. Then you can then start testing the different potential lettuces and other vegetables.

VR: Got it.

DG: *Legionella*. I think we're doing a little bit better as of July 14, 63 total cases. You can see we had that peak, eight, nine, 10 a day, and now it's been one case, one case. The last positive was on the 13th, but this is updated the 14th, so we'll see what happens. July 14th, just a few days ago, for folks listening, New York City Health said 76 cooling towers on the Upper East Side had tested positive for *Legionella*. Now, what to say about that? It's a molecular test, very sensitive. We don't know if this is living *Legionella*. We don't know if it's a high enough amount of *Legionella* that's getting everyone sick, but it's basically going ahead, and everyone is cleaning those towers.

There was a discussion. I was listening- I listen to the *Brian Lehrer Show* on NPR, full disclosure there, and there was a New York City Health person talking. They were a little evasive when someone said, "Hey, can I still go to New York City and go to the Guggenheim, and do I have to worry about getting *Legionella* walking around the streets?" They wouldn't answer the question. I'm going to answer the question and say it's OK. You're not going to be out there standing, breathing long enough.

The idea is you've got these cooling towers, and then, unfortunately, there's usually an intake to the building, and then you end up with enough of an exposure. We don't really think that you're on your way to go to a museum, and somehow you pass through a neighborhood, and you get Legionnaires' disease. Just full disclosure on that.

VR: What you're saying is you have to be in the building a prolonged period of time?

DG: You need an actual inoculum of this. It's probably not one bacteria. It's not like you walk through, or your taxi or your bus goes through a neighborhood, and you end up. People don't need to avoid the Upper East Side of New York City. We do need to do a better job. We keep having these outbreaks. People keep getting sick, so we need a better approach to this.

VR: Why do these water towers get contaminated? Are they open? Is that the problem?

DG: The *Legionella* bacteria will be in the water at a small amount, and then you end up with this warm weather. The bacteria proliferates. It's in there with the paramecium, and then it's going to be a natural cycle. It's going to cool down. The bacteria is not going to do as well. It's going to go down.

VR: I see. The water in these towers is pumped up. It's reservoir water basically from upstate New York -

DG: Yes.

VR: You're saying the *Legionella* is already present in the reservoir water.

DG: That's the problem. Yes. Usually, it's at a small amount, but then you get the right conditions. It multiplies. You start getting enough inoculum that people are getting sick.

VR: If it's everywhere, why are they isolated? We had the Harlem outbreak, I guess, last year. Now we have this. Why isn't it everywhere?

DG: Yes. I think particular cooling towers, and this is an issue. You actually get fined for this, for finding that your cooling tower has *Legionella* bacteria. There are, in place, protocols for how you're supposed to clean these and how often you're supposed to clean these to prevent this from happening.

VR: It seems to me that we should put some kind of a UV sterilizer in these and just [crosstalk].

DG: I like the idea. Yes. Somehow prevent this from happening.

VR: Yes. Someone asked me last night on the stream if we need a *Legionella* vaccine. What do you think?

DG: I don't think we do. Yes. It's one of those risk benefits. We don't see enough cases for it to warrant probably number needed to vaccinate.

VR: What would be the number? Here we have - what do we have in New York? 63 cases.

DG: Yes. In a city of millions. Yes.

VR: What would it be [crosstalk]?

DG: As we've seen, a few people end up in the hospital. We've had 12 currently hospitalized, 40 discharged. Of the 63 cases that came to attention, a number ended up hospitalized. Nobody died. I think that's part of it, too.

VR: This is also mainly a city thing?

DG: No. We see it in other areas. Basically, all you need to do is get that *Legionella* in some kind of a water system so people can inhale it. We talked about it, *ID Puscast*. We had a couple of cases down in the Virgin Islands where people are hanging out in hot tubs. Somehow the hot tub had the -

VR: Wow. What about your little window air conditioner? They usually have some water in them. Is that a problem?

DG: Yes. That could be a source. Yes. Sometimes we'll see that end of the season when people just haven't been cleaning those, and the water gets in there, and you start - Yes.

VR: OK.

DG: Moving on to screwworm, we're still seeing more cases. No fly trap detections yet. At

some point, we're going to have to talk about fly traps, and I'll bring a visual because that's a cool idea that we have these. As we're seeing here, we're up to 37 cases. Couple of these have been in pets and dogs. We're not really putting an end to this. We'll have to see what happens with the millions of sterile, irradiated males being released. The big thing going on, this is really a huge problem, is Ebola.

The Ebola outbreak in Eastern Congo is now the fastest-growing one in history. If you look at DRC, over 2,000 cases. We're up to over 750 confirmed deaths just in the DRC. We've also got the cases in Uganda. We have that one confirmed case in France. What are we doing about it? University of Oxford has launched the first human trial of a vaccine against *Bundibugyo ebolavirus*.

VR: Bundibugyo.

DG: Bundibu - Say this again.

VR: There's a soft G. Bundibugyo.

DG: Bundibugyo.

VR: Bugyo. Bugyo.

DG: Bugyo.

VR: I think bourgeois. Bugyo.

DG: Bugyo.

VR: Bundibugyo.

DG: I'm going to have to write in some mnemonics here and call it the BD Ebola virus in the meantime. Bundibugyo.

VR: No, Bugyo.

DG: Bugyo.

VR: Bugyo.

DG: Bugyo. [laughs] This is not going to turn into a YouTube short, I hope. They got a vaccine.

VR: Get a lot of views.

DG: Early-stage trial. It's known as the BD-Ebov. That's actually what it's named. They don't mispronounce it like I do. They're going to look at safety. They're going to look at immune response. This is tiny. They're only going to vaccinate 50 healthy adults aged 18 to 55.

VR: That's a Phase 1, basically.

DG: Phase 1, yes. This is phase one.

VR: You have to do this. You can't just put it in Phase 2.

DG: Yes. You got to start with this phase one, see if you get an immune response, see if there's any safety issues, and then we can move on. Probably going to be a Phase 2/3, the

way they do that these days. *TWiV* 1339, right?

VR: Yes, Tom Ksiazek.

DG: We'll leave a link into that.

VR: He thinks that it's mainly infection control that limits these outbreaks. He doesn't believe that the vaccines do much good.

DG: I wonder if the vaccines help with just healthcare workers feeling comfortable going into these areas, feeling that security, and then they're more comfortable, willing to help.

VR: Yes. I would think a healthcare worker should get a vaccine, for sure. Yes. That would make them feel better.

DG: We need to make sure that they're effective. Then, but what about EP? What about EBO-PEP? July 14, the first participants were rolled in a trial testing Gilead Sciences experimental antiviral drug Obeldesivir. It sounds familiar. As post-exposure prophylaxis, PEP, for preventing disease for the ongoing outbreak, DRC. The trial called EBO-PEP is being conducted in Ituri Province, the epicenter of the outbreak. It's being run by the National Institute for Biomedical Research in Kinshasa and several humanitarian partners. Vincent, is it fair to think of this as oral remdesivir?

VR: Very interesting question. When you take these drugs, they are not the final drug that actually inhibits. It's a precursor. It has to be activated. Both Obeldesivir and remdesivir, the final drug, is an inhibitor of the RNA-dependent RNA polymerase. That final drug is exactly the same, but the precursor is different. Remdesivir is given IV. It has a phosphoramidate prodrug, which means it has a little chemical structure that looks like a phosphate, but it's hidden because things with phosphates don't get into cells very well, so you have to hide it.

Then, when it gets in the cell, the cell takes off the hiding group, and now you have the first phosphate. You have to have three. Getting the first one on is rate-limiting. It's very inefficient in cells. That's really cool that remdesivir goes in already with that. That's a chemistry that was done years ago, and it's very revolutionary. Now,

Obeldesivir is not like that. It's got a protective group, but it doesn't look like a phosphate. It's removed in the stomach because that's orally taken, whereas remdesivir, it goes up in the liver.

This now has to get into cells without a phosphate and get phosphorylated inside the cell, which is less efficient, but that's why it's different because the prodrug form is what we call is different for the two, but the actual drug is the same.

DG: Interesting chemistry, right?

VR: Oh, the chemistry is fabulous. This chemistry of making a hidden phosphate is revolutionary. It's really great.

DG: People thinking of going into chemistry, right? Think of it. This is cool stuff.

VR: Oh, my gosh, chemistry. Last night on the livestream, I gave a mini lecture on monoclonal antibodies, and, oh, my gosh, the things that they can do, it is revolutionary.

DG: Yes, amazing. This has a bunch of folks upset. CDC is assessing travelers arriving in the

United States who have recently been in DRC or Uganda, as well as neighboring South Sudan, for symptoms of and possible exposure to Ebola to reduce the risk of Ebola importation into the United States. CDC under Title 42 and the Department of Homeland Security under Title 49 are currently working together on a do-not-board process regard to the DRC.

American citizens who are departing from the DRC may be subject to a do-not-board order. Americans are able to return to the United States 21 days after leaving the DRC. You've been in the DRC. You've been in one of these areas. You've got to go somewhere else for 21 days before we'll let you in the U.S. U.S. citizens.

VR: This is despite us having Ebola treatment centers here in the U.S., which are very capable.

DG: Yes. Measles. If you look at the Hopkins tracker, we're already passed last year's. We're up to 2,250. The CDC has 2,231. Last year was 2,242 confirmed. At this point, we are now past. Here we are. It's mid-July. We're recording in mid-July, and we already surpassed the over 2,000 cases that we saw last year in the United States. This is terrible. Moving on to our multicolored curves for COVID. What is going on with COVID? I even did a zoom in so we can see what's been going on over the last few years, but then it's flat.

VR: It's flat, but there's a little blip there.

DG: Is there a blip? [chuckles] You think there's a blip?

VR: Very tiny, but someone wrote in and said there are cases of COVID throughout the country.

DG: It's got to be a few. There are a few.

VR: Some areas.

DG: Not a lot. It'll be interesting to see what happens. This date is only to 7/4, to July 4. There also are some issues. A lot of people have commented about how reliable

are we getting all the information that we historically got that went into this. We'll keep an eye on it. Also, I'm going to keep an eye and share if we start seeing cases in the hospitals, in the clinics, the urgent care.

VR: You haven't seen any so far?

DG: No. It's been actually a little while.

VR: Oh, did you see? We can combine a polio story. The last lady in an iron lung from polio in the U.S. just died.

DG: I heard that. I heard that.

VR: She was in it since 1953.

DG: Wow.

VR: She died of COVID.

DG: Yes.

VR: Isn’t that terrible?

DG: It's really terrible.

VR: I don't know how they treated her, but it seems to me that she shouldn't have died, right?

DG: Yes. It's horrible.

VR: She used to sleep in it. She would get out during the day and move around and do things. She would just sleep in it. Then, when she got COVID, she was in it all the time.

DG: Yes, it's tough. A couple articles here to wrap us up. These are our Long, our post-COVID papers, zPASCt papers. The first one, the article, "Long-term Ocular Symptoms Following COVID-19 Linked to Immune Dysregulation, Dysautonomia, and Peripheral Neuropathy," published in *Nature Communications*. Prospective cross-sectional study that examined persistent ocular symptoms, plus emerging in non-hospitalized individuals after COVID-19. They're going to use individuals without persistent ocular symptoms, without POS, post-recoveries controls, using symptom, quality of life data, clinical examinations, biofluid proteomics.

They documented ocular symptoms persisting from three months to up to three years post-infections. POS, persistent ocular symptoms, led to significant vision disability and was linked to clinical findings not detectable in routine exams, but only with specialized tests. These folks ended up with near vision disturbances, strabismus, weakened autonomic pupillary reflexes, corneal neurodegeneration, chronic activation of ocular surface dendritic T-cells. They actually identify this particular proteomic profile. Really interesting stuff. Really finding some objective differences in these folks.

They actually come up with these diagnostic models. Basically, 77% to 91% accuracy and implicate chronic T-cell-mediated neuroinflammation in the pathogenesis. This, I think, hits home for a lot of ideas about what's been going on.

This is this article, "Vagal Cholinergic Denervation of the Gastric Mucosa in Long-COVID-19: In Vivo Evidence of Structural Autonomic Dysfunction," published in the *International Journal of Infectious Diseases*. Great figure here.

They conducted a case-control study including 12 patients with Long COVID, eight control patients undergoing routine gastroscopy, so they're putting the scope down. Gastric mucosal biopsies were analyzed using immunohistochemistry with the pan-neuronal marker protein gene product 9.5, (PGP 9.5), and vasoactive intestinal peptide as a marker of cholinergic fibers. Nerve fiber density was quantified in both fundus and antral samples. Hopefully, we'll have, for the people watching this on YouTube, or hopefully for people, we'll leave a link into this. It's really striking to just look.

Compared with controls, Long COVID-19 patients exhibited a significant reduction in mucosal innervation density, 2.1 versus 3.9 in the fundus, about half, 1.9 versus 3.9 in the antrum, so again, about half. The reduction in cholinergic innervation was most pronounced in the fundus and also evident in the antrum. Gastric nerve density correlated with some of these parameters that they give us. Look at these figures. You can see the bright green.

VR: It's very striking, Daniel.

DG: It's really striking.

VR: Is it a cause or a consequence?

DG: It's a good question. We don't know.

VR: Don't know. Long COVID may have caused this. We don't know if this caused Long COVID, right?

DG: Yes. We don't know.

VR: The gastric part, that's what they're looking at here.

DG: Yes. Really interesting stuff. I'm going to wrap us up there. No one is safe until everyone is safe. We're actually in the final month of our Foundation International Medical Relief of Children fundraiser. Again, doubling your donations, trying to get to that donation of $10,000, which really goes a long way in Uganda. Go to parasiteswithoutborders.com, click on the Donate button. Yes, for all the folks that have already stepped up, thank you so much for that support.

VR: It's time for your questions for Daniel. You can send yours to Daniel@microbe.tv. David writes, "Interested in your thoughts on how the *Legionella* outbreak is being handled in New York City. They seem to be waiting on culture results to release data about which buildings are responsible. PCR and whole-genome sequencing would give a faster and more detailed view of the outbreak. Matching strains from infected individuals to populations in cooling towers would rapidly pinpoint sources of concern."

David sends a link to a Twitter post, an X post by someone who says, "New York City should be required to release the concentration detected by a PCR and the culture results as they get reported. Then we'll be able to evaluate how effective the approach of listing any building with detectable *Legionella* by a PCR is in terms of advancing the response and reduction of risk to the public."

DG: Yes. David, these are good comments. Basically, what they've done is they've tested all the cooling towers. If it's PCR positive, they say, get it cleaned. The majority of them have been cleaned within 48 hours. It's been really good response. You bring up some interesting things. They're not waiting on culture results to go ahead and clean the towers. That's number one. Number two is that - You point out a really interesting thing, and you use genetics. Can you do the sequence, like folks that have been hospitalized, compare those sequences to the sequences we're getting, and then see if it looks like, "Hey, it's the same source that got these folks sick?"

No, these are excellent, but I do think they're moving ahead pretty quickly. Another question somebody asked, "Why don't they just clean them all? Say, every cleaning tower in New York City needs to be cleaned right now." Depending on the size of the building, depending on the size of the cleaning tower, we can be talking about thousands or tens of thousands of dollars per building. There can be a big cost. We're talking about 70, 80 buildings, let's say it's 5,000, it's a lot of money. It's a lot of money.

VR: Also, when you refill them, you're just going to put more *Legionella* back.

DG: Yes, that's why we need a solution like the UV or some way to actually - yes.

VR: Something like that, yes.

DG: Yes, I like that idea.

VR: Christine writes, "I'm a dedicated listener of both *TWiV* and *TWiV* clinical update. I've been a nurse for 40 years and returned to school to get my MPH from Tufts School of Medicine during the pandemic. I appreciate the depth with which you cover all topics, viruses, parasites, bacteria, and the like. I too share your concerns for the current direction of our nation's health under this administration. I'll digress here to say I'm delighted to hear that Dr. Griffin's daughter is a teacher at Magruder. I hope she has found her people. There are many William and Mary grads who remain in the area, and the Virginia Education Association has robust membership in and around town.

I live in Williamsburg and volunteer at a local community health clinic. We work with area school nurses to ensure that all students have access to age-appropriate vaccines, and we'll be holding two free vaccine clinics in August. If she would like more information, she may reach me at this email. Virginia is now a measles outbreak location with 177 cases this week, as compared to five for all of last year. Recently, you've been reporting that the COVID-19 summer wave is virtually non-existent. Sadly, I can report that it is alive and well in the historic triangle.

Anecdotally, folks are posting photos of positive antigen tests on Facebook. This seems to correspond with a higher wastewater analysis for the week of 7/5 at the York River Collection Site, as reported by the Virginia Department of Health, though nothing of significance has been reported from the Williamsburg Collection Site. I wonder if, given the hypothesis that a large majority of the population has a degree of hybrid immunity this many years in, the collective viral load from COVID cases is less and thus not reflective of the number of cases but the degree of severity.

Also, I've not opted to get a six-month summer booster as it seems that we might not have an updated vaccine formulation until the fall. What are your thoughts about the

efficacy of Nuvaxovid versus Pfizer or Moderna's latest mRNA formulation? I've been partial to Moderna. Thank you for reminding us that none of us are safe until all of us are safe. The same can be said about gun violence prevention and the current dismantling of protective policies that were enacted during the Biden administration. Perhaps you will consider including the uniquely American public health crisis of gun violence in a future discussion. It can spread like a virus in our communities."

DG: Yes. Christine, thank you for your email. I guess I'll jump into one question that you ask about comparing the efficacy of the vaccines, Nuvaxovid versus Pfizer versus Moderna. There are some comparative where Moderna's newer formulation looked like there was a little bit of improved efficacy compared to the original Spikevax. In general, these are effective. A lot of the issue could be a difference in reactogenicity. Sometimes it could be an issue of access. People that maybe have had a lot of reactogenicity with the mRNAs are looking at the Nuvaxovid. No, they're all very effective, very safe, and I think vaccines should be part of our routine going forward.

VR: Kathy writes, "Thank you for all you do. I started listening to *TWiV* during the pandemic. I find it very interesting, educational, and often over my head. I have a question. I have asked my GP, who referred me to an asthma and immunology doctor, who said he does not know, but suggested a possible approach. Sorry, this is so long, but here's the story. One, as far as I know, I never had chickenpox. As a child, I lived in a typical Michigan neighborhood, went to public school, the four kids next door had chickenpox, but I did not. I'm currently 62.

Two, in '97, when I was pregnant with my first child, my OB/GYN ran a titers test. She said,

'You never had chickenpox.' She recommended I get the vaccine. After my pregnancy, after I gave birth, I got the vaccine, two doses. In '99, when I was pregnant, same OB/GYN, ran the test and said, 'Did you get the vaccine?' I said, 'Yes.' She said, it must not have worked because the titers were negative. She said I should do it again. She didn't do it again because of work and having another baby.

I'm trying to figure out how to proceed as I am at the age where my doctors keep recommending I get shingles vaccine. I have to explain this story. First GP said, 'Everyone has a chickenpox, so just get the vaccine.' I no longer see that doctor. My current GP consulted an ID doc who said due to my sluggish response to the chickenpox vaccine back in '98, he suggested we check my overall immune capacity to rule out an immunoglobulin deficiency. I had my IgG levels tested." You can see those, Daniel, there.

DG: Yes.

VR: "The immunologist suggested I get Pneumovax 23 and test my IgG after the vaccine. I have not yet done this. My understanding is the person with low IgG is typically sick often. I'm not a sick person. I get a cold once a year. I did have mild COVID, but I'm not sick. My question is, would you recommend a specialist to go see to help me figure out the following? My understanding is I do not need the shingles vaccine if I had not had chickenpox. My understanding is also that the shingles vaccine does not protect me from chickenpox. Should I get the chickenpox vaccine again since it appears I don't have immunity and there are less children receiving the vaccine?

My research also says I can get chickenpox from someone who has shingles. If I get chickenpox vaccine, do I need to get the shingles vaccine because the chickenpox is

an infectious virus? If I get the chickenpox vaccine, should I have my titers tested? These were all my original questions. I'm not against vaccines, but I don't want to get one that's not necessary or that will do nothing for me."

DG: Oh, Kathy, this is great. This is one of the reasons why I went into medicine. I love things like this. Going back a little to the different immunoglobulin subclasses. Yes, the way you figure out what's going on here is, sure, there are ranges, you can check stuff, but what you really want to do is what the immunologist suggested, is you do a challenge, right? You get the Pneumovax 23 vaccine, and you're going to do the IgG levels before, and then 30 days after the vaccine. That's going to tell us about your ability to respond.

Now, what are we going to do with that information? I'm not really sure at this point because we're going to move forward. You'll get that information. You'll see if there's an issue there. Sounds to me like you're absolutely fine. I'm not sure we're going to really do much with that information other than move forward to try to figure out what's going on. Here's your questions. One, "My understanding, I do not need the shingles vaccine if I have not had chickenpox." That's true. If you've never had chickenpox, you don't really need a shingles vaccine to prevent shingles.

If you've never had chickenpox and you're potentially vulnerable to chickenpox, ideally, you want to be protected. Sounds like you already went ahead and got the chickenpox vaccine. You may not have gotten the antibody levels, but you hopefully got some kind of a cellular response. You're going to fall into this category like so many young people these days to get chickenpox vaccine when they're younger. Their risk of going on to get shingles is incredibly low to the point now where we really have not started to routinely suggest it. At the end of the day, I'm not sure you need the shingles vaccine. I'm not sure you need any more

chickenpox vaccines. You probably could just go on with life.

VR: Quetzalcoatl writes, “From a cool and rainy Scotland. I was listening to the recent clinical update at 1338 and heard of long West Nile and wondered if there was long polio other than paralysis."

DG: This is great, so appropriate.

VR: "Does long polio exist, and what are the symptoms? Every search and resource I find comes back with the obvious paralytic issues. Are there any papers on this? First world countries' tracking of chronic conditions was poor before elimination of polio, and places with polio now tend to have poor follow-up."

DG: We can talk a little bit about this. This is, as we talked early on, appropriate with this email, is this incredibly high, 25% to 40% of folks that get polio, years go by, and they're going to end up with post-polio syndrome with all those lists of different things, gait issues, weakness, falls. Sometimes it can even be breathing issues. They could start ending up having higher incidence of pulmonary infections. You jump in, Vincent. This is your bread and butter.

VR: I am not aware of any non-paralytic long polio. This is an acute infection, so is SARS-CoV-2. There are many undiagnosed polio infections. You can have abortive polio, you can have non-specific flu-like symptoms, and most of these people recover. We don't know if there are some people who have a continuing issue, but it's never tied in with polio because they were never diagnosed with polio.

DG: I think that's a good point.

VR: We don't know.

DG: It's really theoretically destruction of the nerves, the fatigue, the brain fog, the other things that we hear about. I don't really see that in post-polio.

VR: The major concern is there's still ongoing polio, and so there will still be post-polio. This happens many years later, 20 to 40 years later, so it's bad. That's *TWiV* weekly clinical update with Dr. Daniel Griffin. Thank you, Daniel.

DG: Oh, thank you. Everyone, be safe.

[music]

[00:44:33] [END OF AUDIO]