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Delta Variant Spreads Exponentially in United States with Millions Unvaccinated

Threat of further viral mutation in susceptible population

By Gary Evans, Medical Writer

A conquering virus has bested its variant brethren and covered the land. The Delta variant of COVID-19 has spread exponentially in the United States, with 96% of counties reporting high (90%) or substantial (6%) transmission as of Oct. 8, 2021.

In ongoing genomic surveillance, prior variants have reached zero or near undetectable levels; Delta is being found in 99.8% of sequenced SARS-CoV-2 in the United States, according to the Centers for Disease Control and Prevention (CDC).^{1,2}

The variant has such a high degree of transmissibility that, if it continues its current pace, those unvaccinated are likely to acquire it, said **Gregory Poland**, MD, director of the Vaccine Research Group at the Mayo Clinic in Rochester, MN.

“Frankly, if you’re not immune, you will become infected, it’s just a matter of

time,” Poland said at the IDWeek 2021 virtual meeting, held Sept. 29-Oct. 4, 2021.

The initial Alpha variant is about 50% more transmissible than the original strain, and the Delta variant is about 60% more transmissible than the Alpha, he noted. That seems understandable enough, but it “leads to a concept that’s hard for people to grasp, and that is exponentiality,” he said.

Noting that the beginning of an exponential surge is commonly missed in outbreaks, Poland gave two different scenarios that underscore how quickly the Delta variant spread because of its high R-naught number, a measure of transmissibility from an infected case to susceptible people.

“Let’s just take that as baseline [of the pandemic], when the R-naught was 2.5. Now after 10 cycles of transmission in a naive population, that would lead to

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about 9,500 infections,” he said. “To give you a sense of exponentiality, let’s look at scenario B, where the R-naught now increases to 6. And with Delta, people have proposed that it’s in the 6 to 8 range. That same 10 cycles of transmission through a naive population doesn’t lead to 9,500 infections, rather it leads to over 60 million infections.”

1 in 500 dead

On Oct. 5, 2021, there were 101,668 cases of COVID-19, 73,020 people hospitalized and 1,808 deaths. Since the beginning of the pandemic, some 705,000 Americans have died.³ As this report was filed, COVID-19 cases were on a downswing from early September, but don’t expect the CDC to make the mistake again of suggesting the vaccinated can unmask. Millions of people remain unvaccinated.

“I think it surprises people to realize that about one out of every 500 Americans has died of COVID-19 — a very sobering statistic,” Poland said. “And yet no one modality in and of itself is sufficient to end this pandemic. It is much like an onion where there are layers of mitigation that we can put one atop of another in order to control this. Certainly, the primary one has to be vaccine.”

A susceptible population allows further infections, which in turn could lead to mutations and the emergence of other variants. We must hope, for example, that a variant more transmissible or virulent than Delta does not evolve, but SARS-CoV-2 will continue to mutate as it circulates in humans around the globe.

“We’re going to continue to see the evolution of viral variance,” Poland says. “In fact, this is one of

the most condensed time periods in which we’ve watched, in living color if you will, the evolution of these viruses. And this includes the ability, the potential, to evade in part or in whole, vaccine-induced and convalescent immunity.”

The vaccines are holding against severe outcomes, but after much debate, the Pfizer booster shot was not approved for the general public as the Biden administration hoped. (See “Booster Options for HCWs Approved as CDC Overrides Advisory Panel.”) One of the central points was that you can’t boost your way out of a pandemic; only immunizing the unvaccinated will move the needle on that.

“You get diminishing returns if you are giving additional doses of vaccine to people who have already been vaccinated,” **Celine Grounder, MD, ScM, FIDSA**, of New York University said at IDWeek. “In order to control the spread, the transmission of the disease, we do not need to prevent all infections, we don’t need to induce sterilizing immunity with the vaccines. We simply need to reduce the effective reproductive rate, so the R-naught goes below 1.”

Given the intransigence of some of the unvaccinated, this is unlikely to happen unless attitudes change over time, and immunization becomes the price of admission to both work and social venues.

“I often ask people, which risk do you want?” Poland said. “The first is COVID-19 infection. And then if you risk it and survive it, [the risk] of post-acute sequelae — long COVID. The other choice you get to make is to get vaccinated, which may have some limited efficacy for immune-compromised individuals. As a vaccinologist for almost 40 years now, I can tell you, no vaccine has

ever been studied with this degree of scrutiny prior to release. And yet I would be among the first to admit that we don't know all that we would wish to know. The science always continues to evolve. The point is that every decision that you must make, whether by default or actively, has risks and benefits."

With multiple millions now vaccinated in the United States, the risks associated with acquiring COVID-19 clearly are higher than the rare side effects of immunization for the vast majority of people. Yet many are blinded to reason by a kind of "cognitive dissonance" response, as social scientists term it.

In this case, the thought of being vaccinated causes unease and conflicts with the thought of remaining unvaccinated, so the latter is reinforced through confirmation by like-minded others and misinformation that supports the decision to refuse the shot. There is no shortage of false anti-vaccine information being amplified on social media, where it is consumed and rationalized as truth by some.

"[These] distorting factors have had a major impact on how this pandemic has played out, human behavior primary among them," Poland says. "[There is] the false presupposition of the democratization of expertise, as if everybody's scientific opinion were equal. We live in the West, in a place of cultural narcissism, where we think about 'me' and not the greater 'we.'"

'I'd rather die than take the vaccine'

Striking examples of this effect were provided recently by a Michigan physician, who posted the dying denialism of COVID-19 patients on

his Facebook page. Many healthcare workers have heard such words themselves, which reveal a startling rejection of science and a zealous commitment to remain unvaccinated. **Matthew Trunsky**, MD, who works in hospice and pulmonary care in Royal Oak, MI, posted the following on September 11, 2021.³ The parenthetical comments are his.

"In my last two days of work I have heard the following," Trunsky wrote.

- "You're wrong doctor. I'm too healthy. I don't have COVID. I'm fine." (In reality, he's fighting for his life.)
- "I demand ivermectin or you'll hear from my lawyer."
- "I demand hydroxychloroquine."
- "I don't care what you say. I'm going to leave." (Response: "That is your prerogative, but you'll be dead before you get to your car.")
- "I'd rather die than take the vaccine." (You may get your wish.)
- "I didn't take it because my son told me it would kill me." (The patient is currently fighting for his life — in fact it was the son's advice that may kill him.)
- "I want a different doctor. I don't believe you."

• From a woman whose husband died of COVID: "I would never feel comfortable recommending the vaccine for family and friends."

"This is not to mention the anger the people have towards the physicians and the nurses who are really doing our best — and who are delivering exceptionally excellent care," Trunsky concluded. "Of course, the answer was to have been vaccinated — but they were not and now they're angry at the medical community for their failure. Numbers are on the rise. Get your vaccine."

Kathryn Ivey, RN, a critical care nurse at a hospital in Nashville,

shared similar sentiments on Twitter: "I don't know what to say that will make people listen," Ivey tweeted.⁵ "I wish I could snap so many people out of their selfish stupor, but I can't, so I get to watch instead as people learn the hard way; with a tube down your throat. With a 'code blue, code blue!' and the crack of a sternum."

Here is just one set of facts from the Pennsylvania Department of Health, which reviewed state data and records recently and reported that 94% of SARS-CoV-2 infections, 95% of hospitalizations, and 97% of deaths occurred in the unvaccinated.⁶ Many states are reporting these kinds of numbers, which are startling at first and then disheartening when they seem to have no effect on the unvaccinated. Likewise, it was thought that full licensure of the Pfizer vaccine would be a tipping point toward vaccination, but it appears only mandates will change the status quo.

"The issue is not data, the issue is not licensure, it has to do with fear and misinformation and a false epistemology," Poland said. "There are certainly legitimate concerns and questions that come up, but all of those should be answered by now. What we're dealing with is misinformation, conspiratorial-type thinking, limited scientific literacy, bandwagoning — which you can kind of think of as peer pressure — and magical thinking, perhaps best exemplified by that famous statement, 'We're going to wake up one morning and this will all be gone.'"

To paraphrase George Bernard Shaw's observation, "What we learn from history is that we learn nothing from history." Poland cited this quote in recalling the 1918 influenza pandemic, saying, "In many ways, we learned nothing from that history." Although there was

no vaccine for that virulent strain of H1N1 influenza A, similar themes to the COVID-19 pandemic were its unknown origin, national disputes over mask wearing, and that people in crowds were more likely to be infected in cities that held large parades for returning soldiers.

“[Now] we see vaccine hesitancy and rejection, anti-masking, political and economic conflicts of interest, lack of leadership, and fear,” Poland said. “Epistemology is the interpretive lens that one uses for determining truth. I would put forward that for a scientific medical problem like SARS-CoV-2, the epistemological lens must be that of science.”

The Science of Vaccine Efficacy

To put science in the lead, we must decide what we are trying to accomplish when looking at, for example, COVID-19 vaccine efficacy, Grounder said.

“Are we measuring vaccine effectiveness against infection, against symptomatic infection — so that would include mild to moderate disease — against severe disease, against hospitalization, or against death?” she said. “Are we trying to protect our healthcare system — which is really about flattening the curve, trying to slow the spread — so that the burden of severe disease is something that our hospitals can absorb and handle?”

After breakthrough infections — and subsequent transmission — were reported in the large outbreak in Provincetown, MA, in July 2021, the default efficacy measure seems to have become preventing hospitalization and death. There has been uncertainty and differing opinions on whether we are seeing the effects of waning

immunity, the rise of the more transmissible Delta variant, or some combination of both.

Grounder broke it down to the basics, using the analogy of “a race” when the variant starts incubating and the memory immune system is triggered.

“Going back to sort of immunology 101, when you’re first exposed to a pathogen, a virus, or for that matter when you’re first vaccinated, you develop an antibody response,” she said. “You also develop an [immune] memory response, which takes a little bit longer to develop. That is the part of the immune response that is longer lasting, even after your neutralizing antibodies wane, declining over time. And then if you’re re-challenged with that same pathogen, be it a virus or perhaps it’s a second dose of vaccination, you get another bump in your neutralizing antibodies and also further maturation of your memory response. In particular, the memory B cells are undergoing a process of becoming better and better at recognizing the antigen — the virus.”

As the antibody response wanes, this immune memory may remain protective for an indefinite period, she said. “It’s the memory response that persists, and then if you’re re-challenged with an exposure or a vaccination, your memory B cells, your long-lived plasma cells will secrete, will produce neutralizing antibodies again,” Grounder explained.

The memory B cells take about four days to ramp up antibodies, which is roughly akin to the incubation period to infection by the Delta variant. At that point, “it’s a race between your immune system and the infecting virus as to which one wins out,” Grounder said. “Right at around the time that your immune

system memory response is revving up, the infection is also taking off, so the timing means that it’s very difficult to beat the virus — at least at the level of a breakthrough infection.”

However, a breakthrough infection in the vaccinated is less important if the stated goal of vaccine efficacy is to prevent hospitalization and death. The problem, which research now is addressing, is that there are no mucosal or intranasal vaccines that could elicit an immune response in the upper airway.

There is a “spillover” effect right after vaccination, but when neutralizing antibodies wane, the immune memory response is not as protective in the upper airway, Grounder said.

“[We need to] find another way to elicit a mucosal response to complement the systemic immune response that you get with a parenteral vaccination,” she said.

Although the current vaccines do not prevent all breakthrough infections, “the protection against hospitalization from the COVID vaccines remains very high over time,” Grounder says. “It remains quite robust at 95%.”

Still, people age 65 years and older are more at risk of breakthroughs and were an important group to be targeted for booster shots, she said.

There is also a rare but real risk of developing long COVID after a breakthrough infection in fully vaccinated people. In a small Israeli study of some 1,500 fully vaccinated healthcare workers, 39 had SARS-CoV-2 breakthrough infections. Of those, seven had persistent symptoms of more than six weeks.⁷

It is one study with small numbers, the lead author emphasizes, but concedes it was disturbing to see.

“They had severe fatigue. They continued to have loss of taste and

smell,” said **Gili Regev-Yochay**, MD, of Sheba Medical Center. “It’s very concerning.”⁸

It’s important to emphasize that those unvaccinated are much more likely to develop long COVID after infection than those immunized.

A United Kingdom study reported recently that vaccination — compared to the unvaccinated — was associated with a 50% reduced likelihood of long COVID with more than 28 days of symptoms.⁹ This is if a breakthrough infection occurs in the first place, which may not happen at all if one is fully vaccinated.

However, both of the aforementioned studies involved the Alpha variant before the Delta variant was predominate.

“Still, this [United Kingdom study] is quite promising, showing that your risk of long COVID is much reduced if you have been vaccinated and have a breakthrough infection vs. having an infection as an unvaccinated person,” Grounder said. ■

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Booster Option for HCWs Approved as CDC Overrules Advisory Panel

Israeli study: Booster restores vaccine to 95% efficacy

Centers for Disease Control and Prevention (CDC) Director **Rochelle Walensky**, MD, MPH, is defending her decision to overrule her own vaccine advisory committee after they voted against giving COVID-19 booster shots to healthcare workers, teachers, and other essential workers at occupational risk of infections.

The surprising 9-6 “no” vote by the CDC Advisory Committee on Immunization Practices (ACIP) rejected a generally worded

“occupational” risk recommendation on boosters at a Sept. 23, 2021. Walensky overruled the panel on the occupational booster question in an email statement sent at 12:27 a.m. September 24. The rapidity and decisiveness of that revocation has rarely been seen between the CDC and its advisory committees.

“It’s not something you see very often,” said **Ann Marie Pettis**, RN, BSN, CIC, president of the Association for Professionals in

Infection Control and Epidemiology. “The turnaround was so quick it made your head snap, but it made sense to me. The booster is optional. It is not being required. Healthcare workers have been putting their lives on the line and they at least deserve that option.”

Walensky explained her decision at a White House pandemic press briefing after the booster approval.¹

“As CDC director, it’s my job to recognize where our actions can

have the greatest impact,” she said. “In a pandemic, we must often take steps with the intention to do the greatest good even in an uncertain environment, and that is what I’m doing with these recommendations. I want to be clear: We will not boost our way out of this pandemic. Infections among the unvaccinated continue to fuel this pandemic.”

Concerns about waning vaccine and the ongoing nursing shortage also support the booster decision, Pettis says.

“We have to preserve the healthcare workforce, both for their safety and patient,” she says. “To me, it’s a risk calculus that had to be made. I understand ACIP was trying to be very measured and it’s true that there are data missing. We are in uncharted waters. I understand their hesitancy and [Walensky] had to make a tough decision, but I think it was the right one.”

In a contentious debate at the end of a long two-day meeting, one of the reasons cited against the recommendation was that healthcare workers have a greater risk of acquiring COVID-19 in the community than at work.

The “occupational” rationale is not actually supported by evidence, since healthcare workers are protecting themselves with personal protective equipment and other measures at work, noted ACIP member **Beth Bell**, MD, MPH, of the University of Washington in Seattle.

“I don’t believe [the recommendation] is scientifically correct,” she said at the meeting. “Perhaps a case could be made for healthcare workers to reduce the incidence of infections they get because of exposure in the community, and therefore reduce absenteeism among vaccinated healthcare workers.”

That may strictly be true given the protective measures taken in hospitals, but there always is the risk of a breach in protocol, an unanticipated direct exposure, or something potentially more widespread, such as not using a negative pressure room to perform an aerosol-generating procedure on a COVID-19 patient.

At the ACIP meeting, concern was expressed about loose wording in the “occupational” recommendation that could negate the purpose of designating groups and let everybody be boosted pell-mell.

“We might as well as just say, ‘Give it to everybody 18 and over,’” said ACIP member **Pablo Sanchez**, MD, of Ohio State. “We have a really effective vaccine, and this is like saying, it is not working — and it is working. Certainly, some high-risk individuals do have waning immunity with time, but I am concerned about this.”

At this point, the narrative was going off track, particularly since the Food and Drug Administration (FDA) had approved a similar recommendation only a day before the ACIP meeting.

ACIP chair **Grace Lee**, MD, MPH, of Stanford, was cool under pressure, reminding the committee that the benefit-risk calculation for the recommendation is “individualized,” meaning those at risk of occupational exposures who are fully vaccinated can choose to get the booster — or not. On the other hand, the benefit in passing the recommendation would be providing greater “access” to the booster, which in turn opens a wider path to equity, she emphasized.

Although CDC officials reminded ACIP that the recommendation will be accompanied by education and close follow-up for myocarditis — a rare side effect primarily seen in

young men — one ACIP member said the effect of the booster actually could increase risk for this population by prompting a strong antibody response.

“If an 18-year-old is anxious about myocarditis, we are not providing anything in the benefit department, but we are providing risk,” said ACIP member **Sarah Long**, MD, of Drexel University.

Other ACIP members argued it was necessary to maintain the healthcare workforce and preserve morale amid massive burnout and a national nursing shortage. Still, in general, many ACIP members seemed unenthusiastic about the boosters, citing competing pandemic priorities — including immunizing children — and frustration at focusing on those already vaccinated when so many are not. The tipping point probably came when an ACIP member called the recommendation a “solution looking for a problem.”

The ACIP meeting ended shortly after the occupational booster recommendation was rejected. In addition to the other reasons cited, Walensky’s quick move to overrule the vote also suggests the agency foresaw a potential public relations debacle. It is not hard to imagine news reports going out saying that healthcare workers — the heroes of the pandemic — were being denied the full measure of vaccine protection.

CDC, FDA Booster Recommendations

Here is the CDC occupational recommendation as reissued and approved by Walensky:

“People aged 18 to 64 years who are at increased risk for COVID-19 exposure and transmission because of occupational or institutional

setting may receive a booster shot of Pfizer-BioNTech's COVID-19 vaccine at least six months after their Pfizer-BioNTech primary series, based on their individual benefits and risks.”

A key difference is that the word “recommended” was deleted from the original ACIP proposal, which now instead emphasizes that those in the occupational category “may” get the booster.

The other booster recommendations approved by ACIP and the CDC are:

- people 65 years of age and older and residents in long-term care settings should receive a booster shot of Pfizer-BioNTech's COVID-19 vaccine at least six months after their Pfizer-BioNTech primary series;²

- people aged 50 to 64 years with underlying medical conditions should receive a booster shot of Pfizer-BioNTech's COVID-19 vaccine at least six months after their Pfizer-BioNTech primary series;²

- people aged 18 to 49 years with underlying medical conditions may receive a booster shot of Pfizer-BioNTech's COVID-19 vaccine at least six months after their Pfizer-BioNTech primary series, based on their individual benefits and risks.²

The FDA recommendations, finalized after a Sept. 17, 2021, meeting of its Vaccines and Related Biological Products Advisory Committee, were similar to the CDC's. One exception is that the ACIP panel lowered the age range for those at high risk to 50 years of age, in a nod to health disparities among minorities and ethnic populations.

Walensky's statement said the agencies are in alignment, but there is much more to be done because the FDA only issued an Emergency Use Authorization (EUA) for a Pfizer booster. The FDA recommended boosters for individuals are:³

- 65 years of age and older;
- 18 through 64 years of age at high risk of severe COVID-19;
- 18 through 64 years of age whose frequent institutional or occupational exposure to SARS-CoV-2 puts them at high risk of serious complications of COVID-19, including severe COVID-19.

In an initial vote, the FDA decided vaccine efficacy was still sufficient in immune-competent people in the general population, dashing President Biden's hopes of a large national rollout of booster shots. A lack of overall data and the concern for myocarditis side effects in young people were among the reasons cited before the 16-2 vote against broad immunization with booster doses.

In comments to fellow FDA committee members, **Paul Offit**, MD, a vaccine expert at the Children's Hospital of Philadelphia, summed up the situation.

“The stated goal of this vaccine for people like Rochelle Walensky and others has been to protect against serious illness,” he said. “The data presented shows that the vaccine still does exactly that. It is also clear, however, that the third dose of mRNA vaccine increases the titer of virus-specific neutralizing antibodies and will likely decrease the incidence of asymptomatic or symptomatic infection, which is associated with contagiousness. So, then the question becomes what will be the impact of that on the arc of the pandemic? It may not be all that much. Certainly, we all agree that if we really want to impact this pandemic, we need to vaccinate the unvaccinated.”

The FDA said the most common booster side effects among clinical trial participants were pain, redness, and swelling at the injection site. Also reported were fatigue, headache, muscle or joint pain, and chills.

“Of note, swollen lymph nodes in the underarm were observed more frequently following the booster dose than after the primary two-dose series,” the FDA reported.

In terms of efficacy, the FDA said it looked at real-world data from the United States and international sources, including the United Kingdom and Israel. “The immune responses of approximately 200 participants 18 through 55 years of age who received a single booster dose approximately six months after their second dose ... demonstrated a booster response,” the FDA said.

The degree of that response of was not detailed by the FDA, but researchers in Israel found that the booster dose reduced COVID-19 infection more than 10-fold compared to those who were vaccinated at least five months previously but were not boosted.

“Our findings can be understood through the following example,” the authors explained.³ “Suppose, first, that the combined effect of waning immunity and the increased prevalence of the Delta variant decreases the efficacy of a vaccine that had been administered six months earlier to approximately 50% relative to the susceptibility in an unvaccinated person, as recent reports have suggested. Then suppose that, as suggested by our results, the booster dose reduces the rate of infection for such vaccine recipients by a factor of 10. This would mean that the susceptibility of a person who receives a booster dose would decrease to approximately 5% (i.e., 50% divided by 10) relative to that in an unvaccinated person and would bring the vaccine efficacy among booster recipients to approximately 95%, a value similar to the original vaccine efficacy reported against the alpha variant.” ■

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The Return of Flu: Signs Point to Possible Severe Season

Risk of co-infection with SARS-CoV-2 could increase

A possible severe influenza season is on the horizon, in part because COVID-19 shutdowns and precautions led to a historically low flu season in 2019-2020, said **Rochelle Walensky**, MD, director of the Centers for Disease Control and Prevention (CDC).

“We had so little disease last year, population immunity will be lower, putting us all at increased risk for influenza this year, especially among those most vulnerable,” she explained at an Oct. 12, 2021, flu press conference held by the National Foundation for Infectious Diseases.

“When there is active flu one year to another, then we have more people — not just who are vaccinated — but people who were actually sick and have built up some protective immunity,” Walensky said. “That immunity actually helps us, especially those who have not been vaccinated. If they had the flu last year, they may have had some residual immunity against getting the flu this year.”

Another signal of more circulating flu virus in the 2021-2022 season is the early, unseasonal appearance of respiratory syncytial virus (RSV).

“We have had a large amount of RSV in the last couple of months, which is atypical for this seasonal virus,” she said. “We did not see some of these respiratory viruses last year because we were taking those prevention and mitigation strategies [for COVID-19].”

CDC surveillance conducted at Vanderbilt University in Nashville confirms this unusual emergence of RSV, said **William Schaffner**, MD, professor of preventive medicine at the school and medical director of the National Foundation for Infectious Diseases (NFID).

“We have seen an unseasonal increase with RSV, and that’s continuing,” he said. “Is that a harbinger of a worse influenza season? We don’t know, but we certainly don’t want a ‘twindemic’ of both COVID and influenza. Let’s get vaccinated against both.”

Flu vaccination has faced historical resistance from people who fear or simply refuse the shot, much as has been seen currently with the COVID-19 pandemic. The shots for flu and SARS-CoV-2 can be given at the same time.

“We can give flu vaccine and COVID vaccine on the same visit,” said **Patsy Stinchfield**, RN, MS, CPNP, president-elect at the NFID. “You don’t need to separate them, but usually we will administer them in separate arms.”

In a recent NFID survey, 44% of U.S. adults said they are unsure or do not plan to get vaccinated against influenza during the 2021-2022 flu season.¹ Another troubling finding was that 23% of people at high risk of flu complications said they were not planning to get vaccinated. People at higher risk of flu complications include pregnant women, children 5 years of age and younger, those 65 years of age and older, and those with chronic conditions, such as diabetes, lung conditions or heart disease. The CDC recommends everyone 6 months of age and older be vaccinated for influenza.

Those survey findings caused alarm, but “the pandemic does seem to be driving changes in some prevention behaviors,” Schaffner said. “For example, 54% of U.S. adults plan to wear a mask during flu season. And 45% say the pandemic will make

them more likely to stay home from work or school if they are sick. That's good news."

Vaccine Myths Resurface

Cited reasons in the survey for not getting vaccinated included the age-old "I never get the flu" and the vaccine is not effective. Another long-imploded myth came up after an unidentified reporter asked: "How do we really know the flu vaccine does not cause flu?"

"You cannot get flu from the flu vaccine. That's an old myth — please, you can't do that," an exasperated Schaffner said. "Virtually all the vaccines are made up of only parts of the virus so there is no way that they can recreate the virus in your body to give you influenza. [No one] can hide behind that as a reason not to get vaccinated. As we say in Tennessee, 'That dog won't hunt.'"

Since the discussion had been breached by serious misinformation, Schaffner took the trouble to explain why the live, attenuated nasal spray vaccine cannot give anyone flu either.

"It is miracle of modern science that the virus can stimulate your immune system, but it cannot get down into your chest," he said. "It can't multiply there. It's 'cold adapted,' as we call it, and cannot multiply at the slightly higher temperatures down in your lungs. So even that live, attenuated virus cannot give you the flu."

Stinchfield said unequivocally, "It is not possible to get influenza from the flu vaccine." She then added an artful analogy that being vaccinated is like practicing before a game or performance.

"When your kids are saying they don't want to get the flu shot, tell them you practice for your sport, you practice for choir and band," she said.

"This is practice for your immune system. You give it a little bit of a vision ahead of time so when the real virus comes your way, your immune system is ready."

The 2021-2022 influenza vaccine protects against four strains of flu, with immunity in place about two weeks after vaccination. However, the vaccine does not protect against other viruses, Walensky noted.

"So, it is not uncommon during respiratory season that someone would get the flu vaccine and a week later get a cold," she said. "We need to make sure that people recognize that is not the flu vaccine."

Regarding flu vaccine efficacy, the vaccine is made every year to match the circulating viral strains and sometimes it is more effective than others. However, even in an imperfect year, the flu vaccine can prevent hospitalization and death, Walensky said.

For example, a record 199 children died of flu during the 2019-2020 season in the United States. "Consistent with findings from other seasons, about 80% of those children were unvaccinated," she said.

Co-Infection with Pandemic Virus

If flu returns in force, there also is the risk of co-infection with COVID-19, which could prompt a serious inflammatory immune response. The viruses can present with similar symptoms of fever, cough, and shortness of breath, but there are tests to discern between the two or identify a co-infection.

"I have seen a couple of cases who had both infections simultaneously," said **Jamie Rutland**, MD, CEO of West Coast Lung in Newport Beach, CA. "Those individuals

were taken care of at home, but when they presented to the ER (emergency room) they were positive for influenza A and SARS-CoV-2. The inflammatory response of the immune system is going to be activated, which, quite frankly, we are all afraid of."

"It's another reason to get vaccinated for both, and we may see a more co-infections because there will be more flu this year," Schaffner said.

Either influenza or SARS-CoV-2 is a serious infection during pregnancy, so the safety of vaccines for both viruses was emphasized to protect mother and child. There also are effective antiviral treatments for influenza, and pregnant women were urged to contact their provider at the first sign of symptoms.

"It is really helpful to call early, because your oxygen level can't go too low before it starts affecting the baby," said **Laura Riley**, MD, obstetrician and gynecologist-in-chief at New York-Presbyterian. "So, we want to know if you are having those symptoms, even if they seem mild. Most pregnant women we don't even test. If we think it's flu, we are going to give you medicine. That's how serious we take it."

The early arrival of circulating RSV was unwelcome news to Riley, in part because there is no vaccine for the virus.

"As an obstetrician, when you hear RSV, you start to cringe," she said. "RSV is particularly bad for newborns, so moms need to do whatever they can to protect them from every virus for which there is a vaccine."

The CDC has rigorous safety systems in place for both flu and SARS-CoV-2, which, in terms of adverse events, allows detection of "needles in haystacks when they occur," Walensky said. "We have seen

extraordinary safety with the flu and COVID vaccines in pregnancy.”

There is some thought that the pandemic will change the way people respond to respiratory viruses, and measures, such as masking, social distancing, and avoiding crowded indoor settings, will become more common in future flu seasons. Given the social divide over COVID-19, all bets are off on people doing the right thing for the current flu season.

“There are probably two groups out there, one being the very careful who are following this thoughtfully,” Schaffner said. “The data from the NFID survey [indicate] that these people will put on masks and do a little more social distancing when they encounter influenza in their community. There are other folks, as we know, who are still pretty cavalier about influenza and probably won’t take those precautions.”

In addition to continuing to emphasize vaccination for both viruses, the utility of masking and other mitigation measures will be a recurrent public health message, particularly for those at high risk of complications if infected with either — or both.

“Remember the common foe is not one another and it is not the vaccine,” Riley said. “It is the disease. We need to unite.” ■

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- National Foundation for Infectious Diseases. 2021 National Survey: Attitudes about influenza, pneumococcal disease, and COVID-19. Published October 2021. <https://www.nfid.org/2021-national-survey-attitudes-about-influenza-pneumococcal-disease-and-covid-19/>

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Contemplating the Next Pandemic

A deadly virus moves between animal species in the United Kingdom

We have heard much about the inevitable “next pandemic” as viruses move and mutate through animals until they become infectious in humans.

An example of this was published recently, revealing how an avian flu virus caused fatal infections in swans, seals, and a fox, a “terrestrial mammal” not usually vulnerable to such a virus.

Was it a near miss? The thoroughness of the investigation and subsequent paper suggest that the outbreak was taken very seriously.

“An episode of unusual disease resulting in deaths in different species at a wildlife rehabilitation center in the United Kingdom during late 2020 led to the retrospective detection of influenza A virus subtype H5N8 of avian origin,” the investigators reported.¹ “The infection of a fox represents an unusual detection of this virus in association with inflammation of the central nervous system in terrestrial mammal species.”

Live virus was isolated from the animals, and researchers detected a single genetic change — “a potential adaptive mutation” in the mammals (meaning the seals and the fox).

“We determined that avian-origin influenza A(H5N8) virus was the cause of death in a red fox and the cause of seizures in a gray seal and several common seals housed at a wildlife rehabilitation center,” investigators found. “These events occurred roughly one week after five swans housed in the same quarantine unit died from infections with highly pathogenic avian influenza (HPAI) H5N8 virus. Genetic and epidemiologic investigations suggest that the swans were most likely the source of infection for the fox and seals. Virus transmission likely occurred by fomite transfer or aerosol spread. The severity of disease and pathologic findings in the seals and fox was unexpected.”

Given that, the investigators questioned whether some combination of underlying

conditions, malnutrition, and stress might have contributed to disease onset. The study was necessarily retrospective, since “many weeks passed” before the fox and seal samples were linked to the cluster of swans.

“The retrospective detection of influenza A virus of avian origin in these mammalian species meant that evidence of human exposure was not evaluated,” the authors reported. “However, the disease event occurred during a nationwide coronavirus disease lockdown in the United Kingdom, during which the population was required to self-monitor for signs of coronavirus disease and be tested whenever clinical disease consistent with an influenza-like illness occurred.”

No staff reported any illness of this type during the six-week period after the disease event.

“Although genetic analyses indicated no increased risk for human infection with the H5N8 viruses in this outbreak, the investigation shows how these viruses may have unexpected and severe health risks for mammalian species,” the authors concluded. ■

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1. Floyd T, Banyard AC, Lean FZ, et al. Encephalitis and death in wild mammals at a rehabilitation center after systemic infection with highly pathogenic avian influenza A(H5N8) virus, United Kingdom. *Emerg Infect Dis* 2021. https://wwwnc.cdc.gov/eid/article/27/11/21-1225_article

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CME/CE OBJECTIVES

Upon completion of this educational activity, participants should be able to:

1. Identify the clinical, legal, or educational issues encountered by infection preventionists and epidemiologists;
2. Describe the effect of infection control and prevention issues on nurses, hospitals, or the healthcare industry in general;
3. Cite solutions to the problems encountered by infection preventionists based on guidelines from the relevant regulatory authorities, and/or independent recommendations from clinicians at individual institutions.

CME/CE QUESTIONS

- 1. According to Gregory Poland, MD, which type of human behavior in the United States has been a "distorting factor" in the pandemic response?**
 - a. Malaise
 - b. Overreliance on scientific expertise
 - c. Cultural narcissism
 - d. Envy of the other
- 2. Centers for Disease Control and Prevention Advisory Committee on Immunization Practices member Sarah Long, MD, warned that giving 18-year-olds SARS-CoV-2 booster shots could increase the risk of which of the following?**
 - a. Blood clots
 - b. Inflammatory immune response
 - c. Public perception that the vaccines are ineffective
 - d. Myocarditis
- 3. Influenza experts said a possible signal of more circulating flu virus in the 2021-2022 season is the early, unseasonal appearance of which of the following?**
 - a. Respiratory syncytial virus
 - b. Rhinovirus
 - c. Epstein-Barr virus
 - d. *Haemophilus influenzae*
- 4. Jamie Rutland, MD, said the immediate clinical concern in patients co-infected with influenza and SARS-CoV-2 is which of the following?**
 - a. Pneumonia
 - b. Inflammatory immune response
 - c. Lung collapse
 - d. Heart failure