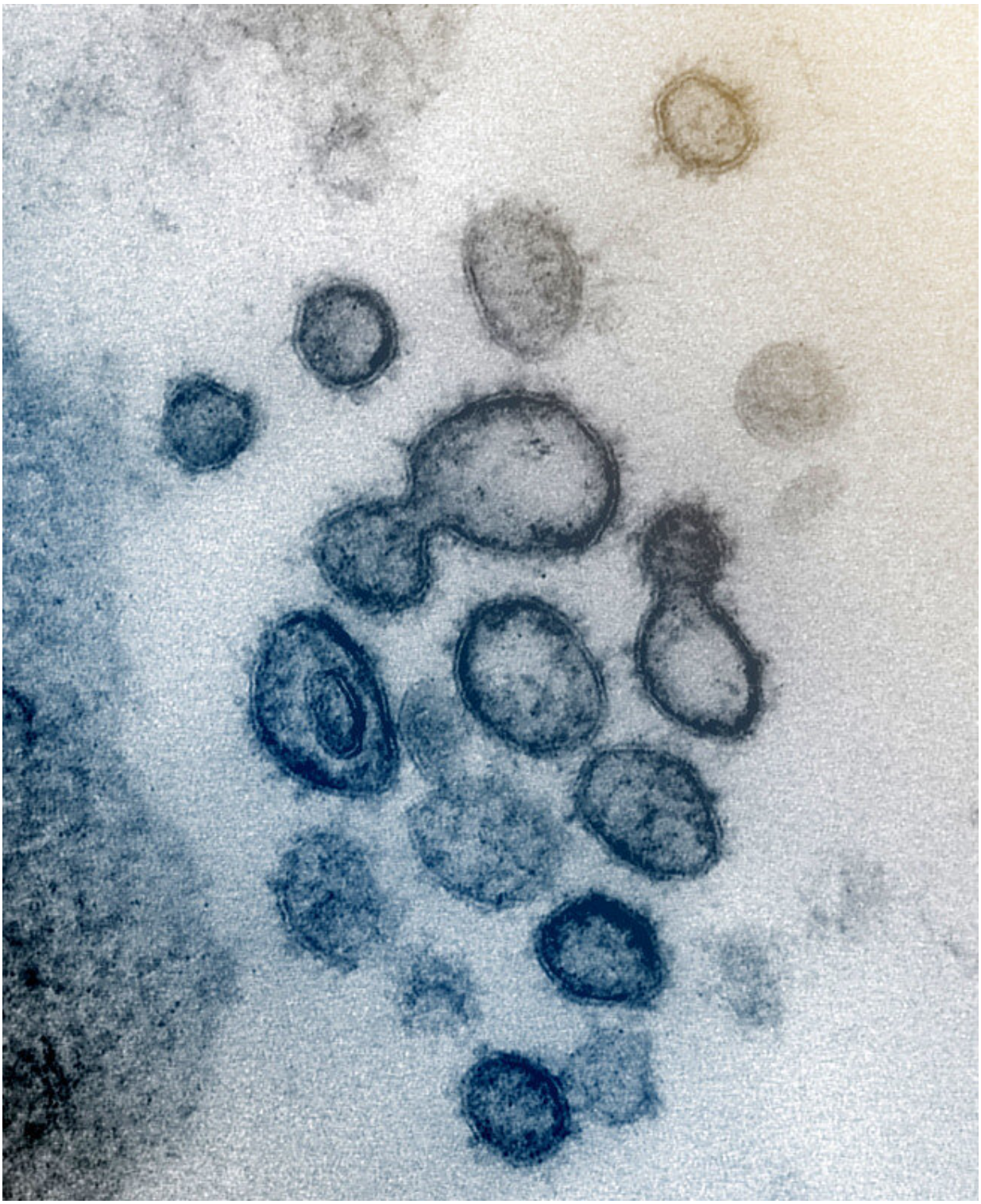
Making the case for intranasal COVID-19 vaccines

July 23 2021, by Bob Yirka



This transmission electron microscope image shows SARS-CoV-2 -- also known as 2019-nCoV, the virus that causes COVID-19 -- isolated from a patient in the US. Virus particles are shown emerging from the surface of cells cultured in the

lab. The spikes on the outer edge of the virus particles give coronaviruses their name, crown-like. Credit: NIAID-RML

A microbiologist and an immunologist from the University of Alabama at Birmingham have published a Perspective piece in the journal *Science* outlining the possible benefits of developing COVID-19 vaccines delivered in an intranasal mist rather in the arm as an injection. In their paper, Frances Lund and Troy Randall suggest that nasal applications provide a host of benefits that injections do not.

The researchers begin their arguments by noting that the SARS-COV-2 virus is transmitted through the air and infects the nasal passages and then lungs, which raises the question: Why are only seven of the 100 vaccines currently under development or in use, delivered intranasally? They note that intranasal vaccines have three obvious advantages: They are needle-free, they can deliver drugs directly to infected sites, and they can elicit mucosal immunity in the lungs.

The researchers also note that use of nasal vaccines is not new; flu vaccines have been administered intranasally for decades. They also point out that prior research has shown that both nasal infections and vaccinations can instigate an immunoglobulin A (IgA) response in both serum and in the respiratory system—intramuscular administration, on the other hand, can only do so for serum fluids. They also note that CD8+ T cells can be primed by nasal vaccines to express receptors, making them ready to fight an infection. They note also that IgA and T and B cells in the respiratory system can provide a barrier of sorts against infections when stoked by an intranasally administered vaccine.

Lund and Randall also argue that some of the nasal vaccines in development have been shown to set off long-lasting virus-neutralizing

responses in immune system cells—some have also been shown to help protect against weight loss and pneumonia associated with viral infections. And they note that during testing, animals given an intranasally administered vaccine versus an intramuscular vaccine had reduced levels of viral shedding and replication, both in nasal passages and in the lungs.

The researchers acknowledge that prior research has shown that intranasally administered vaccines do suffer from a couple of flaws. First, intranasally administered vaccines involve the use of live attenuated viruses, which carries some risk of infection. Second, they do not provide the same degree of immune longevity as those administered in the muscle. They conclude that, ultimately, the best solution may be to use both types of vaccinations—one to give the body immediate protection, the other to keep the body safe longer.

More information: Frances E. Lund et al, Scent of a vaccine, *Science* (2021). DOI: 10.1126/science.abg9857

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