1000 contacts have been included already; a first result from that subset should be available around 15 April, Mitjà says. Similar studies are underway in Minnesota, Washington, and New York.

Experience with HIV has shown that PrEP and PEP can work to reduce infections. But before large-scale studies in HIV began, scientists had an "amazing amount of data" from a monkey model and epidemiology studies suggesting the strategies would work, says Steven Deeks, an HIV researcher at the University of California, San Francisco (UCSF). "I'm not sure any of that applies to what's happening now."

Potential side effects of chloroquine and hydroxychloroquine, including heart arrhythmia, are another concern. "The risks that might be acceptable in someone with disease may be much less acceptable when you are treating someone who doesn't have it," says Annie Luetkemeyer, an infectious disease physician at UCSF. "And you're very unlikely to be monitoring them in the same way."

Some countries aren't waiting for the new trials. India, for instance, has already recommended hydroxychloroquine for health care workers caring for suspected or confirmed COVID-19 cases as well as patients' household contacts. Many scientists say such measures are premature. "The idea that it is better than nothing is not true," White says. "It could be worse than nothing."

That's not just because of the potential side effects. People who think they are protected may also become less cautious and run a greater risk of infection. And broad use of the drugs will make them harder to obtain for other conditions. In addition to curing malaria, chloroquine and hydroxychloroquine are mainstays for patients with lupus and rheumatoid arthritis, Luetkemeyer says. "We better be really sure that these drugs are working before we start impacting that drug supply."

Even if chloroquine works, it is unlikely to confer 100% protection—and a low level of protection may not make the risk of side effects worthwhile. "If you were a health care worker and I said, 'Here's a medicine which you have to take every day and it reduces your risk of getting COVID-19 by 20%,' would you take it?" White asks. Below that, people probably wouldn't bother, he says.

White hopes for a quick answer, but he is still navigating the "myriad rules, regulations, and sequential hurdles that govern the conduct of clinical trials." No one is acting with ill intent, he adds, but he thinks the emergency warrants faster action. "Is it really ethical to take 3 weeks to review an application for a medicine that has been available for 70 years?" ■

COVID-19

NAS letter suggests 'normal breathing' can expel coronavirus

But some experts are skeptical that small respiratory particles transmit infectious virus

By **Robert F. Service**

On 31 March, University of California, San Diego, atmospheric chemist Kimberly Prather set off an online debate by saying people should stop surfing during the coronavirus outbreak. Her reasoning: Viruses can travel long distances if carried by wind. "I ignited a bomb," Prather says, as commenters pushed back, pointing to official assurances that the novel coronavirus is transmitted only short distances in respiratory droplets from a sneeze or cough.

The surfing controversy just adds to the fog surrounding how the novel coronavirus is transmitted. When people cough and sneeze, the droplets they expel fall to the ground within 1 or 2 meters. The fallen droplets deposit virus on surfaces, where people can pick it up and infect themselves by touching their faces. But if the coronavirus can be suspended in an ultrafine mist of particles smaller than 5 micrometers—known as aerosols—people could potentially spread infection when they exhale. And aerosol particles are so light that they can float like dust for hours in air.

8 meters
The distance a single sneeze can propel aerosol particles

The National Academy of Sciences (NAS) weighed in last week, suggesting it's likely the novel coronavirus can spread this way. A 1 April letter to Kelvin Droegemeier, head of the White House Office of Science and Technology Policy, noted that current studies are inconclusive. But, it added, "The results of available studies are consistent with aerosolization of virus from normal breathing."

The debate was kicked off by a finding published 17 March in *The New England Journal of Medicine* that the new coronavirus, SARS-CoV-2, can float in mechanically generated aerosols for up to 3 hours and remain infectious. People readily shed such particles, and an analysis published 26 March in *JAMA* reported that a single sneeze can propel them up to 8 meters. "From the physics it's very clear the emissions go beyond [2 meters]," says the paper's author, Lydia Bourouiba, a physicist at the Massachusetts Institute of Technology.

The NAS letter also pointed to a preprint posted on medRxiv on 26 March by Joshua Santarpia and colleagues at the University of Nebraska Medical Center that found widespread evidence of viral RNA in rooms of patients being treated for COVID-19. Viral RNA turned up on hard-to-reach surfaces and in air samples more than 2 meters from the patients. Another preprint posted 10 March on bioRxiv found the coronavirus can be resuspended in the air when health care workers remove their personal protective equipment, clean the floors, and move through infected areas. Considering all the data, "The presence of viral RNA in air droplets and aerosols indicates the possibility of viral transmissions via these routes," the NAS letter concluded.

"This added airborne pathway helps explain why [the virus] is spreading so fast," Prather says.

To others, the question is far from settled. A 27 March scientific brief from the World Health Organization states that aerosol transmission "may be possible in specific circumstances and settings that generate aerosols," such as when severely ill patients are intubated. However, the brief adds, an analysis of more than 75,000 coronavirus cases in China revealed no cases of airborne transmission. As for studies such as Santarpia's, it notes that detection of viral RNA doesn't necessarily mean infectious virus persists.

Meanwhile, some researchers are considering another possible transmission route: feces. According to the Centers for Disease Control and Prevention, no cases of fecal transmission have been documented even though the novel coronavirus has been detected in the feces of some patients. CDC says the risk "is expected to be low based on data from previous outbreaks of related coronaviruses, such as severe acute respiratory syndrome and Middle East respiratory syndrome." ■

With reporting by Jocelyn Kaiser.

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