

SARS-COV-2 virus isolated from air within a car

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Researchers at the University of Florida collected the SARS-CoV-2 virus which causes COVID-19 from the air within a car driven for 15 minutes by a patient confirmed to have the illness. The driver had

minimal symptoms, without a cough, and was not wearing a face mask during the drive.

Senior author J. Glenn Morris Jr., M.D., M.P.H & T.M., who directs UF's Emerging Pathogens Institute, says the findings underscore the importance of wearing a mask when using public transportation or sharing a vehicle with another person. Their work is currently posted on the medRxiv preprint server and is publicly available.

"In a way, we showed what you expect to find," Dr. Morris says. "However, in contrast to prior studies, we were able to isolate the [virus](#) from the air of the car. We also used an air sampler that let us stratify particles collected from the air by size, and we only found culturable, or viable, virus in a size range that can be inhaled into the lower lungs."

A virus must be viable in order to cause an infection in a person. Non-viable viruses will not cause infection and are harmless.

UF virology expert John Lednicky is the paper's first author and says that the work has important implications for understanding COVID-19's airborne risks.

"We were able to retrieve this virus from the infected person's air space, and then we propagated the virus in [cell cultures](#)," says Lednicky, who is a professor in UF's College of Public Health and Health Professions Department of Global and Environmental Health. "This indicates viable virus was present and posed an inhalation risk."

Public health authorities have debated the role of both large and small respiratory droplets in the spread of COVID-19. While large droplets expelled with a cough or sneeze fall to the ground within a few feet of the ill person, smaller respiratory droplets can become aerosolized and ride on air currents, like meandering cigarette smoke, for a considerable

distance.

Prior work by this same research group collected viable SARS-CoV-2 virus in the air of a hospital room occupied by a patient ill with COVID-19. Genetic sequences of the virus collected from the air, and a swab from the patient's nose, were identical; this indicated that the viral particles in the air came from the patient. Samples from the air of a hallway adjacent to the patient's room did not detect viable virus.

"For this study, we wanted to move beyond the medical setting and test air in the community, in a setting where normal people go about their day," says Dr. Morris, who is also a professor of medicine and infectious diseases in UF's College of Medicine.

Epidemiological studies have identified public transportation as a risk for transmission, and at least [one study](#) has estimated that someone's risk of contracting COVID-19 is about three times higher if they share a vehicle with an infected person.

In the study, UF investigators clipped a portable air sampler to the passenger-side sunshade of a car driven by a patient who had received a confirmed laboratory test for COVID-19 a few days earlier. The patient drove for 15 minutes with the air conditioner on, and then the car was left with the windows up for another two hours while the air sampler continued to run. This allowed the sampler time to process about 1.22 cubic meters of air.

The team then retrieved the sampler and transported it back to a secure lab at the University.

The air sampler used by the research team separates particles captured from the air into five size categories that range from less than 0.25 micrometers, to between 0.25 and 0.50 micrometers, between 0.50 and

1.0 micrometers, between 1.0 and 2.5 micrometers and greater than 2.5 micrometers.

The investigators recovered viable, culturable virus from only the filter that captured airborne particles ranging from 0.25 to 0.50 micrometers in length, which is roughly equivalent to 1/200 to 1/100 the thickness of a human hair.

"This was the most surprising part," Morris says. "With the air sampler running for two hours, we'd have expected the smaller-sized particles to dry out and be rendered non-infectious."

Instead, when particles from this size range were introduced to animal cells cultured in a secure lab, they successfully infected the cells. A molecular test suggested that the infective virus was SARS-CoV-2, which the researchers then confirmed by sequencing the entire virus genome. The researchers even matched mutations in the sampled virus to a previously known and identified strain isolated from the UF community.

Other studies have shown that wearing cloth face masks, especially those constructed with multiple fabric layers, effectively reduces the emission of respiratory droplets by the wearer.

"These findings show that there is a risk of airborne transmission from people ill with COVID-19 who are not wearing a mask," Morris says. "It really underscores the importance of mask-wearing, especially in small spaces with poor ventilation, or even wearing two masks as the CDC has recently recommended."

More information: John A. Lednicky et al. Isolation of SARS-CoV-2 from the air in a car driven by a COVID patient with mild illness, (2021). [DOI: 10.1101/2021.01.12.21249603](https://doi.org/10.1101/2021.01.12.21249603)

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