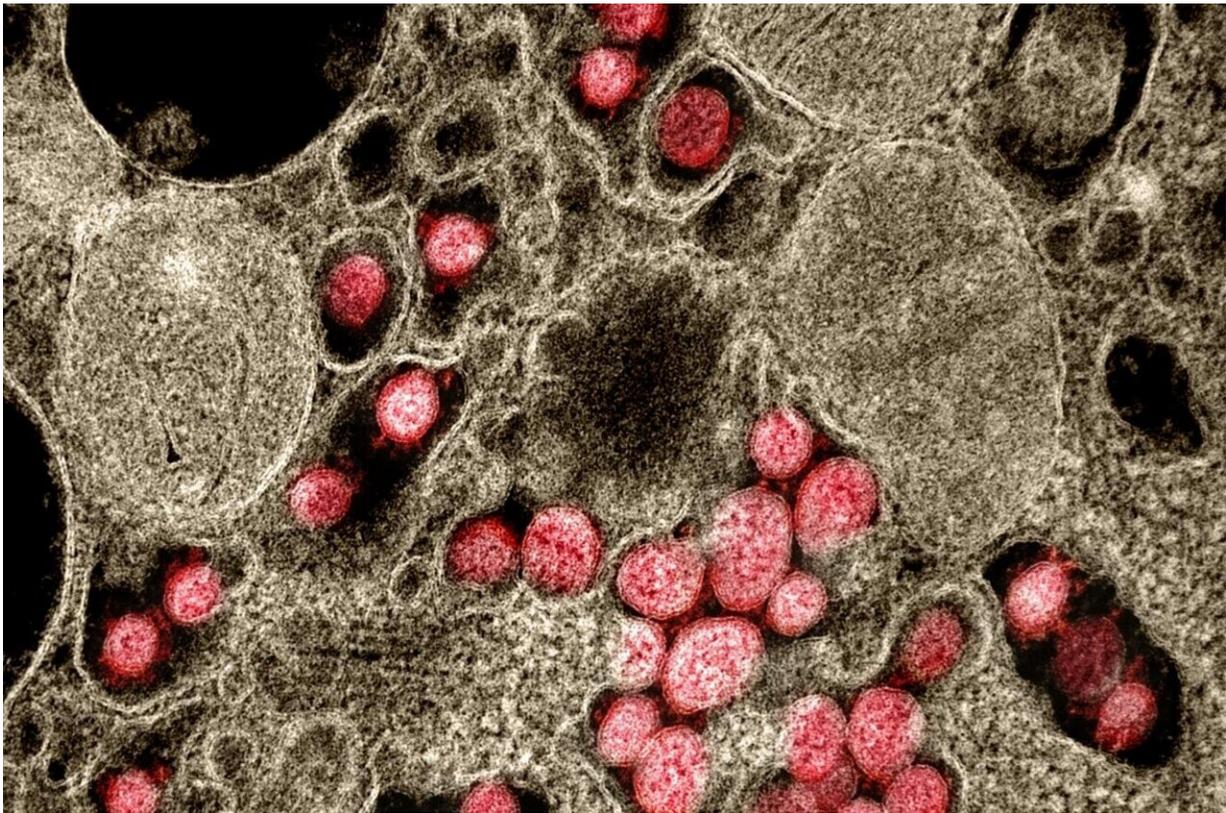


New breath test can identify COVID-19 in critically ill patients

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Transmission electron micrograph of SARS-CoV-2 virus particles isolated from a patient. Credit: NIAID

Instead of an invasive nasal swab, researchers at The Ohio State University Wexner Medical Center are exploring the use of a unique

breath test for the rapid screening of patients for COVID-19.

Results from the initial study in patients, published today in the journal *PLOS ONE*, found the [breath test](#) is highly accurate in identifying COVID-19 infections in critically ill patients.

"The gold standard for diagnosis of COVID-19 is a PCR test that requires an uncomfortable nasal swab and time in a lab to process the sample and obtain the results," said Dr. Matthew Exline, lead researcher, director of critical care at Ohio State Wexner Medical Center University Hospital and professor of internal medicine at The Ohio State University College of Medicine. "The breathalyzer test used in our study can detect COVID-19 within seconds."

COVID-19 infection produces a distinct breath print from the interaction of oxygen, nitric oxide and ammonia in the body. The breath detector device, developed by Pelagia-Irene Gouma, researcher and professor in the Department of Materials Science and Engineering and the Department of Mechanical and Aerospace Engineering at The Ohio State University and Milutin Stanačević, associate professor in the Department of Electrical and Computer Engineering at Stony Brook University, can detect the breath print of COVID-19 in [exhaled breath](#) within 15 seconds.

"This novel breathalyzer technology uses nanosensors to identify and measure specific biomarkers in the breath," said Gouma. "This is the first study to demonstrate the use of a nanosensor breathalyzer system to detect a viral infection from exhaled breath prints."

The study followed 46 patients in the intensive care unit with acute respiratory failure that required mechanical ventilation. Half of the patients had an active COVID-19 infection and the remaining half didn't have COVID-19. All patients had a PCR COVID-19 test when they were

admitted to the unit.

Researchers collected exhaled breath bags from the patients on day 1, 3, 7 and 10 of their inpatient stay. The breath bag samples were tested within 4 hours of sample collection in a lab. The breath print was identified in patients with COVID-19 pneumonia with 88% accuracy upon admission to the ICU.

"PCR tests often miss early COVID-19 infections and results can be positive after the infection has resolved," Exline said. "However, this noninvasive breath [test](#) technology can pick up early COVID-19 [infection](#) within 72 hours of the onset of respiratory failure, allowing us to rapidly screen patients in a single step and exclude those without COVID-19 on [mechanical ventilation](#)."

The use of breathalyzer technology to rapidly diagnose patients with respiratory infections has the potential to greatly improve the ability to rapidly screen both patients and asymptomatic people. Future studies will look at the use of this technology for less severe COVID-19 patients and will explore whether other diseases and infections could benefit from it. The research team has applied to the U.S. Food and Drug Administration for emergency use authorization of the breathalyzer technology.

Dr. Andrew S. Bowman, associate professor in the Department of Veterinary Preventive Medicine at The Ohio State University College of Veterinary Medicine, contributed to this study.

More information: *PLOS ONE* (2021). [journals.plos.org/plosone/article... journal.pone.0257644](https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0257644)

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