

# Quick COVID breathalyzer could allow mass screening in public places

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A SERS-based breathalyzer can distinguish volatile organic compounds in the breath of COVID-positive people in less than five minutes. Credit: Shi Xuan Leong and Yong Xiang Leong, Nanyang Technological University

According to experts, bringing an end to the pandemic will require rapid screening of people attending large gatherings, such as conferences and weddings. Even those who are asymptomatic can still transmit COVID-19 to others, making it important to identify and isolate them until they are no longer contagious. Now, researchers reporting in *ACS Nano* have developed a prototype "breathalyzer" that can sensitively and accurately diagnose COVID-19, even in asymptomatic individuals, in

less than five minutes.

Currently, the "gold standard" for COVID-19 testing is a technique called reverse transcription-polymerase chain reaction (RT-PCR), which is slow, requires an uncomfortable nasopharyngeal swab for sample collection and must be performed in a lab. The rapid antigen test is much quicker but has a higher rate of false negatives and positives. Scientists have also developed [breathalyzer](#)-type tests for COVID-19, which rely on differences in concentrations of volatile organic compounds exhaled by those infected with the coronavirus, but most require bulky, nonportable instruments for analysis. Xing Yi Ling and colleagues wanted to develop a quick, convenient and accurate breathalyzer test that would be suitable for on-site screening of large numbers of people.

The researchers designed a handheld breathalyzer that contains a chip with three surface-enhanced Raman scattering (SERS) sensors attached to silver nanocubes. When a person exhales into the device for 10 seconds, compounds in their breath chemically interact with the sensors. Then, the researchers load the breathalyzer into a portable Raman spectrometer that characterizes the bound compounds based on changes to the molecular vibrations of the SERS sensors.

The team found that Raman spectra from COVID-positive and -negative people were different in regions responsive to ketones, alcohols and aldehydes, which they used to develop a statistical model for COVID diagnosis. They tested the breathalyzer on 501 people in hospitals and airports in Singapore, who were shown by RT-PCR to be negative (85.2 percent), positive and symptomatic (8.6 percent), or positive and asymptomatic (6.2 percent) for the coronavirus. The method had a 3.8 percent false-negative and 0.1 percent false-positive rate, comparable to RT-PCR tests, but it could be completed on-site in less than five minutes. The breathalyzer could someday be a new tool to reduce the silent spread of COVID-19 in communities, the researchers say.

**More information:** Shi Xuan Leong et al, Noninvasive and Point-of-Care Surface-Enhanced Raman Scattering (SERS)-Based Breathalyzer for Mass Screening of Coronavirus Disease 2019 (COVID-19) under 5 min, *ACS Nano* (2022). [DOI: 10.1021/acsnano.1c09371](https://doi.org/10.1021/acsnano.1c09371)

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