

Sputum testing provides higher rate of COVID-19 detection

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Early and accurate detection is critical for preventing the spread of COVID-19 and providing appropriate care for patients. Nasopharyngeal (NP) swabs, which require inserting a long shaft into the nasal cavity to collect a sample from the back of the nose and throat, are currently the gold standard for collecting a specimen for diagnosis. But the procedure

is technically challenging, often uncomfortable for patients and requires personal protective equipment that may be in short supply. Other approaches to collecting specimens—including from an oropharyngeal swab and sputum—have been tested in small studies, but there is uncertainty about which method is best for detecting the virus. In a new study published in *EBioMedicine*, investigators from Brigham and Women's Hospital conducted a systematic review and meta-analysis, analyzing data from more than 3,000 specimens to compare the three approaches. The team found that sputum testing detected the RNA of the virus that causes COVID-19 at significantly higher rates while oropharyngeal swab testing had lower rates. Regardless of the collection method, the earlier samples were collected after symptoms began, the higher the detection rate.

"The accurate diagnosis of COVID-19 has implications for health care, return-to-work, infection control and public health," said corresponding author Jonathan Li, MD, a faculty member in the Division of Infectious Diseases at the Brigham. "Our gold standard in and out of the hospital is the nasopharyngeal [swab](#), but there's a lot of confusion about which sampling modality is best and most sensitive. Our study shows that sputum testing resulted in significantly higher rates of SARS-CoV-2 detection and supports the use of this type of testing as a valuable method for the diagnosis and monitoring of COVID-19 patients."

Li and his colleagues scoured the literature—both preprints and published papers—for studies that assessed at least two respiratory sampling sites using an NP swab, oropharyngeal swab or sputum. From more than 1,000 studies, they identified 11 that met their criteria. These studies included results from a total of 3,442 respiratory tract specimens.

The team examined how often each collection method produced a positive result. For NP swabs, the rate was 54 percent; for oropharyngeal swabs, 43 percent; for sputum, 71 percent. The rate of viral detection

was significantly higher in sputum than either oropharyngeal swabs or NP swabs. Detection rates were highest within one week of symptom onset for all three tests.

"When it comes to testing, the earlier the better, as diagnostic accuracy is improved earlier after symptom onset, regardless of the sampling site," said Li. "Unlike antibody testing, it's very rare to have a false positive qPCR test when diagnosing COVID-19 early in the course of the disease using these methods."

Nasopharyngeal swabs are collected through the [nasal cavity](#); oropharyngeal swabs are collected by inserting a shaft through the mouth; and sputum samples are generally collected by having a patient cough deeply to produce and expel phlegm. Not all patients are able to produce a sputum sample; for such patients, a nasopharyngeal swab may be the best collection method. The meta-analysis included only studies conducted on hospitalized individuals—additional study will be needed of patients who are asymptomatic or have mild symptoms. The current study did not assess alternative testing methods, such as saliva or anterior nasal swabs (taken from the front of the nose). Li and his colleagues at the Brigham are currently working on a project, funded by the Massachusetts Consortium on Pathogen Readiness, to collect and process multiple kinds of samples from patients with COVID-19 to create a resource for researchers.

"The holy grail will be to find a test that is readily acceptable by patients, easy to collect, and highly sensitive," said Li.

More information: Abbas Mohammadi et al, SARS-CoV-2 detection in different respiratory sites: A systematic review and meta-analysis, *EBioMedicine* (2020). [DOI: 10.1016/j.ebiom.2020.102903](https://doi.org/10.1016/j.ebiom.2020.102903)

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