



Positive coronavirus tests could reveal a person's infectiousness, too. MARTIN BERNETTI/AFP VIA GETTY IMAGES

## One number could help reveal how infectious a COVID-19 patient is. Should test results include it?

By **Robert F. Service** | Sep. 29, 2020 , 3:15 PM

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Ever since the coronavirus pandemic began, battles have raged over testing: Which tests should be given, to whom, and how often? Now, epidemiologists and public health experts are opening a new debate. They say testing centers should report not just whether a person is positive, but also a number known as the cycle threshold (CT) value, which indicates how much virus an infected person harbors.

Advocates point to new research indicating that CT values could help doctors flag patients at high risk for serious disease. Recent findings also suggest the numbers could help officials determine who is infectious and should therefore be isolated and have their contacts tracked down. CT value is an imperfect measure, advocates concede. But whether to add it to test results "is one of the most pressing questions out there," says Michael Mina, a physician and epidemiologist at Harvard University's T.H. Chan School of Public Health

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Standard tests identify SARS-CoV-2 infections by isolating and amplifying viral RNA using a procedure known as the polymerase chain reaction (PCR), which relies on multiple cycles of amplification to produce a detectable amount of RNA. The CT value is the number of cycles necessary to spot the virus; PCR machines stop running at that point. If a positive signal isn't seen after 37 to 40 cycles, the test is negative. But samples that turn out positive can start out with vastly different amounts of virus, for which the CT value provides an inverse measure. A test that registers a positive result after 12 rounds, for a CT value of 12, starts out with more than 10 million times as much viral genetic material as a sample with a CT value of 35.

But the same sample can give different CT values on different testing machines, and different swabs from the same person can give different results. "The CT value isn't an absolute scale," says Marta Gaglia, a virologist at Tufts University. That makes many clinicians wary, Mina says. "Clinicians are cautious by nature," Mina says. "They say, 'If we can't rely on it, it's not reliable.'" In an August letter in *Clinical Infectious Diseases*, members of the College of American [Pathologists urged caution in interpreting CT values](#).

Nevertheless, Mina, Gaglia, and others argue that knowing whether CT values are high or low can be highly informative. "Even with all the imperfections, knowing the viral load can be extremely powerful," Mina says.

Early studies showed that patients in the first days of infection have CT values below 30, and often below 20, indicating a high level of virus; as the body clears the coronavirus, CT values rise gradually. More recent studies have shown that a higher viral load can profoundly impact a person's contagiousness and reflect the severity of disease.

In a study published this week in *Clinical Infectious Diseases*, researchers led by Bernard La Scola, an infectious diseases expert at IHU-Méditerranée Infection, examined 3790 positive samples with known CT values to see whether they harbored viable virus, indicating the patients were likely infectious. La Scola and his colleagues [found that 70% of samples with CT values of 25 or below](#) could be cultured, compared with less than 3%

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of the cases with CT values above 35. “It’s fair to say that having a higher viral load is associated with being more infectious,” says Monica Gandhi, an infectious diseases specialist at the University of California, San Francisco.

Conversely, people often test positive for weeks or even months after they recover but have high CT values, suggesting the PCR has identified genetic material from noninfectious viral debris. Current guidelines from the Centers for Disease Control and Prevention and World Health Organization, which call for patients to isolate themselves for 10 days after onset of symptoms, recognize they are not likely to be infectious after that period. But Mina and others say the recent findings also suggest that a patient who has undergone multiple tests with high CT values is likely at the tail end of their infection and need not isolate themselves. He adds that contact tracers should triage their efforts based on CT values. “If 100 files land on my desk [as a contact tracer], I will prioritize the highest viral loads first, because they are the most infectious,” Mina says.

Broad access to CT values could also help epidemiologists track outbreaks, Mina says. If researchers see many low CT values, they could conclude an outbreak is expanding. But if nearly all CT values are high, an outbreak is likely waning. “We have to stop thinking of people as positive or negative, and ask how positive?” Mina says.

CT values could also help clinicians flag patients most at risk for severe disease and death. **A report in June** from researchers at Weill Cornell Medicine found that among 678 hospitalized patients, 35% of those with a CT value of 25 or less died, compared with 17.6% with a CT value of 25 to 30 and 6.2% with a CT value above 30. **In August**, researchers in Brazil found that among 875 patients, those with a CT value of 25 or below were more likely to have severe disease or die.

Gandhi agrees that having access to CT values could help clinicians identify people at high risk for developing symptoms. Nevertheless, she and others note that a high viral load doesn’t necessarily lead to disease; some 40% of people who contract SARS-CoV-2 stay healthy even though they have a similar amount of virus to patients who fall ill. “As a physician, having the CT value is not the only thing I will use” to diagnose and track patients, says Chanu Rhee, a hospital epidemiologist at Brigham and Women’s Hospital. “But I do still find it helpful.”

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