Which types of tests are currently available?
As of mid-August, available tests include:

- **Molecular / PCR**: A diagnostic test that detects nucleic acid from the virus, often done via a nasal swab. This is **highly accurate** because it is most sensitive in looking for a fragment of the virus.
  - **Status**: All top 10 global diagnostic companies have launched a COVID-19 test. As of August 20, the U.S. has issued Emergency Use Authorization for **141 diagnostic tests and to 35 testing labs**. Many of these tests are also available and approved for use outside the U.S.

- **Rapid / Antigen**: A diagnostic test that detects antigens from the virus, often done via nasal or throat swab. This is **highly accurate** but less sensitive and may require a second test to confirm negative results.
  - **Status**: As of August 20, there are only **two rapid antigen tests** with Emergency Use Authorization in the U.S. At the global level, only **38 are commercialized** but have seen limited overall adoption.

- **Serological / Antibody**: A test to see contact with the virus and potentially developed immune response, often done via blood testing. This has **limited accuracy** because it is least sensitive and often shows discrepancies with results from molecular / PCR test results.
  - **Status**: All major serology players are offering tests in this space. As of August 20, the U.S. has issued Emergency Use Authorization to **39 serology tests**, but the FDA also explicitly identified **80 tests no longer to be made available** to the public due to poor performance.

What is the current scientific understanding of test accuracy and adoptability?
According to Yves Dubauche, head of diagnostics solutions at MilliporeSigma, “The PCR tests will not go away as the confirmatory tests, but the point-of-care testing – being able to test in other settings, decentralized and being faster to test results – is going to be important.”

The scientific outlook is that **molecular / PCR tests will remain the standard**, as they are the most sensitive and improvements are being made to these tests, such as using a nose swab rather than nasopharyngeal or point-of-care tests with isothermal amplification.
<table>
<thead>
<tr>
<th>Test</th>
<th>Benefits</th>
<th>Considerations</th>
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<tbody>
<tr>
<td>Molecular / PCR</td>
<td>• Highest accuracy and sensitivity</td>
<td>• Nasal swab can be challenging to run</td>
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<tr>
<td></td>
<td>• Simple to build</td>
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</tr>
<tr>
<td>Rapid / Antigen</td>
<td>• High accuracy and sensitivity</td>
<td>• May require confirmation of negative results</td>
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<td></td>
<td>• Potential for faster time to results with lateral flow</td>
<td>• Longer process to make reagents</td>
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<tr>
<td></td>
<td></td>
<td>• Fewer available in today’s market due to issues explained above</td>
</tr>
<tr>
<td>Serological / Antibody</td>
<td>• Easy to develop</td>
<td>• Low sensitivity and specificity</td>
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<td></td>
<td>• Blood draw can be easier to manage than nasal swabs</td>
<td>• Discrepancies with molecular / PCR test results</td>
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<tr>
<td></td>
<td></td>
<td>• Uncertainty about relationship between antibody presence and future immunity to virus</td>
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<tr>
<td></td>
<td></td>
<td>• Clinical utility undefined</td>
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<td></td>
<td></td>
<td>• <a href="https://www.fda.gov">FDA issued guidance</a> not to use for individual diagnostic decisions (only for convalescent plasma donor screening or surveillance / epidemiology)</td>
</tr>
</tbody>
</table>

*Visit the [FDA](https://www.fda.gov)’s or [CDC](https://www.cdc.gov)’s webpages on coronavirus testing for further information.

**What role can digitalization play in detection and contact tracing?**
According to Jim Harper, co-founder and chief operating officer at Sonde Health, “If you can augment the potential exposure [deduced from contact tracing] with the correlation of growth in symptoms, fusing this kind of data gives you additional actionability when it comes to population health – even prioritizing what will be in our limited resources for contact tracing and individual follow up.”

**Vocal biomarkers** picked up by digital devices can be leveraged as a means of health assessment to assist in contact tracing efforts with Covid-19.

- **Vocal biomarker analysis** involves a health monitoring audio analysis technology and uses subtle changes in a person’s voice to screen for everything from depression to cardiovascular problems.
- The goal is to extract **clinically meaningful health information** from everyday voice interactions people have on a range of devices they already own. See the Pandemic Response Supermind Activation’s [Diagnostics and Monitoring report chapter](https://www.sondehealth.com) for more detailed proposals and exploration of digital contact tracing.
How can scientists track indications of viral spread through genomic content?

According to Mariana Matus, CEO and co-founder of Biobot Analytics, “What we’re observing is that people are adopting different data streams, like the clinical Q-PCR testing; when they have access to it, antibody testing; random testing surveys, wastewater testing data, and then looking at it altogether, side-by-side to paint a better picture of what’s happening.”

Wastewater epidemiology research can help track viral spread in large populations by gathering Covid-19-related data from sewage.

- A June 2020 study determines that both symptomatic and asymptomatic individuals shed SARS-CoV-2 in their stool, and the viral RNA is present in high loads for a prolonged time:
  - Median initial fecal RNA load was $7.68 \log_{10}$ copies/mL and remained **steadily high** for >3 weeks.
  - Fecal positivity remained >80 percent.
  - The median RNA load in fecal samples was **significantly higher** than that for nasopharyngeal swab specimens over time.

- An April 2020 study found that most frequent shedding occurs in infected individuals immediately after contracting the virus:
  - Shedding begins **approximately seven days** before exhibiting symptoms.

- Wastewater analysis reports of communities with Covid-19 show a correlation between **increased virus concentration** in wastewater and an **increase in new cases** in the following days.

For more information:

Scientists are collaborating to source solutions to Covid-19 challenges on the Pandemic Response CoLab, an open platform from MIT’s Center for Collective Intelligence and Community Biotechnology Initiative. MilliporeSigma is a founding member of the online community, which works to harness collective intelligence and better address public health crises. Join the conversation and view the contributions at [www.PandemicResponseCoLab.org](http://www.PandemicResponseCoLab.org).