

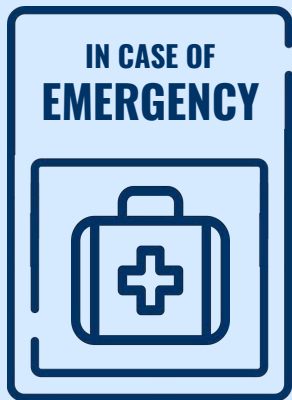
Preventing Workplace Closures

How To Implement A Simple COVID-19 Workplace Testing Strategy Today

PRESCOUTER

Updated February 2021.





Companies can ensure business continuity by keeping easy-to-use COVID-19 test kits on-site. For less than \$4000, these kits can be deployed immediately - just like first aid kits - to mitigate adverse outcomes.

The slower than anticipated vaccine rollout means the the pandemic is not likely to end before 2022. Employers are facing - and will continue to face - challenging scenarios. These range from having critical operators not be available for work due to needing to quarantine, to having a sudden outbreak of positive cases at a facility.

To face these challenging scenarios successfully, companies can adopt testing strategies that mitigate the adverse outcomes of these scenarios. These testing strategies are built on RT-PCR testing kits and packs that are affordable, portable and easily deployed across multiple facilities.

For most companies, saliva-based RT-PCR is more user-friendly and more accurate than alternatives, such as antigen testing and serology (antibody) testing. Partnering with a lab that returns results within 24 to 48 hours, saliva-based RT-PCR is also sufficiently fast for most of the scenarios employers face.

The information provided is US centric; please contact PreScouter for advice on other regions.



During this pandemic, PreScouter is leveraging its network of 4000+ experts, lab partners and prototyping firms to provide clients with the testing expertise and resources they need to safeguard their workplaces. While this report provides general recommendations, we welcome inquiries to help determine what may be best for your specific situation.

Contact us at covid19@prescouter.com or (708) 613-7132

Businesses are at risk until 2022 at least.¹

To enable the pandemic to end, **the vaccine must be manufactured, distributed and accepted by over 40% of people worldwide.** This is taking longer than most people expected.

In the meanwhile, though companies have implemented practices that are keeping staff safe while at the workplace, **employees are contracting the virus from exposure outside of the workplace.**

For employees that are impacted, public testing timelines do not prioritize the return to work of employees most critical to a business, for example. **Public testing options are not designed to ensure continuity of business operations.**

All of these factors mean that, while the virus can continue to spread, businesses will need to continue to safeguard their facilities from becoming a hotspot.

The Business Impact of the Poor Availability of Testing



Employees are off from work, waiting for test results. In some regions, it may take 5 to 10 days to find a test site and obtain the results.



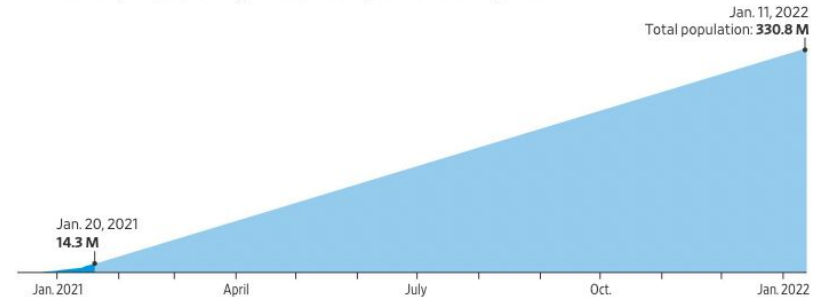
There is a real cost to either individuals or the employer. Either the employer pays for time spent isolating or the employee loses wages.



Employees key to running a business or facility may have to be absent. Critical operators and their deputies may have to quarantine, or be too sick to work.

How long will it take to get the US vaccinated?

At rate of 893,572 people a day, based on average of the seven days before Jan. 21



Source: [WSJ: How Long It Will Take to Get Covid-19 Vaccines to Most Americans](#)

[1] <https://www.prescouter.com/inquiry/when-will-the-covid-19-pandemic-end/>

Unfortunately, testing is not a magic bullet solution for creating airtight, COVID-free work environments.

Employers want a rapid test that can be deployed at the entryway to the workplace. Such a test would be used with everyone entering a facility, much like temperature scans are now. It would provide results within 15 minutes. Such a test would allow a facility to be an air-tight bubble into which the coronavirus could not enter. The options that get closest to this dream sacrifice accuracy or are prohibitively expensive.

Antigen Tests Sacrifice Accuracy For Speed



The US has purchased 150M Ag Card tests from Abbott Labs. The test is the closest to a “home pregnancy test,” returning results in 15 minutes. However, as an antigen test, the accuracy is ~80% and the test only detects the virus during a narrow window over the lifecycle of an infection. It works best for a program of frequent testing.

Purchasing Test Machines - Too Prohibitive For Most Companies



Using a testing machine such as the Xpert Xpress from Cepheid, companies can essentially set up a testing environment similar to the ones used in pharmacies. However, the “best in market” machines are largely sold out and unavailable. The level of expenditure, setup and training has also proven itself to be prohibitive to most companies.

If You Have Unlimited Resources: The NBA ‘Disney’ Bubble



The NBA showed how unlimited resources and careful planning can create an airtight ‘bubble’ where events can be held successfully. By having players quarantine before coming into the NBA bubble located in Disney Orlando, FL, and then through rigorous and frequent testing, the NBA managed to hold this season’s finals without any major incidents.

July 7th: *Teams arrive at the “Disney” bubble and quarantine.*

July 30th: *Season resumes and frequent testing is used to monitor infection status of players.*

July - October: *Teams stay in the bubble and get tested daily. Teams can only leave once they are eliminated in the playoffs.*

October 12th: *Final game is played, the LA Lakers and and Miami Heat are the last teams to leave the bubble.*

Instead, testing is an insurance policy - a tool for mitigating difficult scenarios that could lead to work stoppages or worse.

Testing is a measure that enables work to continue. Rather than isolating for 10 days after symptoms onset or for 14 days after exposure to someone with COVID-19, negative RT-PCR test results allow employees to return to work quicker and for businesses and workplaces to continue to operate.¹

With the the flu season coming, many more people will have to take time away from work and quarantine or isolate than during the Summer months. This is because the flu and COVID-19 have similar symptoms. This complication will likely lead to a sharp increase in testing demands, as employees seek to find ways to return to work quicker. This increase in testing demand will likely in turn lead to a further reduction in the availability of public testing capacity.

[1] <https://www.cdc.gov/coronavirus/2019-ncov/hcp/disposition-in-home-patients.html>

A Landscape of the Testing Options



Our previous report, *[How Can Companies Offer Workplaces COVID-19 Testing?](#)*, provides a comprehensive landscape of the testing options available in June 2020. It recommended companies build local pharmacy style testing at facilities. Based on the success of safety protocols companies have implemented, we now recommend companies reconsider how they think of testing. Specifically, more feasible testing options have emerged, such as saliva-based individual test kits and pooled testing.

With the right testing tools, workplaces can be prepared to handle the various scenarios they face as a result of the pandemic.

Returning Critical Staff To Work Quickly



For scenarios with **critical staff that the business cannot afford to have away from work** (e.g. key operators, C-Suite)



Keep individual testing kits at hand to give to affected staff members, to get results quickly and return them to work.

One-Off Mass Exposure



For scenarios where a **number of staff members may have been exposed to the virus** (e.g. during an event)



Keep pooled testing equipment at hand to perform a one-time mass testing event for all affected employees.

Clearing Staff With Negative Test Results



For scenarios where staff need to **prove they do not have the virus** (e.g. for visiting client facilities or air travel)



Provide affected staff with individual testing kits, the quick results from which prove absence of COVID-19 infection.

Ongoing Exposure



For scenarios where staff come into contact with **many new people on a regular basis** (e.g. restaurants, public transit)



Implement a structured, recurring pooled testing plan for all employees to provide a safe work environment.

For most companies, PreScouter recommends RT-PCR saliva-based testing kits for individual testing and pooled testing packs for mass testing.

Why RT-PCR?

RT-PCR testing is the “gold standard” for COVID-19 testing, as discussed later in this report.

Why saliva-based?

Saliva samples are **non-invasive**. A swab does not need to be poked up the nose, so is less intimidating for the person providing the sample.

Saliva samples can also be **self-administered**, i.e. provided without the assistance of a nurse. Hence, are ideal for making regular, ongoing testing **as easy as possible** for employees.

Saliva-based RT-PCR has also been shown to have the **same sensitivity and power** of RT-PCR tests using other types of samples.

Why individual testing kits and pooled testing packs?

These kits and packs can be easily procured and stored for use as necessary. They do not require sophisticated equipment or training to use. They are also portable and can be used flexibly as an “insurance policy” to be used with a small number of employees as necessary. The speed of results is also sufficiently fast - typically within 48 hours from sending in the samples.



Individual Test Kits. Each kit contains a tube into which saliva is deposited, as well as prepaid overnight shipping to a lab that processes the tube. Results are returned within 48 hours via text message to the individual providing the sample, as well as via a web portal accessible to only the employer.



Pooled Testing Packs. The pack contains the equipment necessary to organize saliva collection events, through which large numbers of employees can provide saliva samples. The samples are sent to a lab, where they are pooled into groups of up to 24. The pooled samples are tested, reducing testing costs. If a pool is negative, all individuals providing samples for that pool are negative. If a pool is positive, the samples are retested and whittled down to two - one of which may be positive. The individuals who provided that pair should take individual tests to determine who is positive.



Returning Critical Staff To Work Quickly

THE SCENARIOS

Examples:



Critical operators on manufacturing lines who can not be easily deputized.



Highly paid individuals spending too much time finding a testing site and/or are handicapped from working.



A backup solution for facilities without access to good public testing solutions.



A second test for workplaces requiring two negative PCR tests to return to work.



Employees who are on unpaid leave and self-isolating because they have used up paid time off.



An employee base with vulnerable, high-risk groups, who would value easy availability of testing.

Questions For Your Team:

- Which 10 people, if you lost for 14 days, may halt operations?
- Whose work time is too valuable to be spent looking for testing sites and waiting for results?
- To what extent would employees feel valued (i.e. that they are “critical”), having easy access to quick testing?

Case Example: UK Prime Minister out of office for 30 days - How did the country manage?



At the start of the pandemic, UK Prime Minister Boris Johnson had a cavalier attitude about the virus, shaking hands at events, for example. On March 27th, the world learned that Johnson had been hospitalized; he became severely sick with COVID-19. He did not return to work until April 27. He was absent for the spring peak of the coronavirus, when **more than 21,000 people in Britain died of the virus and nearly 4 million workers were furloughed.** Johnson had tested positive too late to empower his deputies to make decisions while he was recovering in hospital. (Source: [Washington Post](#))



Returning Critical Staff To Work Quickly

THE SOLUTION

Keeping individual test kits in facilities and giving them out as necessary allows employees to get tested easily and quickly. This helps ensure the quick and safe return of employees to work.

How It Works:

1. Facilities procure saliva-based RT-PCR kits and keep testing kits on-site.
2. When a scenario arises that calls for it, individual kits are either given to employees or dropped off at their home.
3. Employees provide a saliva sample into a tube. The kit includes prepaid overnight shipping to send the saliva sample to the lab.
4. The lab processes the sample to provide results to both employee and employer, generally within 24 hours of arrival at the lab.

Example Pricing:

\$125 Per Person Tested



A typical individual test kit includes a saliva collection device and instructions, as well as return postage and packaging to get the sample to the lab overnight.

Advantages:

- Available nationwide; ease of rolling out one testing program across multiple sites.
- Kits are self-contained and take care of everything, from obtaining employee consent to reporting positive results to local authorities.
- Kits can be stocked without special storage needs and do not expire for several years.

Disadvantages:

- These testing kits are in high demand. Some suppliers are currently not taking new orders.



One-Off Mass Exposure

THE SCENARIOS

Examples:



Identifying other positive cases after there have been known cases at a facility.



Clearing exposed individuals identified during contact tracing (when the number is more than 5).



Reducing anxiety among employees after positive cases.



Before admission to a large event (e.g. in-person, hands-on training).



As a benefit for staff in a local area who are concerned they may have been exposed.



When there are a large number of symptomatic staff, but uncertainty if they have the flu or COVID-19.

Questions For Your Team:

- Do you suspect there are positive individuals among your staff, but are unsure who?
- Has contact tracing identified a large number of individuals who should be tested?
- Are there upcoming events where a large number of staff may come into contact with each other?

Case Example: **Outbreak at Foster Farms poultry complex - Meat processing plant shutdown for a week.**



On August 29 2020, Foster Farms announced that it would temporarily shut down the main building of its Livingston, California, poultry complex after almost 400 workers contracted COVID-19. Foster Farms is one of many manufacturing firms plagued by outbreaks of the novel coronavirus, including those of Ford Motor Company, Tyson Foods, and Boeing. (Source: [EHS Today](#))



One-Off Mass Exposure

THE SOLUTION

A “collection event” is held to collect saliva samples for all those who were exposed. Collected samples are sent to a lab, where they are pooled into groups of 24. If a pool is negative, everyone providing samples for that pool is negative. If a pool is positive, steps are taken to identify the sample that contributed the positive result.

How It Works:

1. The worksite keeps pooled saliva testing supplies on-site.
2. When the need for a mass testing event arises, a collection event is held, with employees providing saliva samples.
3. Saliva samples are shipped to the lab overnight.
4. Pooled saliva sample results are provided within 24 to 48 hours of the results arriving at the lab.

Example Pricing:

\$42 Per Person Tested



A typical pooled saliva sampling pack includes barcoded tubes, a “collection aid” (straw) to assist staff with providing saliva and the necessary packaging to ship the samples to the lab.

Advantages:

- Personally identifiable information is kept locally, with the employer. Results are reported only in terms of barcodes that may be positive. The employer maps barcodes to employees.
- If necessary, tubes and other materials used for testing can be packed into a “kit” that can be taken home and brought back.
- Lower regulatory overhead, e.g. no need for oversight by a healthcare professional or for reporting to local health authorities, since specific individuals who are positive are not identified.

Disadvantages:

- Does not isolate a specific individual within the pool who is positive.



Clearing Staff With Negative Test Results

THE SCENARIOS

Examples:



Clients that require proof of a negative test result before allowing external parties to enter a facility.



Preflight testing to help staff avoid 14-day quarantines imposed by some US states and many foreign governments.



Post-travel, allowing staff to return to facilities without a 14-day quarantine.



Post-travel, allowing staff to visit vulnerable family members without a 14-day quarantine.



Employees that need to show their daycare a negative test result for their child, so the employee is not stuck at home babysitting.



Hotels, stadiums, college campuses and other organizations that require proof of a negative test for employees to enter them.

Questions For Your Team:

- Where might staff need proof they are not infected in order to do their work?
- Are there situations where staff would be more effective travelling? e.g. to troubleshoot a client problem onsite?
- Is there value in having staff get out of quarantine quicker?

Case Example: Many destinations require travellers to present a negative COVID-19 test result.



A sign explaining new a health mandate requiring COVID-19 testing for travelers entering Alaska, as seen at Ted Stevens Anchorage International Airport on June 5th, 2020 (Source: [Loren Holmes / ADN](#))



Clearing Staff With Negative Test Results

THE SOLUTION

Keep individual test kits with staff for use as necessary during travel or other circumstances, in order to provide proof of a negative result.

How It Works:

1. Individual test kits are given to employees who may need to demonstrate negative test results at some point.
2. When negative result proof is required, the employee uses the kit to take a saliva sample and ship it to the lab using a FedEx dropbox or pickup.
3. The lab processes the sample to provide results to both employee and employer, generally within 24 hours.
4. Lab result is accessible online, to present to parties that need to inspect the result.

Example Pricing:

\$125 Per Person Tested



Spectrum Solutions' At-Home Kit, which is also the basis of the Vault At-Home Kit.

Advantages:

- Portable testing solution that employees can carry in suitcases or in their carry-on.
- Samples can be dropped off at over 35,000 FedEx drop boxes across the US, or pickup can be scheduled with FedEx.
- Detailed lab analysis on samples available, upon request.

Disadvantages:

- Not widely available for use internationally, due to differences in local regulations and availability of testing resources.



Ongoing Exposure

THE SCENARIOS

Examples:



Staff who come regularly into contact with new people (e.g. restaurant staff).



Staff regularly visit new people (e.g. for sales or client service visits).



For monitoring the infection rate among staff to get ahead of a potential outbreak.



Staff at facility regularly come into contact with each other.



Testing vulnerable staff to ensure their safety.



Where patrons are reticent to visit the worksite because of rising local infection rates.

Questions For Your Team:

- Is your staff coming into contact with new people on a frequent basis?
- Are there some facilities or teams that absolutely cannot be taken offline?
- Are staff concerned about coming into work?

Case Example: Educational facilities are especially vulnerable to ongoing exposure of faculty and students.



A New York Times survey of more than 1,700 American colleges and universities has revealed more than 178,000 cases and at least 70 deaths since the pandemic began. College campuses are particularly susceptible to the spread of the virus because of the number of students that come together from different parts of the country. (Source: [New York Times](#))



Ongoing Exposure

THE SOLUTION

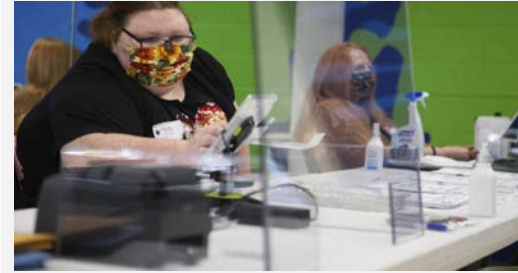
On a routine basis, impacted staff provide saliva samples. The samples are sent to the lab, where they are pooled. Results are returned within 24 to 48 hours of the samples arriving at the lab.

How It Works:

1. A relative infection risk assessment is performed to determine how frequently staff should be tested.
2. The facility receives pooled testing supplies on a monthly basis.
3. Employees provide saliva samples in tubes, e.g. every Friday afternoon.
4. Saliva samples are shipped to the lab overnight.
5. Results are provided within 24 to 48 hours of arriving at lab.

Example Pricing:

\$35 Per Person Tested



Staff at collection events for mass testing need to use PPE equipment and follow other safety protocols.

Advantages:

- The frequency of testing can be easily increased or decreased depending on local infection risk levels.
- If preferred, voluntary pooled testing can maintain anonymity of participants.
- A long-term contract ensures testing capacity with the lab.




Disadvantages:

- Collection events can require greater involvement from the employer, such as staffing of events.





For less than \$4000, a 200-person facility can be equipped to face a wide range of difficult scenarios that will arise from time to time.

Employers can mix and match the available testing options to suit their budget, risk tolerance and needs. We outline here two different example approaches. PreScouter can help employers create a more tailored plan for their specific situation.

More Cost-Effective Approach

	Unit Cost	Number	Total
 Individual kits for returning critical staff to work quickly	\$125	20	\$2,500
 Pooled saliva pack for one-off testing of 12% of facility (i.e. impacted teams)	\$35/ person	24 (1 pool)	\$840
 Retesting of Individual samples if Pooled saliva pack tests positive	\$15/ person	24 (1 pool)	\$360
Total			\$3,700

More Balanced Approach

	Unit Cost	Number	Total
 Individual kits for returning critical staff to work quickly & providing clearance to employees as needed	\$125	30	\$3,700
 Pooled saliva pack for one-off testing of 12% of facility (i.e. impacted teams)	\$35/ person	24 (1 pool)	\$840
 Retesting of Individual samples if Pooled saliva pack tests positive	\$15/ person	24 (1 pool)	\$360
 Pooled saliva pack for 4 week surveillance of 12% of facility (i.e. critical teams)	\$35-\$50/ person	24 (1 pool) x 4 = 96	\$3360 - \$4800
Total			\$8,260 - 9,700

All sound testing strategies must be built on RT-PCR testing

While there are three major diagnostic test types that can be used to diagnose COVID-19, Reverse Transcriptase Polymerase Chain Reaction (RT-PCR) is the golden standard diagnostic technique to diagnose infectious diseases, including SARS-CoV-2.

Currently, the RT-PCR is the only test type that can be used to determine whether employees can return to work. A consecutive double negative RT-PCR test proves, beyond a reasonable doubt, that a person is not infectious to their surroundings.

RT-PCR is not only far superior to other test types in its analytical sensitivity (the ability to pick up a positive case), but also specificity (the ability of a test to measure exclusively what it intends to measure).

Another huge advantage of RT-PCR strategies is that saliva samples can be used to reliably detect viral genetic material. Because testing options require frequent testing, less invasive sampling strategies will be key to increase the willingness of employees to participate in diagnostic or preventative screening. When saliva is used as the sample for RT-PCR, no healthcare workers are required on-site to administer samples.

The 3 Types of COVID-19 Tests



RT-PCR



Serology (Antibody)



Antigen

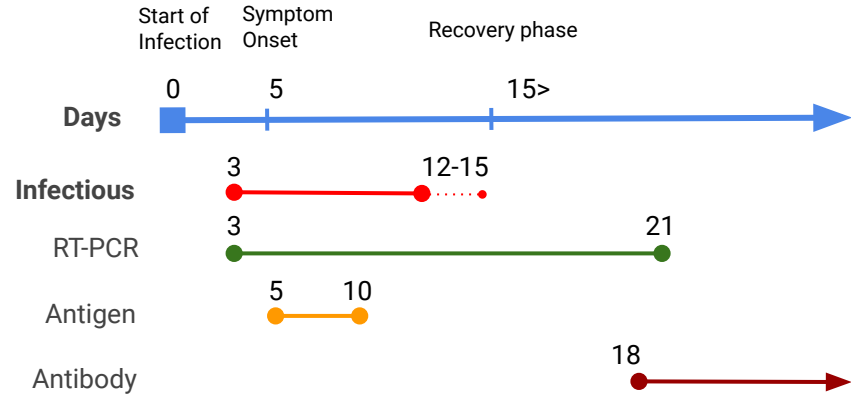
RT-PCR is the only method that detects infections over the full time period during which people are believed to be infectious.

People are infectious, on average, for 9-12 days. RT-PCR is the only test that will reliably cover this time period during which a person is infectious. RT-PCR is able to do this because it detects low amounts of viral RNA through amplification of the signal.

In contrast, **antigen tests** cover a short 'peak period' and will miss positive cases beyond that period. **Antibodies** only detect past infections that are in the recovery phase.

RT-PCR test will show a positive result for a short period after a person is infectious, but this is the tradeoff for having coverage over the full window of when a person is infectious.

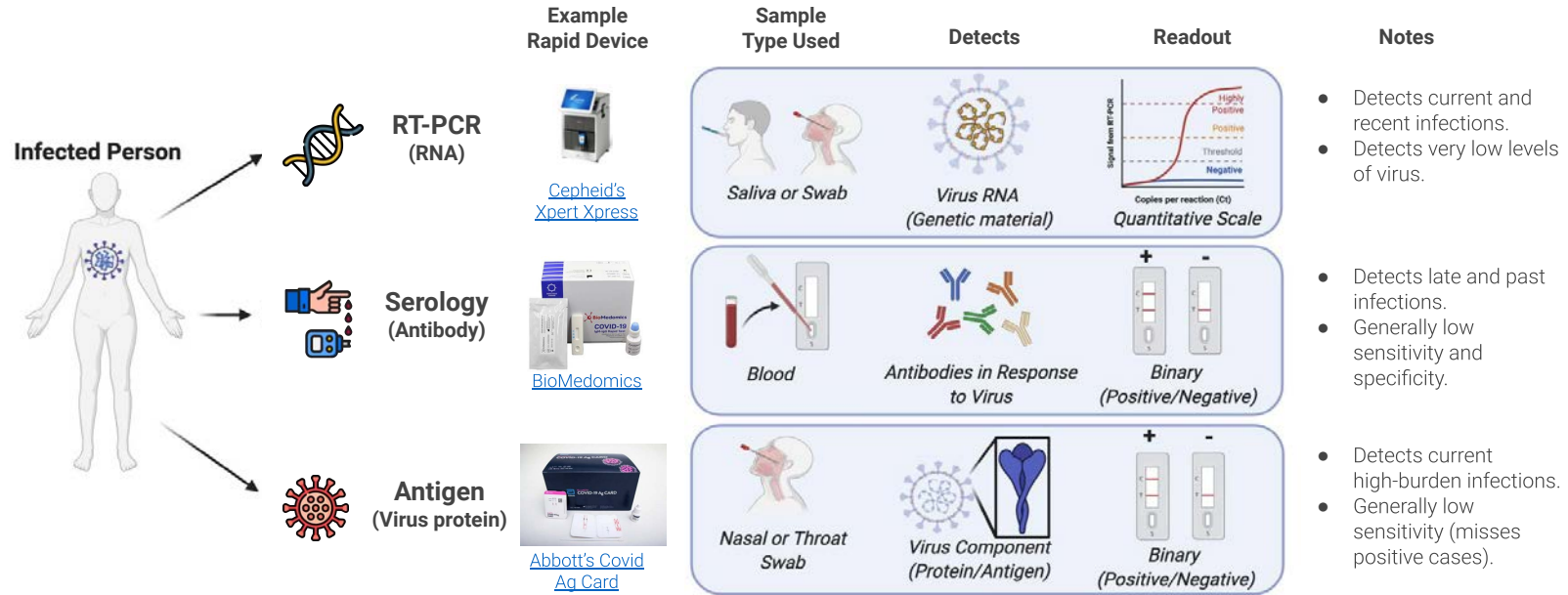
Timeline indicating the window during which the infection can be detected by the three test types, over the lifecycle of an infection



*Adapted from Prof. Dr. David Liu
Professor of Chemistry and Chemical Biology at Harvard University*

Each of the three test types detects a different molecule or protein arising from a person having COVID-19.

All three test types can be deployed by sending samples to a laboratory to be processed through conventional methods, as well as through 'rapid' devices. We highlight here examples of those rapid devices, and how they work.





RT-PCR tests detect the actual viral RNA from SARS-CoV-2, the COVID-19 virus, from either saliva or swab samples.

Advantages:

- Can be used to determine return-to-work status.
- Highly sensitive and reliably detects infections.

Disadvantages:

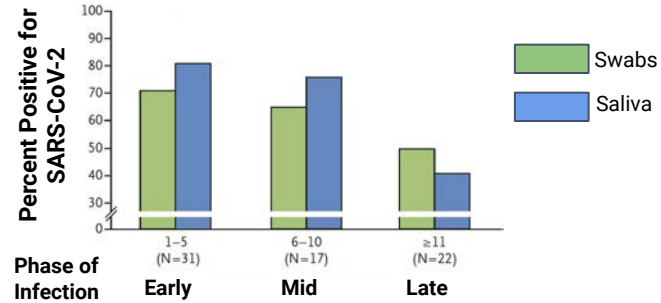
- No instant result (1 to 2 day window to result).
- Requires a contract with a lab partner.

Case Example: Cepheid's Xpert Xpress



The Xpert Xpress is highly accurate, but is difficult to procure, due to lack of availability. It may be a good future option of companies willing to make a \$50k++ investment for results within an hour. Companies will also need a local nurse and to obtain State regulatory approval.

Saliva vs Swabs



A research group has shown that, compared to nasopharyngeal swabs, saliva samples can detect a larger average number of SARS-CoV-2 virus. This means that the saliva test is more sensitive than swabs.

The same research group that published this paper has shown that saliva samples can be pooled to increase testing capacity.

Additionally, they developed SalivaDirect, an inexpensive RT-PCR method which is currently used by the NBA to do high-frequency COVID-19 diagnostics.

Adapted from [Wyllie et al.](#) New. Engl. J. Med. (2020)



Serology (antibody) tests detect the antibodies that are created in response to SARS-CoV-2.

Advantages:

- Rapid antibody tests could be used on-site if companies have a healthcare worker or lab technician on staff that can draw blood.
- A confirmed positive test means that the person has an active antibody response against SARS-CoV-2.

Disadvantages:

- Tests have lower sensitivity/specificity than RT-PCR.
- Antibody tests can't be used to decide whether people can go (back) to work.
- Requires a healthcare professional to draw blood and administer the test.
- Reporting of cases falls under the employer's responsibility.

Case Example: BioMedomics IgM-IgG Rapid Test



Images from: BioMedomics

BioMedomics IgM-IgG Rapid Test can be used in 10-15 minutes. The test requires a blood sample as input and therefore companies should have a nurse on staff. These types of antibody tests have a relatively [low sensitivity](#) (BioMedomics: 81.8%, 20 days after infection) and specificity (BioMedomics: 87.9%, 20 days after infection), which can lead to false-positive results.

Currently, there is no added value for employers to invest in rapid antibody testing, because there is no real use case for this test in a workplace environment.



Antigen tests detect the peak of current infections by measuring viral components of SARS-CoV-2 derived from nasal or throat swabs.

Advantages:

- Antigen tests exclusively detect active infections.
- Rapid tests can be used on-site if companies have a healthcare worker or lab technician on staff.
- Could be used to supplant RT-PCR.

Disadvantages:

- The tests have a far lower sensitivity/specificity than RT-PCR and can only detect the peak of infection.
- Antigen tests can't be used to decide whether people can go (back) to work.
- Requires a healthcare professional or lab specialist to operate tests.
- Reporting of cases falls under the employer's responsibility.

Case Example: Abbott's Covid Ag Card



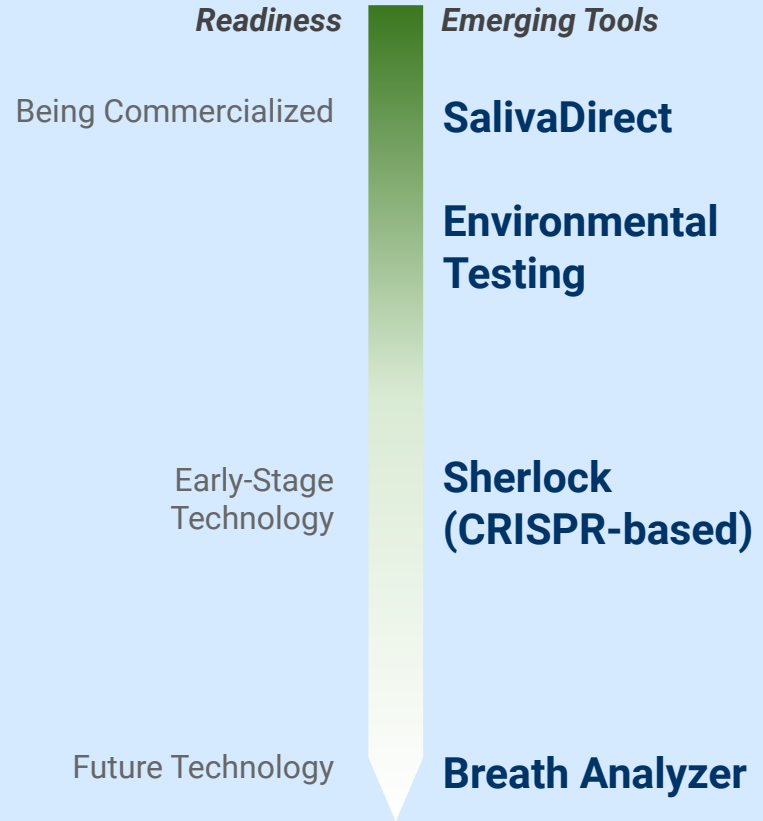
Images from: Abbott

Abbott's COVID-19 Antigen Test is a rapid (15-minute) lateral flow test that has to be administered by healthcare professionals or lab technicians, on-site. The test requires a naso-pharyngeal or nasal swab as sample input.

Rapid antigen tests can only detect very high amounts of virus (the test needs 1000x more virus particles to detect a positive sample compared with RT-PCR). This means it is prone to miss infections. For instance, the Quidel Sofia2 was found to miss an estimated 7 out of 10 infected cases. Therefore, use of this test would always have to be combined with a golden standard RT-PCR to reliably diagnose COVID-19.

Over the next year, new COVID-19 diagnostic tools are likely to emerge.

Innovators are continuing to make strides towards a test that is rapid, reliable and easy-to-use. Such testing technologies could supplement existing RT-PCR-based strategies.



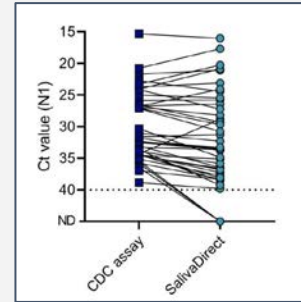
SalivaDirect: Rapid, low-cost saliva-based RT-PCR testing.

Status: Being Commercialized

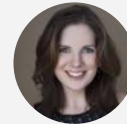
Typically, with RT-PCR testing, the genetic viral material (RNA) in a sample is isolated and undergoes a series of purification steps before performing RT-PCR. A recent study from Yale found that saliva samples can be used directly without the need for isolation of RNA. This method, called SalivaDirect, reduces costs normally associated with the RT-PCR testing process. It was used by the NBA to test all the players and staff in the Disney Bubble for the NBA finals.

- ✓ SalivaDirect saves time and is far less expensive because the viral RNA isolation step is removed.
- ✓ SalivaDirect retains all the benefits of regular RT-PCR. For instance, the method can detect very low amounts of virus.
- ✓ Collection of saliva is minimally invasive and can reliably be self-administered. This makes it ideal for on-site testing.

SalivaDirect at a Glance



SalivaDirect is an FDA-EUA approved RT-PCR technique that uses saliva instead of respiratory swabs. SalivaDirect is highly sensitive with a limit of detection of 6-12 SARS-CoV-2 copies/ μ L. When compared to a traditional RT-PCR test recommended by the CDC, using nasopharyngeal swabs, high agreement was found in testing outcomes (>94% overlap, see figure above). The technique is inexpensive and easy to implement. It was first piloted in the NBA during the Spring of 2020. (Source: [SalivaDirect Publication](#))



PRESCOUTER EXPERT NOTE:

“SalivaDirect is a game-changer and will allow for low-cost, rapid RT-PCR testing for workplaces and schools”

- Anne Wyllie - Developed SalivaDirect, Scientist at Yale University

Environmental Sampling: A proxy for measuring SARS-CoV-2 infections in a community.

Status: Being Commercialized

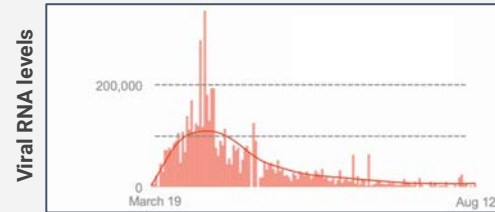
Monitoring the amount of virus in environmental samples, such as wastewater, is a powerful tool that can track COVID-19 outbreaks in a community. People with an active infection excrete the virus in their stool. The presence of the virus in stool can be measured with representative sampling of wastewater and consecutive RT-PCR testing. There are several advantages of environmental sampling over other diagnostic techniques.

- ✓ Environmental samples test a community as a whole with one test.
- ✓ Environmental samples have been shown to detect outbreaks early on and detect asymptomatic individuals as well.
- ✓ Besides wastewater, it is also possible to take samples from surfaces and centralized air ducts.

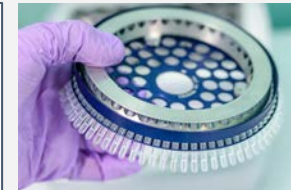
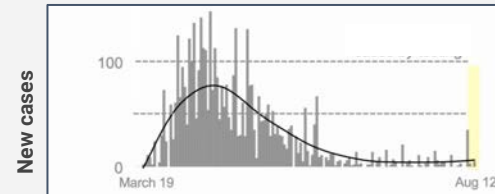
Case Study: Wastewater Sampling in New Haven (CT) Tracks Community Infections

In this study, wastewater samples were acquired between March and June 2020. Samples were analyzed for SARS-CoV-2 with RT-PCR. Wastewater screening correlated with the rise and fall of clinically confirmed cases. In addition, the study showed that monitoring the wastewater revealed an outbreak about 6–8 days ahead of positive test results acquired in the hospital. This means that wastewater sampling can be an early indicator of COVID-19 outbreaks. (Sources: [Nature Microbiology](#) & [CT Covid Tracker](#))

RNA levels in wastewater ([CT Covid Tracker](#))



New Confirmed Cases ([CT Government](#))



The levels of virus detected in wastewater exactly matched the clinically confirmed COVID-19 cases. This indicates that wastewater can be an early indicator of viral outbreaks in communities.

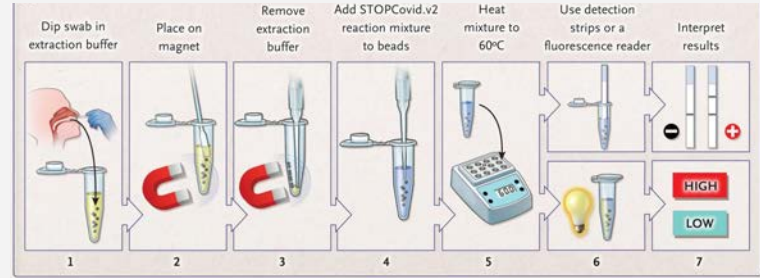
CRISPR-based Diagnostic Testing: Working towards an alternative, point-of-care testing.

Status: Early-Stage Technology

One way of solving testing capacity shortages is to invest in new methods that relieve the pressure on existing techniques and limited reagents. Until recently, [CRISPR-based diagnostic](#) testing was not possible in a point-of-care setting. A new research paper published in a leading scientific medical journal shows that simplification steps in the protocol can eliminate the need for viral RNA isolation as well as pipetting steps. The method is called STOP (SHERLOCK Testing in One Pot).

- ✓ STOP has the potential to be used at point-of-care settings.
- ✓ This technology can play a role in future disease diagnostics and has commercial potential.
- ✓ STOP has a lower sensitivity than RT-PCR but can still reliably detect positive samples.

Case Study: The CRISPR-based STOP.Covid Assay



STOP.Covid is a CRISPR-based COVID-19 diagnostic test that can be performed with minimal lab equipment. This allows use of this test in a point-of-care setting. First, a swab is acquired by a healthcare worker (step 1). Afterwards the swab is mixed with an extraction buffer and a magnet is used to capture viral genetic materials (step 2 & 3). After replacing the extraction buffer with a reaction mixture, the sample is heated to 60°C (step 4 & 5) and a dipstick can be used (80 minutes later) to read out the result. Alternatively, a fluorescence reader can be used to read the result after 45 mins at 60°C (step 6 & 7).



PRESCOUTER EXPERT NOTE:

“CRISPR-based testing strategies may not be ready for deployment in COVID-19 diagnostics, but are an incredibly promising tool for future disease diagnostics.”

- Ryan LaRanger, PhD, PreScouter Technical Director, PreScouter

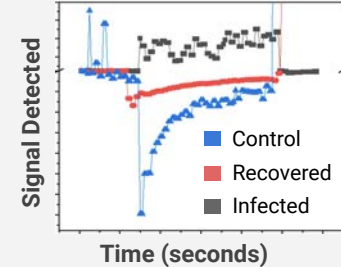
Breath Analyzer: The future of diagnostic screening detects biomarkers in patient breath.

Status: Future Technology

Disruptive technologies that can instantly and accurately diagnose COVID-19 are a holy grail. Whereas the diagnostic testing landscape is evolving rapidly, such a test is still out of reach, for now. However, proof-of-principle testing devices have been gaining traction. One such device is a breathalyzer that detects specific biomarkers that point to infection. Initial results show that such a breathalyzer has the potential to detect disease. Major advantages of a breath test include:

- ✓ Potentially instant results.
- ✓ Non-invasive method of analysis.
- ✓ Could be used anywhere, for instance at airports, events and shops.

Case Study: Nanomaterial-based breath analyzer can be used for COVID-19 screening



The graph above shows the signal that was detected using the breathalyzer from a single patient during his infection (grey line) and shortly after he was infected (red line). A control is used in the experiment to measure background signal. The device clearly shows a higher signal for the infected patient's breath. The training and test set data used in the paper shows a 76-94% accuracy in differentiating patients from controls as well as 90%-95% accuracy in differentiating between patients with COVID-19 and patients with other lung infections. Figure adapted from: [Breath Analyzer Paper](#).

ABOUT PRESCOUTER

DURING THIS PANDEMIC, PRESCOUTER IS LEVERAGING ITS NETWORK OF 4000+ EXPERTS, LAB PARTNERS AND PROTOTYPING FIRMS TO PROVIDE CLIENTS WITH THE TESTING EXPERTISE AND RESOURCES THEY NEED.

PreScouter traditionally provides corporate innovation and R&D leaders with expertise on emerging technologies and markets, during this pandemic. During this pandemic, PreScouter is vetting, selecting and promoting *best in class* testing solutions from lab partners, to providing clients with the unbiased expertise and the resources they need to deploy testing to safeguard their workplaces.

To learn more, contact us at covid19@prescouter.com or (708) 613-7132.

EXAMPLES OF OTHER PRESCOUTER PROJECTS:



Technologies and tactics for reducing disinfection time: What tools can companies use to automate disinfection and other safety practices.



Supply Chain Disruption: When traditional resources or raw materials are not available during a pandemic, PreScouter helps clients find alternative solutions - uncovering connections around the world.



Driving Consumer Confidence: Tactics that give workers and consumers confidence that they are in a safe environment, to ultimately drive their re-engagement in economic activity.

Important Disclaimer: The information provided in this briefing report is based on advice from public health authorities, other regulatory agencies and vendors, as well as news reports and scientific publications. This information has been analyzed, reviewed, and summarized by PreScouter. It is not a substitute for medical or legal advice about your employees, workplace, or obligations.

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