

Briefing Note

Testing Individuals for SARS-CoV-2 Coronavirus – A Guide for Food Businesses

How to arrange a SAR-CoV-2 test in the UK

In the UK, those **with symptoms** or those who have been asked to get a test by public health officials or by NHS Test and Trace can book a free PCR test (<https://www.gov.uk/get-coronavirus-test>).

For testing to identify SARS-CoV-2 in **symptomless (or asymptomatic)** individuals, as part of the Critical National Infrastructure, Food businesses can join a government scheme to test workers without symptoms who cannot work from home, using rapid lateral flow tests, (<https://www.gov.uk/get-workplace-coronavirus-tests>). With around 1 in 3 people with coronavirus having no symptoms, rapid testing in the workplace using lateral flow tests is an effective tool to identify these asymptomatic individuals keeping key workers from unknowingly passing on the virus.

Employer referral for essential workers

Employers can refer essential workers for testing if they are self-isolating because either they or members of their household have coronavirus symptoms. They can do this by uploading the names and contact details of self-isolating essential workers to the secure employer referral portal. Referred essential workers will then receive a text message with a unique invitation code to book a test for themselves (if symptomatic) or their symptomatic household members at a regional testing site.

To get a login to the employer referral portal, employers of essential workers should email portalservicedesk@dhsc.gov.uk with the following information:

- Organisation name
- Nature of the organisation's business
- Region
- Names (where possible) and email addresses of the 2 users who will load essential worker contact details

Background on SARS-CoV-2 Testing Methods

There are different types of "Covid-19" or SARS-CoV-2 tests available, each giving different information. Each is suitable, or unsuitable, for different purposes. The confidence that they can provide to inform your decision-making often depends on how the tests are used and interpreted. This Briefing Note is intended to guide you in whether testing is appropriate and selecting the correct test for purpose, and in any decision-making based on test results that their employees provide.

There are four main reasons to test people.

- To diagnose individuals who are infective, so that they can self-isolate
- To estimate the overall prevalence of infection in a population, school or workforce, or to model the epidemiology
- To identify individuals who are immune, because of vaccination or previous infection, in order to relax restrictions around their activities (the "Green Card" approach)
- To sequence the strain of the virus, to study mutations and changes in its structure



Each favours a different type of test and demands different levels of certainty or confidence in the results.

(The testing of food, food contact materials and workplace surfaces is covered in a separate IFST Briefing Note)

What can the tests detect?

Each SARS-CoV-2 virus particle (“virion”) contains a signature RNA surrounded by a shell of proteins. Virions are infective and cause COVID-19. There are tests for the component parts of the virion, but these do not prove that it is intact and infective. The infectivity must be inferred from the context (e.g. if the sample was taken from somebody’s throat, the inference is that it is intact and infective, even if the person is asymptomatic).

Once someone has been infected or vaccinated, their body produces antibodies. These circulate in the blood for at least a few months. There are tests to detect these antibodies. If antibodies are detected, the inference is that the person has some degree of immunity. This inference lacks evidence, but is the working assumption of the majority of professional virologists.

If a person has a fever, their body temperature increases. This could, in principle be detected by a temperature check. In practice, temperature checks do not detect asymptomatic COVID-19 spreaders, and give many false positive results (high temperature for reasons other than COVID-19). They are not discussed here.

What types of tests are available?

Tests for detecting whether people are infected with SARS-CoV-2 coronavirus include tests which specifically detect presence of the virus by detecting viral RNA or protein, or by detecting the presence of antibodies to the virus. Tests for the virus or uninfected virion are sometimes called “antigen tests”.

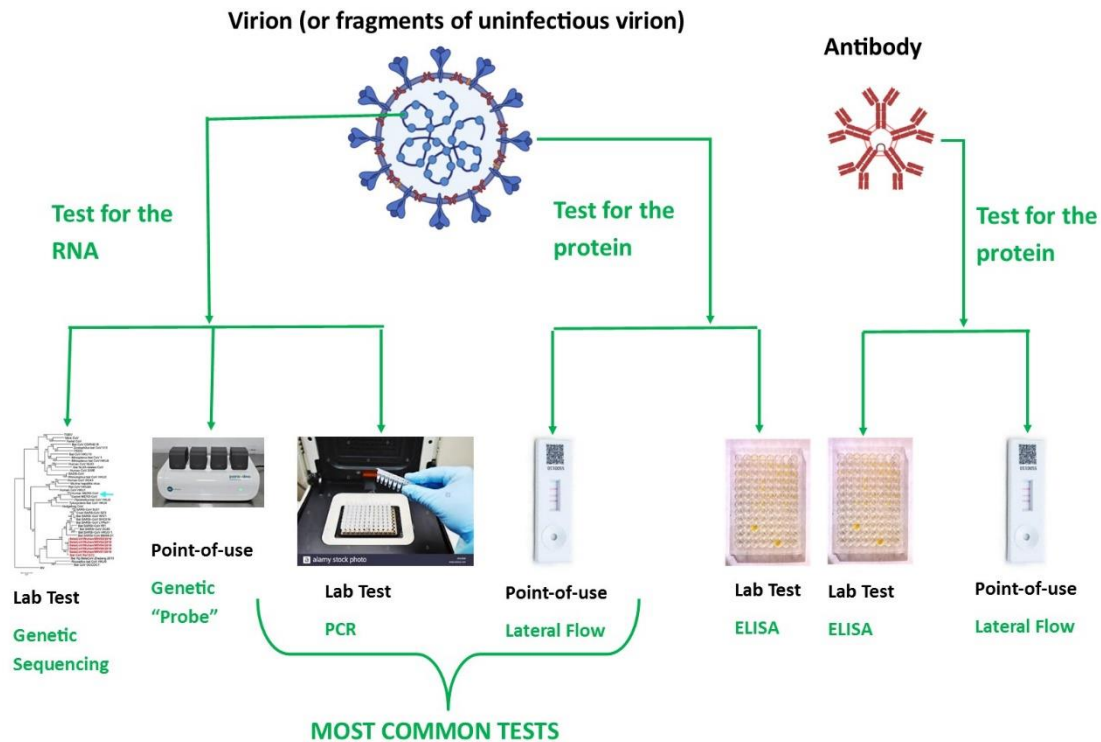
Test technology is developing rapidly, and tests based on different principles are continually being launched. The diagram below shows examples of the types of test available.

The Polymerase Chain Reaction (PCR) amplifies the RNA until the point at which it can be detected. This is viewed as the gold-standard test for diagnosing individuals who are infectious.

Lateral flow tests for virion proteins are widely used in UK schools and workplaces, and one test kit has been piloted for mass-population testing in Liverpool.

UK government have produced a short overview of the lateral flow testing technology behind asymptomatic testing and the role these tests play in the national COVID-19 testing programme. See https://www.gov.uk/guidance/understanding-lateral-flow-antigen-testing-for-people-without-symptoms?utm_medium=email&utm_campaign=govuk-notifications&utm_source=e06e67b6-56cb-41de-8c28-79767bfc8b7d&utm_content=daily





How to choose a test and interpret the result?

PCR and lateral flow tests have different strengths and weaknesses. The detection limit and false positives are those attributes that most affect interpretation of results.

	PCR	Lateral flow
Sampling	Uncomfortable, and prone to error (throat and/or nose swab)	Uncomfortable, and prone to error (throat and/or nose swab)
Time to result	Typically, 48-hours	Typically, 30-minutes
Quantification (how many virions are present)	No	No
Detection limit	Extremely low. Some risk that it may identify people as infectious when they have too few virions to be infectious.	Varies. Some risk that it may miss people who have a low number of virions (or inefficient swab sample) but who are infectious. Much more confidence that it will correctly identify people who are highly infectious.
False positives (substances other than the target RNA/protein giving a positive result)	Extremely low. Tests for RNA are extremely selective.	Varies. All tests are based on antibody-antigen "lock-and-key" binding, which inherently cannot guarantee selectivity.



These tests are often described and quantified in terms of their:

- **Sensitivity** – the percentage of true “positive” samples that the test will identify as positives
- **Selectivity** – the percentage of true “negative” samples that the test will identify as negatives

These can be difficult to define, as there is not a standard benchmark of what constitutes a true “positive” or “negative”. This is because the tests are not quantitative, and because it is unknown how many virions are the lower limit for infectivity. In principle, a “positive” could be a person carrying one single virion (which would not be infective, and which no current test would detect). In practice, the PCR is taken as the benchmark against which other tests are measured. By this definition, PCR by default has 100% sensitivity.

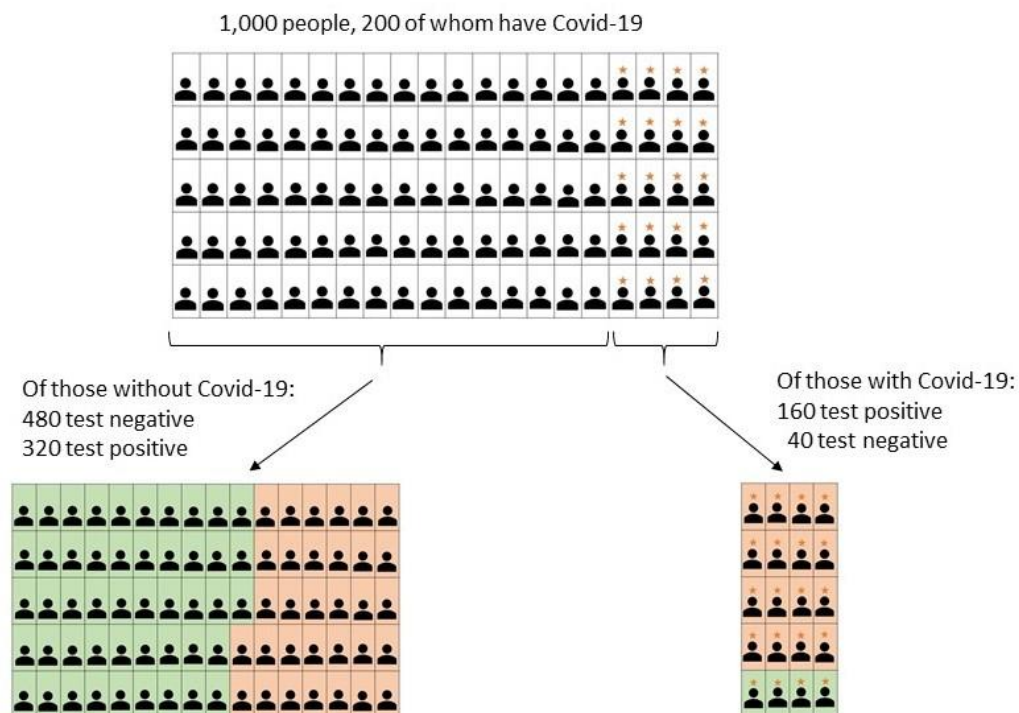
Figures for the sensitivity and selectivity of lateral flow tests can be highly contended, with vendors claiming performance that academics subsequently challenge, or is reliant on over-optimistic assumptions about how well the swab samples are taken.

The usefulness of lateral flow tests to inform decision-making is highly dependent on three factors:

- Their sensitivity (which is, in turn, driven by the efficiency of the swab sampling)
- Their selectivity
- The prevalence of COVID-19 in the population

This can be illustrated by the following example, if 1000 people were tested and

- The sensitivity is 80%
- The selectivity is 60%
- The prevalence of COVID-19 is 20%



Overall outcome, from the 1,000 people:

480 positive tests, of which only 160 are people with Covid-19
520 negative tests, of which 40 are people who have Covid-19



It follows that lateral flow tests are poor for applications such as workforce screening if the **selectivity** is low and the **prevalence** of Covid-19 in the population is low – in these cases they will generate a large proportion of “false positive” results.

An individual person should never assume they are “clear” on the basis of a lateral flow test result. This is because no lateral flow tests are 100% **sensitive**.

If an individual has a positive lateral flow test they should assume the result is correct and self-isolate, but may choose to follow up with a PCR test to confirm the result. If the result is not confirmed then they can stop self-isolating.

