

## Testing

**i** *PCR-based tests are recommended for the diagnosis of acute COVID-19 infection. Upper respiratory tract samples should be sent on all patients. Sputum or (if the patient is intubated) bronchoalveolar lavage samples should be sent when available.*

**i** *Due to very poor sensitivity within the first 1-2 weeks after symptom onset, serology is not recommended for the diagnosis of acute COVID-19 infection.*

Patients seeking healthcare services for potential COVID-19 should preferably phone ahead of time to their doctor, clinic, emergency room, or closest testing centre, so that adequate precautions can be taken. Patients should wear masks while in transit to the hospital (cloth masks can suffice until they are given a surgical mask on arrival). Patients who do not self-identify as potentially having COVID-19 should be screened and identified as soon as possible upon arriving at a health facility, to avoid prolonged contact with other patients and healthcare workers.

A suspected COVID-19 case includes any person presenting with an **acute** ( $\leq 14$  days) **respiratory tract infection** or other clinical illness compatible with COVID-19, or an asymptomatic person who is a close contact to a confirmed case.

In the context of COVID-19, the key respiratory syndrome consists of ANY of:

- Cough
- Sore throat
- Shortness of breath
- Anosmia or dysgeusia

... with or without other symptoms (which may include fever, weakness, myalgia, or diarrhoea).

An acute exacerbation of a chronic pulmonary condition (e.g. COPD, asthma) should also be regarded as potentially being due to COVID-19.

Atypical manifestations are increasingly being recognised, including large vessel strokes in young patients, diabetic ketoacidosis/hyperglycaemic hyperosmolar syndrome, unexplained abdominal pain, various dermatological manifestations, and a multisystem inflammatory syndrome in children.<sup>1-3</sup>

A close contact is defined as a person having had face-to-face contact ( $\leq 1$  metre) or having been in a closed space with a confirmed COVID-19 case for at least 15 minutes. This includes, amongst others:

- All persons living in the same household as a COVID-19 case, and people working closely in the same environment as a case.
- Healthcare workers or other people providing direct care for a COVID-19 case while not wearing recommended personal protective equipment or PPE (e.g., gowns, gloves, N95 respirator, eye protection).
- A contact in an aircraft sitting within two seats (in any direction) of the case, travel companions or persons providing care, and crew members serving in the section of the aircraft where the case was seated

## Testing

Testing for acute COVID-19 infection should be by means of polymerase chain reaction (PCR) assays.

Samples to be sent are:

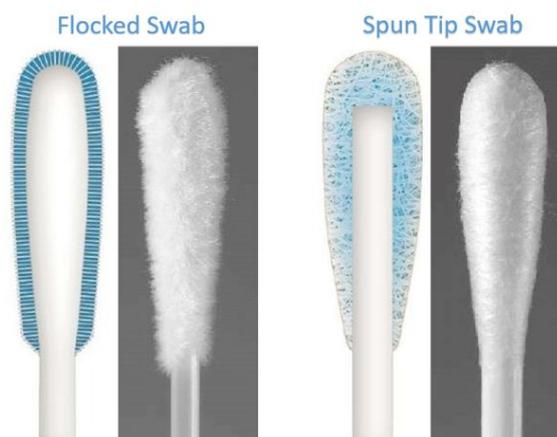
- *Upper respiratory tract samples* – A sample from the upper respiratory tract should be sent from all patients. A single site is sufficient. Currently, a nasopharyngeal swab is the preferred specimen, but in patients where this is not possible (e.g. recent nasal surgery, or severe coagulopathy), an oropharyngeal, nasal mid-turbinate, or anterior nares swab can be collected instead.<sup>4,5</sup>
- *Lower respiratory tract samples* – send when available. Lower respiratory tract samples may have a higher sensitivity than upper respiratory tract samples.<sup>4,6</sup> Sputum, tracheal aspirates, or bronchoalveolar lavage fluid are all acceptable samples to send. Sputum induction should not be performed however.

Where both upper and lower respiratory tract samples are available, both should be sent.

Appropriate personal protective equipment (PPE) should be worn by all healthcare workers when obtaining specimens (see IPC section).

### Obtaining samples for SARS-CoV-2 testing

- Healthcare workers obtaining respiratory samples require appropriate personal protective equipment, including eye protection (goggles or visor), gloves, an apron or gown, and an N95 respirator (or equivalent, e.g. FFP2 mask). Meticulous hand hygiene is also essential. See section 6 for further details.
- Collecting a good quality specimen is vital – see box below.
- Appropriate swabs are flocked or spun, and consist of polyester, nylon or rayon material with a plastic or aluminium shaft. Cotton swabs, calcium alginate swabs, and swabs with a wooden shaft are not recommended, as they may contain substances that inactivate SARS-CoV-2 and inhibit PCR testing.



*Illustrations obtained from publically available material*

### Transport of specimens

- Nasopharyngeal, mid-turbinate and anterior nares samples should ideally be placed in viral/universal transport medium (UTM) and kept between 2-8°C until they are processed at the laboratory. Due to constraints in the supply of viral/universal transport medium, dry

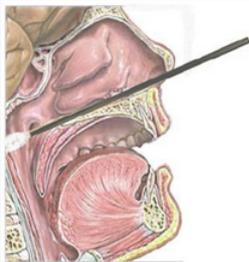
swabs can be sent provided that the sample will reach the laboratory within 2 days. Dry swabs can be sent at ambient temperature.

- Lower respiratory tract samples can be sent in standard specimen containers and do not require viral/universal transport medium.

<b>Transport time to testing laboratory</b>	
<b>&lt;2 days:</b> can use dry swab (no transport medium needed) and can be transported at ambient temperature	<b>&gt;2 days:</b> transport in UTM, preferably at 2-8°C. If UTM is not available, can use normal saline as an alternative.

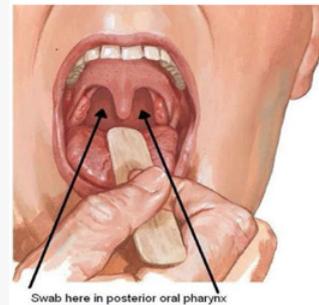
#### Collection of a nasopharyngeal specimen

1. Ask the patient to tilt his/her head back slightly.
2. Gently insert swab into the nostril, aiming backwards (not upwards) until a slight resistance is met – about the distance from the nose to the anterior ear. If resistance is met before fully inserted, remove and try the other nostril.
3. Rotate swab 2-3 times and hold in place for 2-3 seconds.
4. Slowly withdraw the swab and put it into the specimen tube containing universal transport medium.
5. Break the swab's shaft and close the tube.



#### Collection of an oropharyngeal specimen

1. Ask the patient to tilt his/her head back and open their mouth.
2. Hold the tongue down with a tongue depressor.
3. Have the patient say "aahh" to elevate the uvula.
4. Swab each tonsil first, then the posterior pharynx in a "figure 8" movement.
5. Avoid swabbing the soft palate or the tongue as this can induce the gag reflex.
6. Place the swab into the same specimen tube.
7. Break the swab's shaft and close the tube tightly.



#### Collection of a mid-turbinate specimen

1. Ask the patient to tilt his/her head back slightly.
2. Gently insert swab less than 2cm into the nostril (until resistance is met at the turbinates).
3. Gently rotate swab several times against the nasal wall.
4. Repeat in the other nostril using the same swab.
5. Withdraw the swab and put it into the specimen tube containing universal transport medium.
6. Break the swab's shaft and close the tube.

#### Collection of an anterior nares (nasal) specimen

1. Ask the patient to tilt his/her head back slightly.
2. Insert the swab at least 1 cm inside the nares.
3. Firmly sample the nasal membrane by rotating the swab and leaving it in place for 10-15 seconds.
4. Sample both nares with the same swab.
5. Withdraw the swab and put it into the specimen tube containing universal transport medium.
6. Break the swab's shaft and close the tube.

### Repeat testing

PCR tests may produce false negative results due to factors such as poor sampling technique, suboptimal specimen storage (e.g. unavailability of viral/universal transport medium, or specimen not stored at cold temperatures), the site the sample is obtained from, and the time point at which the swab is taken (viral loads are usually highest early on in the disease course). If a high clinical suspicion for COVID-19 persists despite an initial negative test, repeat testing should be considered in consultation with an infectious diseases expert, particularly in hospitalised patients for whom management might be significantly altered. However, it is equally important to maintain a broad differential diagnosis and to always consider alternative diagnoses (see box below).

A single positive PCR test is sufficient proof of COVID-19 infection. There is no role for repeat “confirmatory” PCR testing on patients who test positive despite the absence of symptoms, as PCR-based tests have excellent specificity, and asymptomatic and presymptomatic COVID-19 patients are now well described.

The **differential diagnosis** of suspected cases includes influenza (remembering the seasonality), both conventional and atypical bacterial pneumonias, and in patients with HIV and a CD4 count <200 cells/mm<sup>3</sup> (or equivalent immunosuppression), *Pneumocystis jirovecii* pneumonia (PJP).

Malaria as the cause of an acute febrile illness (typically with headache, rigors and malaise) must always be considered in persons residing in or travelling from malaria transmission areas.

Non-infectious causes of dyspnoea and/or fever should also be considered, such as pulmonary emboli, myocardial infarction, and heart failure.

For patients with severe disease who require admission, appropriate tests may include:

- HIV test (if status unknown)
- Full blood count + differential
- Blood culture
- Nasopharyngeal and/or oropharyngeal swabs for detection of viral and atypical pathogens
- Chest radiography
- Sputum for MCS and *Mycobacterium tuberculosis* detection (GeneXpert MTB/RIF Ultra).
- Urine for lipoarabinomannan (LAM) if HIV positive
- Beta-D-glucan and expectorated sputum/tracheal aspirate for PJP if HIV positive and clinically suspicious of PJP (don't induce sputum though)

For patients with mild disease who do not require admission, a more limited workup may be appropriate. Depending on the specific presentation, test may include:

- HIV test (if status unknown)
- Sputum GeneXpert MTB/RIF Ultra if patient is HIV positive and is coughing (would fulfil case definition for TB), or if HIV negative and in close contact with TB patients

### Antibody tests

**Currently, we do not recommend using antibody-based (serological) tests for the diagnosis of acute COVID-19.** These tests are insufficiently sensitive early in the disease course (before sufficient antibodies have been produced).<sup>7,8</sup>

- Antibody-based tests may have a role in other scenarios, such as for seroprevalence surveys

Point of care antigen tests

We do not currently recommend point of care antigen-based tests, due to concerns about poor sensitivity and specificity.<sup>9</sup>

## References

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