



COVID-19 Screening Solutions



Literature review: recommendations for COVID-19 diagnostic tests

● Early diagnosis by RT-PCR in the acute phase of infection

- Reduced window of detection of viral RNA in swabs¹
- Sample collection has a significant impact on the quality of the result

● Serology as a complement to RT-PCR screening

- Delayed appearance of antibodies: from D13 onwards all patients are IgM and/or IgG positive²
- If symptoms appear but RT-PCR test is negative, serological screening allows to identify patients that are still potentially contagious

● CRP testing as an aid in screening

- CRP levels in infected patients increase proportionally to the severity of the infection³

¹ Wölfel, R., Corman, V.M., Guggemos, W. et al. Virological assessment of hospitalized patients with COVID-2019. *Nature* (2020).
² Ahmed TSOURIA, Perrine BOURGEIOS, Isabelle RAUZY, Laurine KRZECZOWSKI, Yannick COSTA from the Medical Biology Laboratory, Evaluation of BIOSYNEX COVID-19 BSS (IgG/IgM), Grand Hôpital de l'Est Francilien, data on file.
³ Jin-jin Zhang et al. Clinical characteristics of 140 patients infected with SARSCoV-2 in Wuhan, China. *Allergy*. 2020;00:1–12.

Symptoms of COVID-19

The onset of COVID-19 symptoms are gradual, unlike the flu whose onset is abrupt.

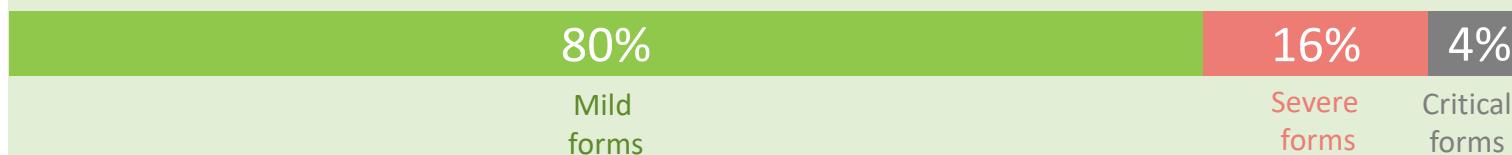
There are several clinical signs, however they are not specific to COVID-19:

Most common symptoms include fever, dry cough and tiredness.

Other symptoms that are less common and may affect some patients include aches and pains, nasal congestion, headache, conjunctivitis, sore throat, diarrhea, loss of taste or smell or a rash on skin.

In the case of respiratory symptoms requiring hospitalisation, a chest CT scan confirms the disease and assesses its severity.

Distribution of severity in subjects with COVID-19⁴



Infection remains asymptomatic or paucisymptomatic in 30-60% of infected subjects⁵. Antibody development in these patients is also delayed⁶.

COVID-19 Diagnostics tests⁷

Contact with SARS-CoV-2 virus

Asymptomatic phase

2 to 12 days

Symptomatic phase

A few days to a few weeks

Recovery

Viral RNA detectable

Peak viral concentration at D5¹

Specific antibodies detectable

IgM first, than IgG persisting for at least several months

Elevated CRP

In 92% of cases³

Lymphocytopenia

In 84% of cases⁷

Pulmonary lesions on the CT-Scan

uni then bilateral⁸

RT-PCR specific to SARS-CoV-2

Serological test specific to SARS-CoV-2 (rapid test or ELISA)

Non-specific, exclusion or confirmation tests for COVID-19

⁴ Wu, Z. and J.M. McGoogan, Characteristics of and Important Lessons From the Coronavirus Disease 2019 (COVID-19) Outbreak in China: Summary of a Report of 72 314 Cases From the Chinese Center for Disease Control and Prevention. *JAMA*, 2020.

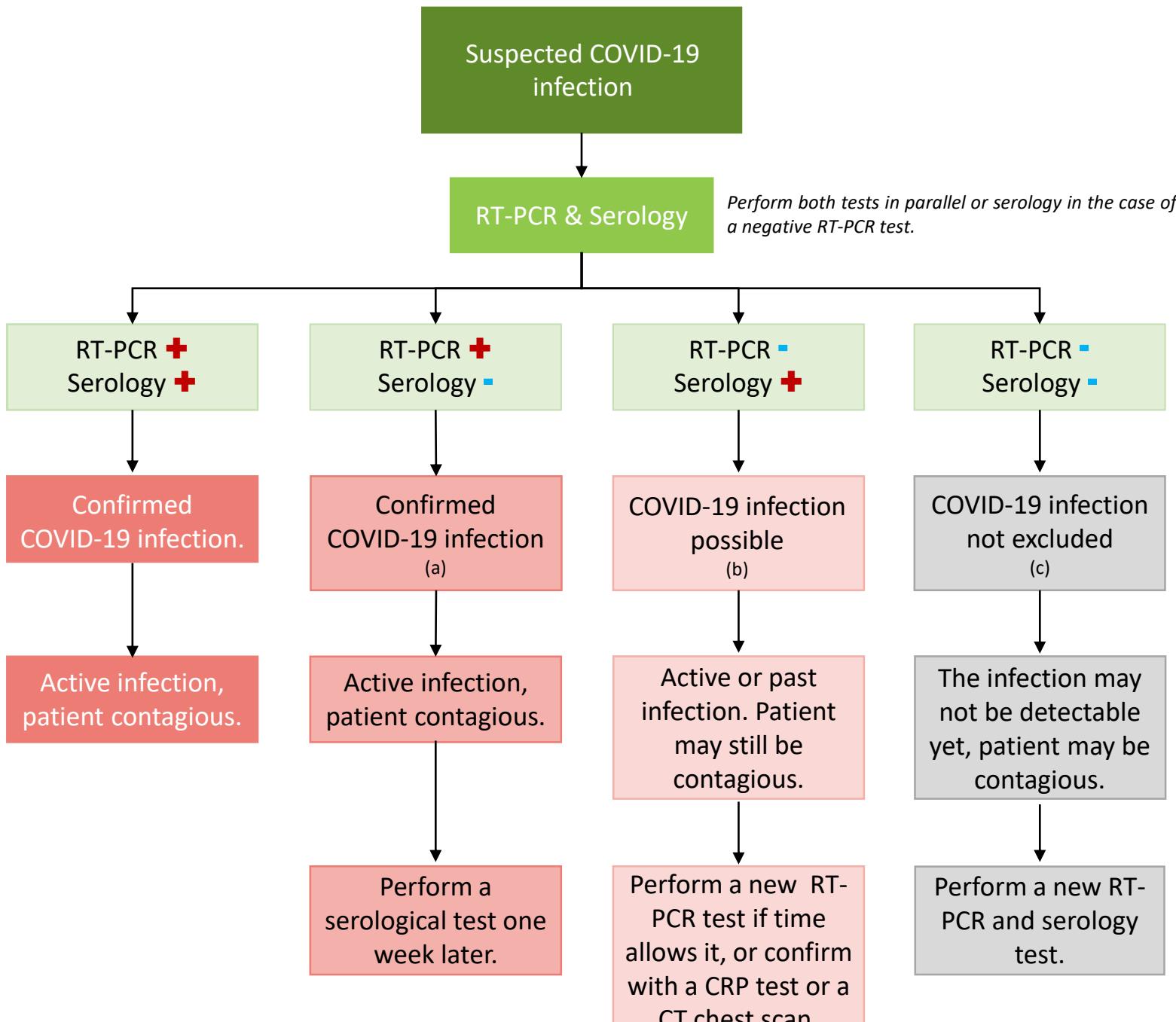
⁵ www.pasteur.fr/fr/centre-medical/fiches-maladies/maladie-covid-19-nouveau-coronavirus

⁶ www.pasteur.fr/fr/espace-presse/documents-presse/developpement-evaluation-quatre-tests-serologiques-detection-anticorps-anti-sars-cov-2-deux-tests

⁷ W. Guan *et al.* Clinical Characteristics of Coronavirus Disease 2019 in China *NEngJIMed* (2020).

⁸ Shi, H., *et al.*, Radiological findings from 81 patients with COVID-19 pneumonia in Wuhan, China: a descriptive study. *The Lancet Infectious Diseases* (2020).

⁹ Sundararaj Stanleyraj Jeremiah *et al.*, Interpreting Diagnostic Tests for SARS-CoV-2. *JAMA*, Published online May 6, 2020.



(a) A negative serology and a positive RT-PCR test, may indicate the early stage of infection. Antibodies may not yet be detectable, especially if the test was performed before 13 days after the onset of symptoms. Repeating the serological test one week later allows monitoring of disease progression and the development of SARS-CoV-2 specific antibodies.

(b) This may be a false negative RT-PCR result. Possible explanations include: poor quality of the sample containing little viral material, incorrect sample collection or sample collected too late in the infection, sample handled/transported under inappropriate conditions, problems inherent in the RT-PCR test technique (presence of PCR inhibitors such as blood or mutation of the virus).

(c) Negative serology may be due to sample collection too early in the infection. Antibodies may not yet be detectable, especially if the test was performed before 13 days after the onset of symptoms. It may also be a false negative RT-PCR result due to poor quality of the sample containing little viral material, incorrect sample collection or sample collected too late in the infection, sample handled/transported under inappropriate conditions, problems inherent in the RT-PCR test technique (presence of PCR inhibitors such as blood or mutation of the virus). Repeat RT-PCR 24 hours later and serology one week later to definitively rule out the diagnosis of COVID-19.