

25 May 2020

## **Public Health Laboratory Network evidence review on the utility of COVID-19 testing to reduce the 14-day quarantine period**

The Public Health Laboratory Network (PHLN) has reviewed evidence for the 14-day quarantine period of suspected COVID-19 cases. The review assessed if testing protocols for SARS-CoV-2 could be used to reduce the length of the quarantine period or facilitate early release.

PHLN confirms the requirement for any quarantine period to remain at 14 days duration.

There is no new evidence to indicate the quarantine period should be reduced. Testing early in the incubation period before symptoms develop may not detect infection, and a negative test result cannot be used to release individuals from quarantine prior to the outer range of the incubation period. An asymptomatic person who returns a negative test prior to the outer limit of the incubation period may still become infectious in that period. The median incubation period for COVID-19 is 4.9 to 7 days, with a range of 1 to 14 days.<sup>1,2,3,4,5,6,7</sup> Most people who are infected and develop symptoms will develop symptoms within 14 days of infection.<sup>1</sup> The duration of any required quarantine is 14 days, because it is possible for an individual to be infected just prior to quarantine and not become infectious until late in that period. Early testing may not detect infection, and release from quarantine based on a negative test could allow an infectious person to infect others in the community.

PHLN note there are two main types of tests for COVID-19, which detect either the presence of the SARS-COV-2 virus itself, or antibodies to the virus produced as part of the immune response.

The diagnostic tests for COVID-19 are known as nucleic acid tests, or polymerase chain reaction (PCR) tests, and are used to detect the presence of the virus in individuals suspected of having COVID-19. These individuals usually have characteristic symptoms. However, the test may not always detect the virus when it is present in low levels, as the amount of virus rises and falls after infection and at certain points in time the level may not be high enough to be detected by the test. Figure 1 depicts the typical rise and fall of the viral ribonucleic acid (RNA) in the airways over 21 days after infection with SARS-CoV-2. PCR testing is most useful during the first 7 days of symptoms,

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<sup>1</sup> Lauer S, Grantz K, Bi Q, Jones F.K., Zheng Q et al. The Incubation Period of Coronavirus Disease 2019 (COVID-19) From Publicly Reported Confirmed Cases: Estimation and Application. *Annals of Internal Medicine*. <https://doi.org/10.7326/M20-0504> (accessed 12 May 2020)

<sup>2</sup> Liu J, Liao X, Qian S, Yuan J, Wang F, Liu Y, et al. Community transmission of severe acute respiratory syndrome coronavirus 2, Shenzhen, China, 2020. *Emerging Infectious Diseases*. <https://doi.org/10.3201/eid2606.200239> (accessed 12 May 2020)

<sup>3</sup> WHO. Coronavirus disease 2019 (COVID-19): Situation Report – 73. Geneva: World Health Organization; 2020 2 April 2020. <https://www.who.int/docs/default-source/coronaviruse/situation-reports/20200402-sitrep-73-covid-19.pdf> (accessed 12 May 2020)

<sup>4</sup> Xia W, Liao J, Li C, Li Y, Qian X et al. Transmission of corona virus disease 2019 during the incubation period may lead to a quarantine loophole (preprint). <https://doi.org/10.1101/2020.03.06.20031955> (accessed 12 May 2020)

<sup>5</sup> Li Q, Guan X, Wu P, Wang X, Zhou L et al. Early transmission dynamics in Wuhan, China, of Novel Coronavirus-Infected Pneumonia. *The New England Journal of Medicine* 2020; 382:1199-1207. <https://doi.org/10.1056/NEJMoa2001316> (accessed 12 May 2020)

<sup>6</sup> Qifang Bi, Yongsheng Wu, Shujiang Mei et al. Epidemiology and transmission of COVID-19 in 391 cases and 1286 of their close contacts in Shenzhen, China: a retrospective cohort study. *Lancet Infect Dis* 2020. [https://doi.org/10.1016/S1473-3099\(20\)30287-5](https://doi.org/10.1016/S1473-3099(20)30287-5) (accessed 18 May 2020)

<sup>7</sup> Backer JA, Klinkenberg D, Wallinga J. Incubation period of 2019 novel coronavirus (2019-nCoV) infections among travellers from Wuhan, China, 20-28 January 2020. *Euro Surveill*. 2020 Feb;25(5):2000062. doi: 10.2807/1560-7917.ES.2020.25.5.2000062. (accessed 18 May 2020)

before the virus is cleared by the immune system. After initial infection with SARS-CoV-2, it takes a number of days for viral replication to produce enough genetic material to be detected by PCR. This occurs roughly 2-3 days before symptoms become apparent. Testing during the incubation period may return a negative result, even when an individual is infected with SARS-CoV-2. There is currently no test that will reliably detect the virus during the incubation period. Further, the PCR test becomes negative later in the course of infection once the virus has been cleared by the immune system and symptoms resolve. At this time, a window period occurs where low viral RNA levels may not be detectable and antibodies cannot be reliably detected, so both the PCR and serology tests may be negative even though the virus is present during the incubation period.

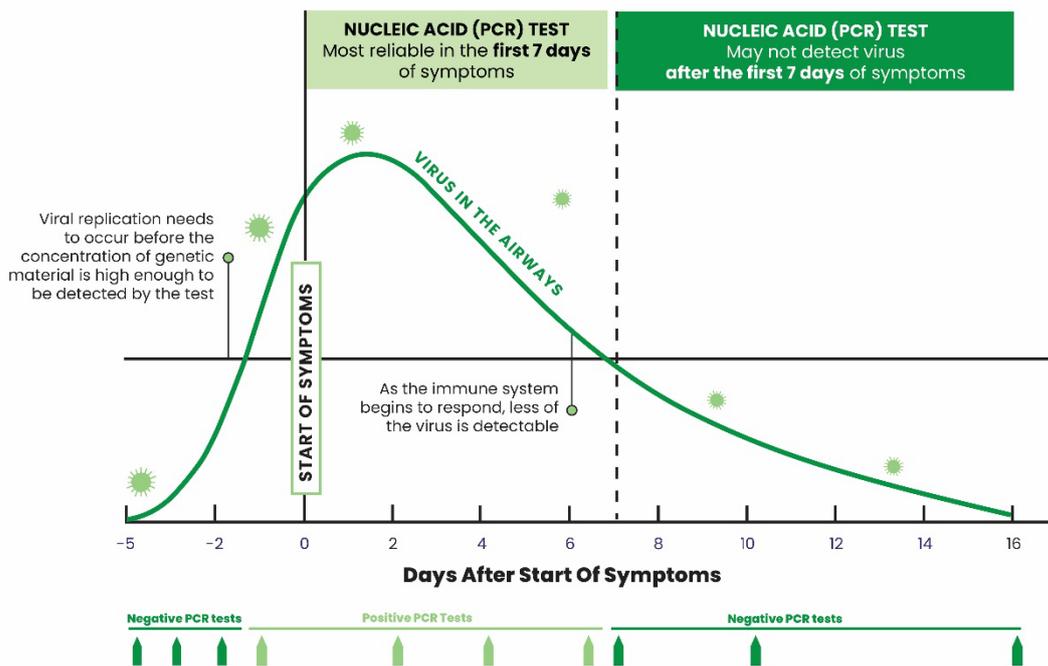


Figure 1. The rise and fall of viral RNA in the airways and Antibodies in the blood over 21 days post-infection

The antibody test, known as serology, detects antibodies produced in the immune response to the virus and is most useful after 10 days post the start of symptoms in most people. Antibodies usually take more than 1 to 2 weeks<sup>8</sup> after infection with SARS-CoV-2 to be produced and be detected by serology testing. Serology can be used to determine if someone has had the disease in the past, but is not useful to identify acute infection or if an individual is infectious.<sup>9,10</sup> As antibody responses have been demonstrated to be variable,<sup>11</sup> their presence in the blood cannot be used to pinpoint the time of infection and does not necessarily imply an infection of more than 1 to 2 weeks earlier. In

<sup>8</sup> Coronavirus Disease 2019 (COVID-19). CDNA National Guidelines for Public Health Units. [https://www1.health.gov.au/internet/main/publishing.nsf/Content/7A8654A8CB144F5FCA2584F8001F91E2/\\$File/COVID-19-SoNG-v2.10.pdf](https://www1.health.gov.au/internet/main/publishing.nsf/Content/7A8654A8CB144F5FCA2584F8001F91E2/$File/COVID-19-SoNG-v2.10.pdf) (accessed 18 May 2020)

<sup>9</sup> Wölfel, R., Corman, V.M., Guggemos, W. et al. Virological assessment of hospitalized patients with COVID-2019. *Nature* (2020). <https://doi.org/10.1038/s41586-020-2196-x>

<sup>10</sup> Disease 2019 (COVID-19). CDNA National Guidelines for Public Health Units. [https://www1.health.gov.au/internet/main/publishing.nsf/Content/7A8654A8CB144F5FCA2584F8001F91E2/\\$File/COVID-19-SoNG-v2.10.pdf](https://www1.health.gov.au/internet/main/publishing.nsf/Content/7A8654A8CB144F5FCA2584F8001F91E2/$File/COVID-19-SoNG-v2.10.pdf) (accessed 18 May 2020)

<sup>11</sup> Guo L, Ren L, Yang S, et al. Profiling Early Humoral Response to Diagnose Novel Coronavirus Disease (COVID-19) [published online ahead of print, 2020 Mar 21]. *Clin Infect Dis*. 2020;ciaa310. doi:10.1093/cid/ciaa310

addition, the presence of antibodies cannot be reliably used to confirm a previous infection, nor can it be used to determine that a person has immunity<sup>12</sup> and does not require quarantine.

If an individual is infected immediately before entering quarantine, they may not show symptoms, and testing during this time cannot reliably determine infection status. If an infected individual was released early on the basis of a negative test, they may then go on to subsequently develop infection and infect others in the community. Testing therefore cannot be a substitute for 14 days of quarantine.

PHLN emphasise the best guide for controlling the risk of disease transmission is current knowledge of the epidemiology and pathogenesis of COVID-19. The main role of quarantine in preventing transmission is to decrease contact of the asymptomatic quarantined person with susceptible individuals, in case the quarantined person is infectious. On the basis of current knowledge, a minimum of 14 days quarantine is required for quarantine to be effective.

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<sup>12</sup> WHO. "Immunity passports" in the context of COVID-19. Geneva: World health Organization; 2020 24 April 2020. <https://www.who.int/publications-detail/immunity-passports-in-the-context-of-covid-19> (accessed 19 May 2020)