The impact of the COVID-19 pandemic on other diseases

Despite the introduction of protective measures, the COVID-19 pandemic has continued to take hold across the world. The latest data from the World Health Organisation indicates that over 40 million cases and 1.1 million deaths have been reported, with the spread of SARS-CoV-2 continuing to accelerate[1]. Aside from the direct implications on individuals, their families, and our collective lifestyles, there are also profound indirect effects of rising infection rates. These include barriers to accessing essential healthcare, mental health impacts, limited social services, and an increase in the incidence of other diseases caused by pathogenic microorganisms[2].

Legionella

Legionella describes a group of pathogenic bacteria responsible for a potentially fatal pneumonia-like illness called Legionnaires disease. The bacteria are common in low numbers in freshwater environments. However, they can multiply in manmade water systems such as air conditioning cooling towers and humidifiers, leading to disease outbreaks in apartment buildings, hospitals, nursing homes, and other industrial buildings. Measures used to reduce the spread of COVID-19 has the unfortunate effect of increasing the risk of legionnaires outbreaks. Local lockdowns and building closures result in water sources being left stagnant and warm, conditions in which the dangerous *Legionella* bacterium thrives[3,4]. Most recently, legionellae have been detected in buildings in Atlanta[5], Montreal[6], and Illinois[7], posing a significant public health risk.

Clostridioides difficile

Clostridioides difficile (C. difficile) is a pathogenic bacterium found in the gut and can cause severe diarrhea and further intestinal complications. Infection is most common in people undergoing extended hospital stays and those taking certain broad-spectrum antibiotics[8]. The association between *C. difficile* and antibiotic use results from disruption of the gut microbiome. The diversity of the intestinal microbial ecosystem is vital for protection against infection by pathogenic bacteria, and imbalances allow *C. difficile* to propagate in the gut of vulnerable individuals[8]. Recent research suggests that around 70%0. of hospitalized COVID-19 patients were treated with antibiotics in an attempt to prevent co-infections and the spread of 'superbugs'[9], putting them at a greater risk of contracting *C. difficile* infections. A recent report identified nine patients with both COVID-19 and *C. difficile* infection at the Detroit Medical Center over six weeks during March/April[10], indicating that such broad use of antibiotics could have significant consequences in healthcare settings.

Dengue

Dengue fever is a tropical disease caused by the dengue virus and spread by mosquitos. It can be fatal and is, therefore, a serious concern in affected countries, primarily South and Southeast Asia and South America. The symptoms of dengue fever are similar to some of the symptoms of COVID-19, including fever, aches, and nausea[11]. Consequently, care must be taken to differentiate between these two diseases in dengue-endemic countries.

Misdiagnosis is linked to the similar clinical manifestations and pathophysiology of the diseases, as well as potential cross-reactivity between SARS-CoV-2 and dengue proteins, which impacts the specificity of blood tests[12]. Additionally, the co-occurrence of COVID-19 and dengue represents a significant problem for healthcare resources in areas where dengue is endemic[12]. To help manage these challenges, the Delhi government has released guidelines for testing and treating both diseases during this incredibly challenging time[13]

The importance of testing

Effective disease testing procedures are crucial for early detection, limiting transmission, and ensuring optimal

treatment is provided. Novacyt offers effective testing solutions to help researchers and clinicians monitor various pathogens, particularly those linked to the COVID-19 pandemic. To prevent outbreaks of Legionnaires disease, artificial water systems should be closely monitored for *Legionella*. This is particularly important before opening buildings that were unoccupied or under limited use during COVID-19 restrictions. Our PCR-based **Legionella tests** provide sensitivity and ease of use for the detection of these pathogens. Additionally, our **immunoassay** detects *Legionella* proteins in human urine to determine whether an individual has been infected and requires treatment. Preventing the spread and effective treatment of *C. difficile* depends on rapid and accurate diagnosis[14]. Our simple **antigen tests** facilitate the detection of *C. difficile* from patient stool samples in less than ten minutes. Such efficient testing is essential in COVID-19 patients in hospital settings, where the risk of C. difficile co-infections is increased. Finally, testing allows healthcare providers to differentiate between diseases with similar symptoms, such as dengue fever and COVID-19. We offer highly sensitive **PCR tests** to detect dengue and produce a simple **multiplexing kit** that can distinguish between dengue subtypes. References

1. Who. COVID-19 Weekly Epidemiological Update Global epidemiological situation. https://www.who.int/docs/default-source/coronaviruse/situation-reports/20201020-weekly-epi-update-10.pdf
2. Center For Global Development. The Indirect Health Effects of COVID-19: The Challenges of Living through a Pandemic. https://www.cgdev.org/blog/indirect-health-effects-covid-19-challenges-living-through-pandemic (2020).
3. Palazzolo, C. et al. Legionella pneumonia: Increased risk after COVID-19 lockdown? Italy, May to June 2020. Eurosurveillance (2020) doi:10.2807/1560-7917.ES.2020.25.30.2007302.
4. Legionella risks during the coronavirus pandemic - HSE news. https://www.hse.gov.uk/coronavirus/legionella-risks-during-coronavirus-outbreak.htm.
5. CDC Closes Atlanta Buildings After Finding Legionella - Outbreak News Today. http://outbreaknewstoday.com/cdc-closes-atlanta-buildings-after-finding-legionella-58035/.
6. Possible Outbreak of Legionnaires' Disease in Lasalle - Santé Montréal https://santemontreal.qc.ca/en/public/news/news/possible-outbreak-of-legionnaires-disease-in-lasalle/.
7. UAW Senior Citizens Center Addressing Legionnaires' Outbreak | Peoria Public Radio. https://www.peoriapublicradio.org/post/uaw-senior-citizens-center-addressing-legionnaires-outbreak#stream/0.
8. Mullish, B. H. & Williams, H. R. T. Clostridium difficile infection and antibiotic-associated diarrhoea. Clin. Med. J. R. Coll. Physicians London 18, 237–241 (2018).
9. Spigaglia, P. COVID-19 and Clostridioides difficile infection (CDI): Possible implications for elderly patients. Anaerobe 64, 102233 (2020).
10. Sandhu, A. et al. Clostridiodes difficile in COVID-19 Patients, Detroit, Michigan, USA, March-April 2020. Emerg. Infect. Dis. 26, 2272–2274 (2020).
11. Dengue and COVID-19 | Dengue | CDC. https://www.cdc.gov/dengue/is-it-dengue-or-covid.html.
12. Harapan, H. et al. Covid-19 and dengue: Double punches for dengue-endemic countries in Asia. Reviews in Medical Virology (2020) doi:10.1002/rmv.2161.
13. Prepare for both dengue and Covid-19 cases: Delhi govt- The New Indian Express. https://www.newindianexpress.com/cities/delhi/2020/oct/21/prepare-for-both-dengue-and-covid-19-cases-delhi-govt-2213095.html.
14. Butler, M. et al. Effectiveness of Early Diagnosis, Prevention, and Treatment of Clostridium difficile Infection. Effectiveness of Early Diagnosis, Prevention, and Treatment of Clostridium difficile Infection (2011).