

It's us versus the virus: the COVID-19 pandemic

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The respiratory illness, COVID-19, which was initially described in December 2019, has since progressed to a large number of reported cases, fatalities, and unprecedented restrictions on human movement and everyday activities across the globe. The Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) that causes COVID-19 is an enveloped, single-stranded, positive-sense RNA virus from the Coronaviridae family.

The most common clinical signs of COVID-19 are cough, fever, and respiratory difficulties along with the development of pneumonia. However, chills, sore throat, and headaches have also been described and there have also been reports of loss of smell and taste in some patients. The primary mode of transmission is thought to be by respiratory droplets, but a recent study has shown that the virus can remain stable in aerosols and on various surfaces, making it transmissible by physical contact. Furthermore, active viral particles have been detected in specimens other than nasal swabs, such as throat swabs and sputum samples, indicating the potential to spread through additional routes. Most of the available diagnostic tests use molecular techniques that can identify an active COVID-19 infection but specific serological tests are also in development that can detect a recently resolved infection. These reagents may also help trace disease transmission patterns and monitor at-risk populations.

The complete genome of the virus has been described and the virus has been successfully cultured from patient samples, allowing researchers to evaluate potential treatments and vaccines in preclinical studies. Recently, investigators at the National Institutes of Health (NIH) have also created the first 3D atomic scale map of the spike protein using electron microscopy. Such advancements are aiding ongoing research at various institutions around the world to identify effective COVID-19 treatments. These include the testing of antiviral agents tested for earlier corona virus infections. Studies on several vaccine candidates are also ongoing as well as the evaluation of antibodies from recovered patients.

Current COVID-19 vaccine development approaches include the use of attenuated influenza viruses, a measles vaccine vector carrying COVID-19 associated antigens, and a previously developed vaccine against SARS-CoV.



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However, the lack of rapid mutations seen in COVID-19 so far suggests that the virus may contain other distinct protective mechanisms for immune evasion. This underscores the importance of also exploring targeted small-molecule-inhibitors as well as immune reactivation strategies for future treatments. Most importantly, creative translational and clinical trials approaches are also needed to address this rapidly expanding pandemic.

Recent data have shown that cancer patients are at an increased risk for developing COVID-19 infection and substantial complications. This is due to the immune suppression brought on by the initial disease as well as the use of cytotoxic therapies. On the other hand, epidemiological data indicate that the infection rate is exceptionally low in children with very few showing severe symptoms. Possible pathophysiological mechanisms behind this phenomenon may include an enhanced activity status of the young immune system and that infection with other corona viruses are common children, hence potentially providing them with beneficial cross immunity.

Overall, the COVID-19 pandemic continues to cause unprecedented devastation in the lives of millions across the world. Many countries are surpassing their health care capacities and are fighting to keep up with the human and economic costs of the rapidly expanding pandemic. As scientists and oncologists, COVID-19 also presents us with unique opportunities to apply the knowledge and research tools that have been developed to fight cancer, for example the experience in the fields of molecular oncology, immunology and clinical trials development, to effectively confront an equally important global health crisis.