

SARS-CoV-2: descendent of a known enemy family with new munition

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Coronaviruses (CoVs) are a family of viruses that can cause illnesses such as the common cold, severe acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS). In 2019, a new coronavirus was identified as the cause of a disease outbreak that originated in China. The virus is known as severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2). The disease it causes is called coronavirus disease 2019 (COVID-19). In March 2020, the World Health Organization (WHO) declared the COVID-19 outbreak a pandemic.¹ SARS-CoV-2 has resulted in global healthcare crises and strained health resources. As the population of patients recovering from COVID-19 grows, it is paramount to establish an understanding of the healthcare issues surrounding them. Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), the pathogen responsible for coronavirus disease 2019 (COVID-19), has caused morbidity and mortality at an unprecedented scale globally.²

Scientific and clinical evidence is evolving on the subacute and long-term effects of COVID-19, which can affect multiple organ systems. Early reports suggest residual effects of SARS-CoV-2 infection, such as fatigue, dyspnea, chest pain, cognitive disturbances, arthralgia and decline in quality of life. Cellular damage, a robust innate immune response with inflammatory cytokine production, and a pro-coagulant state induced by SARS-CoV-2 infection may contribute to these sequelae. Survivors of previous coronavirus infections, including the SARS epidemic of 2003 and the Middle East respiratory syndrome (MERS) outbreak of 2012, have demonstrated a similar constellation of persistent symptoms, reinforcing concern for clinically significant sequelae of COVID-19.³⁻⁸

CoVs are enveloped positive-sense RNA viruses, are spherical with diameters

of approximately 125 nm characterized by club-like spikes that project from their surface, give them the appearance of a solar corona, prompting the name, coronaviruses. Coronavirus particles contain four main structural proteins. These are the spike (S), membrane (M), envelope (E), and nucleocapsid (N) proteins, all of which are encoded within the 3' end of the viral genome. CoVs cause a variety of diseases in mammals and birds ranging from enteritis in cows and pigs and upper respiratory disease in chickens to potentially lethal human respiratory infections. COVID-19 is now recognized as a multi-organ disease with a broad spectrum of manifestations.¹⁰

The COVID-19 virus spreads mainly from person to person among those in close contact (within about 6 feet, or 2 meters). The virus spreads by respiratory droplets released when someone with the virus coughs, sneezes, breathes, sings or talks. These droplets can be inhaled or land in the mouth, nose or eyes of a person nearby. Sometimes the COVID-19 virus can spread when a person is exposed to very small droplets or aerosols that stay in the air for several minutes or hours — called airborne transmission. The virus can also spread if you touch a surface with the virus on it and then touch your mouth, nose or eyes. But the risk is low. The COVID-19 virus can spread from someone who is infected but has no symptoms. This is called asymptomatic transmission. The COVID-19 virus can also spread from someone who is infected but hasn't developed symptoms yet. This is called pre-symptomatic transmission. It is possible to get COVID-19 twice or more, but this is uncommon.⁹

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Signs and symptoms of COVID-19 may appear 2 to 14 days after exposure. Common signs and symptoms can include: fever, cough, tiredness, early symptoms may include a loss of taste or smell. Other symptoms can include: shortness of breath or difficulty breathing, muscle aches, chills, sore throat, runny nose, headache, chest pain, conjunctivitis, nausea, vomiting, diarrhea, rash and may be many others. Children have similar symptoms to adults and generally have mild illness. The severity of symptoms can range from very mild to severe. If COVID-19 symptoms persist for more than four weeks after they are diagnosed then it is post-COVID-19 conditions. Some children experience multisystem inflammatory syndrome, a syndrome that can affect some organs and tissues, several weeks after having COVID-19.⁶⁻⁸

People who are older have a higher risk of serious illness from COVID-19, and the risk increases with age. Certain medical conditions that may increase the risk of serious illness from COVID-19 include: serious heart diseases, such as heart failure, coronary artery disease or cardiomyopathy, cancer, chronic obstructive pulmonary disease (COPD), type 1 or type 2 diabetes, overweight, obesity or severe obesity, high blood pressure, smoking, chronic kidney disease, sickle cell disease or thalassemia, weakened immune system from solid organ transplants or bone marrow transplants, pregnancy, asthma, chronic lung diseases such as cystic fibrosis or pulmonary hypertension, liver disease, dementia, down syndrome, weakened immune system from bone marrow transplant, HIV or some medications, brain and nervous system conditions, such as strokes, substance use disorders. Although most people with COVID-19 have mild to moderate symptoms, the disease can cause severe medical complications and lead to death in some people. Complications can include: pneumonia and trouble breathing, organ failure in several organs, heart problems, severe lung condition that causes a low amount of oxygen to go through your bloodstream to your organs (acute respiratory distress syndrome), blood clots,

acute kidney injury, additional viral and bacterial infections. A vaccine can prevent one from getting the COVID-19 virus or prevent one from becoming seriously ill if you get the COVID-19 virus.¹¹⁻¹⁵

The COVID-19 virus has mutated several times and now has several variants that are being monitored in the United States. Viruses like SARS-CoV-2 continuously evolve as changes in the genetic code (genetic mutations) occur during replication of the genome. A lineage is a genetically closely related group of virus variants derived from a common ancestor. A variant has one or more mutations that differentiate it from other variants of the SARS-CoV-2 viruses. As expected, multiple variants of SARS-CoV-2 have been documented in the United States and globally throughout this pandemic. Key Points Genetic lineages of SARS-CoV-2 have been emerging and circulating around the world since the beginning of the COVID19 pandemic. The Delta variant is a variant of SARS-CoV-2, the virus that causes COVID-19. It was first detected in India in late 2020.^{16,17}

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