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EDITORIAL

A novel coronavirus emerges

Un nuevo coronavirus emerge



Coronaviruses are a family of viruses that usually cause mild upper respiratory tract infections, but mutations in the surface proteins of the virus can lead to severe lower respiratory tract infections such as the Middle East Respiratory Syndrome (MERS-CoV) and Severe Acute Respiratory Syndrome (SARS-CoV). Currently, a novel version of a coronavirus is causing epidemics of serious illness and death in humans. As it has been proved for other viral epidemics, this one is another zoonoses, infections transmitted from animals to people.

Coronaviruses have an animal reservoir, usually wild animals, and can be transmitted to humans.¹ Once the virus infects humans it can evolve into strains not previously identified. Recently, the first case of a new type of coronavirus, causing pneumonia, was found in December 2019 and linked to the largest seafood market in Wuhan (China). This novel coronavirus has been designated as 2019-nCoV by the World Health Organization, as determined by sequencing the viral RNA genome. Many patients were exposed to the seafood market to several potential wildlife animals acting as reservoirs, such as poultry, snakes, bats, and other farm animals. The sequence analysis and the relative synonymous codon usage (RSCU) bias among different known coronaviruses suggest that 2019-nCoV is a recombinant virus between a bat coronavirus and another unknown coronavirus. The recombination between the two species of viruses occurred within the viral spike glycoprotein which recognizes cell surface receptors. Additionally, the findings suggest that snake is the most probable wildlife reservoir for the 2019-nCoV based on the RSCU bias resembling snake compared to other animals.² It should be noted that this is a preliminary result and other phylogenetic analyses are being conducted. Peridomestic animals may serve as intermediate hosts, facilitating the recombination of the virus, and serving as amplification hosts.

Coronaviruses are enveloped positive-strand RNA viruses belonging to the family Coronaviridae that can be divided into 4 genera: alpha, beta, delta, and gamma. Most infections caused by coronaviruses in humans are mild, but two beta coronaviruses, SARS-CoV³ and MERS-CoV⁴ led to more

than 10,000 cases in the past two decades, with a mortality rate of 10% in the case of SARS-CoV and 37% in the case of MERS-CoV. In the case of 2019-nCoV the number of laboratory-confirmed cases still is rising with a reported mortality rate of around 3%, and the number of transmissions between 1.5 and 3.5. Cases have been confirmed in all continents except Africa.⁵ The ongoing effort to contain the outbreak is significant, cities have been effectively locked down, schools have been closed, and trains and flights have been canceled. Two new facilities, to accommodate 1,000 beds, and 1,500 beds have been built in a little over a week in Wuhan, the epicenter of the outbreak. However, the magnitude and the trajectory of the epidemic is difficult to predict since China has clamped down on critics of their current efforts, and controlled all media, including social media. This has caused some citizens to lose credibility in their statements.⁶

A preliminary analysis of 41 patients with laboratory-confirmed 2019-nCoV showed that most were men, less than half had an underlying condition with a median age of 49 years. Common symptoms at the onset of illness were fever, dry cough, and myalgia or fatigue. However, some patients can be asymptomatic and/or afebrile and can still spread the infection. This was the same seen in the 2009 H1N1 influenza pandemic that started in Mexico and the United States. Dyspnea developed in half of the patients with a median time to develop of 8.0 days. All patients had abnormal findings on chest CT, showing bilateral multiple lobar, and subsegmental areas of consolidation. Complications included acute respiratory distress syndrome in 29%, acute cardiac injury (12%), and secondary infections (12%). One-third of patients required ICU admission and six (15%) died.⁷ Due to the high production of cytokines induced by coronaviruses, corticosteroids have been used to reduce inflammatory lung injury. However, current evidence shows that patients receiving corticosteroids did not have benefit, and had a delayed viral clearance. Since 2019-nCoV is an emerging virus, it is not known whether drugs used for MERS-CoV⁸ such as beta-interferon, lopinavir-ritonavir or remdesivir (a broad-spectrum antiviral nucleotide prodrug), will be effective.

Currently, there are candidates for MERS-CoV vaccine and there is an initiation of 3 programs to develop vaccines against the 2019-nCoV. There are novel vaccine technologies that accelerate the production of vaccine products⁹ The use of platform technology; a system that uses the same basic components as a backbone, can be adapted for use against different pathogens as needed by inserting new genetic or protein sequences. Another technology used for vaccines is called molecular clamp: Enveloped viruses, like influenza, have antigenic proteins in their surface- although the proteins can elicit an immunological response, they are unstable. One approach to vaccine design is to synthesize these surface proteins while clamping them into a stable shape, making it easier for the immune system to induce a response. This synthetic antigen can be purified and rapidly manufactured into a vaccine, within 16 weeks from pathogen identification.

Ultimately, only preventive measures will lead the epidemic to an end. For the general population, anyone visiting animal markets should practice general hygiene measures, including regular handwashing after touching animals or animal products, avoiding touching eyes, nose or mouth with hands and, avoiding contact with sick animals. Any contact with wild animals in the market should be strictly avoided. The consumption of raw or undercooked products should be avoided. Raw meat, milk or animal organs should be handled with care to avoid cross-contamination with undercooked foods.¹⁰ For clinicians, a detailed travel history should be obtained for patients with fever and respiratory symptoms.¹¹ For patients with these symptoms who were in Wuhan on or after December 1st, 2019 and had onset of illness within 2 weeks of leaving, consider the possibility of an infection caused by 2019-nCoV. Ask patients to wear a surgical mask as soon as they are identified. Conduct their evaluation in a private room with the door closed, ideally in an airborne infection isolation room, if available. Personnel entering the room should use standard precautions, contact precautions, and use eye protection (goggles or face shield). Public health efforts at higher levels should also be taken such as the closing of the markets, the closing of transportation and the airports to avoid the person-to-person spread. On Saturday, January 25th, 2020, China ordered the suspension of tours abroad. President Xi Jinping warned of an accelerating crisis.

The course of this progressive outbreak is unknown, but history shows that it is necessary to be prepared for epidemics of evolving microorganisms that initially were considered as harmless. These are uncertain times, and predictions about the arc of the coronavirus are premature. But how we respond to epidemics defines us as a society. Going forward we need science, compassion, agility, and truth.

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