

Coronavirus Now: A Timely and Practical Summary of the Current Epidemiological Information, Clinical Presentation, and Prevention and Treatment of 2019-nCoV (2019 Novel Coronavirus)

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Abstract

Coronaviruses can infect birds and mammals, including humans. The coronavirus 2019-nCoV is believed to have originated in Wuhan, China. To date, little is known about this coronavirus, although it shares characteristics and presentations of SARS-CoV and MERS-CoV, which predated 2019-nCoV. The virus can encode a large number of genes in a small number of nucleotides, making it potentially virulent and problematic to treat. Currently, there is no vaccine or approved drug regime to prevent or treat 2019-nCoV. Thus, the avoidance of the spread of the virus and the identification and isolation immediately of infected individuals are crucial to containing this contagion and averting a global pandemic. The Centers for Disease Control and Prevention, World Health Organization, and numerous country-specific organizations have developed and published prevention and control recommendations for patients under investigation for 2019-nCoV, specifically for healthcare workers and emergency department personnel. This review contains a summary of the current (interim) epidemiological information, clinical presentation, and prevention and treatment of 2019-nCoV, with vital links to resources regarding screening, reporting, and specimen collection.

Keywords: 2019-nCoV; Coronavirus; COVID-19; MERS-CoV; Mortality; SARS-CoV

Abbreviations

CDC: Centers for Disease Control and Prevention; CoV: Coronavirus; COVID-19: Coronavirus Disease 2019; EOC: Emergency Operations Center; MERS-CoV: Middle East Respiratory Syndrome Coronavirus; PUI: Person Under Investigation; SARS: Severe Acute Respiratory Syndrome; WHO: World Health Organization

Introduction

The origin of 2019-nCoV is, by consensus, the Huanan Seafood Wholesale Market in Wuhan, China. The market sells seafood and exotic creatures for consumption, like bats and snakes. Previously, a group of Chinese researchers believed the virus originated from snakes; however, Peter Daszak, president of EcoHealth Alliance, has repudiated their claim [1,2].

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Coronaviruses (CoVs) are a group of viruses that cause disease in mammals (including humans) and birds. Chickens can develop respiratory conditions, cows and pigs diarrhea, and humans respiratory infections that are mild to lethal. Currently, no approved vaccines or antiviral drugs are available for the prevention or treatment of 2019-nCoV [3].

According to de Groot, *et al.* (2011): "Coronaviruses are viruses in the subfamily Orthocoronavirinae in the family Coronaviridae, in the order Nidovirales. Coronaviruses are enveloped viruses with a positive-sense single-stranded RNA genome and with a nucleocapsid of helical symmetry. The genomic size of coronaviruses ranges from approximately 26–32 kilobases, the largest for an RNA virus" [4].

Mechanism of 2019-nCoV invasion

Following the entry of this virus into the cell, the virus particle is uncoated, and the RNA genome is deposited into the cytoplasm, where it attaches to ribosomes for translation. CoVs can also be transcribed into new RNA copies using the host cell’s machinery. The RNA genome is replicated and a long polyprotein is formed, where all of the proteins are attached. CoVs have a nonstructural protein (a protease), which can separate the proteins in the chain, allowing the virus to encode the highest number of genes in a small number of nucleotides [5,6].

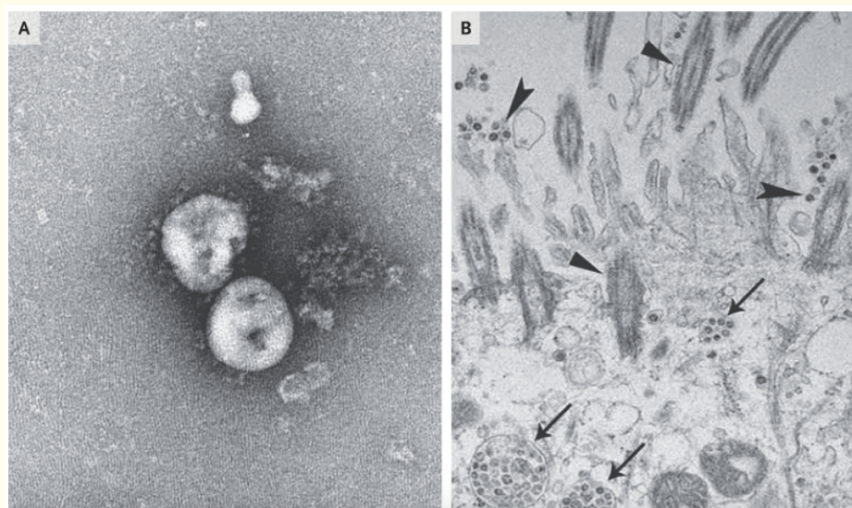


Figure 1: (A, B). Visualization of 2019-nCoV with Transmission Electron Microscopy. Negative-stained 2019-nCoV particles are shown in Panel A, and 2019-nCoV particles in the human airway epithelial cell ultrathin sections are shown in Panel B. Arrowheads indicate extracellular virus particles, arrows indicate inclusion bodies formed by virus components, and triangles indicate cilia. Note: images reproduced from *The New England Journal of Medicine* “A Novel Coronavirus from Patients with Pneumonia in China, 2019” [7].

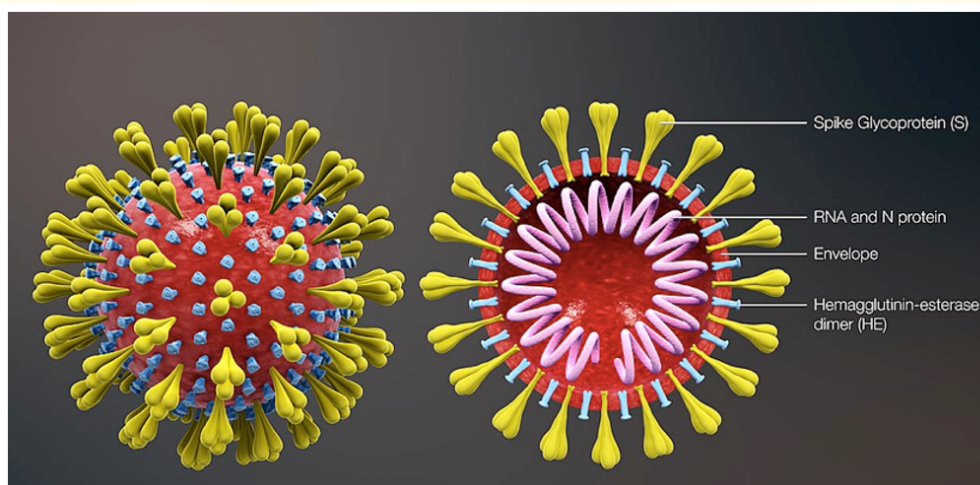


Figure 2: Illustration depicting components of a coronavirus. Note: image reproduced from *SCIENTIFIANIMATIONS.COM*.

Discussion

Recent coronaviruses

Severe acute respiratory syndrome coronavirus (SARS-CoV)

In 2003, the World Health Organization (WHO) stated that a novel coronavirus (which had been identified by several laboratories) was the causative agent for the severe acute respiratory syndrome, termed SARS coronavirus (SARS-CoV). Thousands of people were infected, and eight hundred of those infected people died, a mortality rate of about ten percent of the infected individuals [8,9].

Middle East respiratory syndrome coronavirus (MERS-CoV)

In September 2012, a new type of coronavirus was identified, which was referred to initially as “novel coronavirus 2012” and later termed, Middle East respiratory syndrome coronavirus (MERS-CoV) [9].

The WHO stated that MERS-CoV did not transmit readily via a person-to-person route [10]. However, in May 2013, France’s Ministry of Social Affairs and Health confirmed a case of human-to-human transmission [11]. Also, human-to-human transmission occurred in Tunisia. However, MERS-CoV did not spread easily from human to human. Most infected individuals did not transmit the virus to other people [12].

In Saudi Arabia, 52 deaths were reported among 124 cases, by October 2013 [13]. In the United States, just two cases of MERS-CoV infection were reported, by May 2014. In both cases, the infected individuals had worked in healthcare facilities in Saudi Arabia before they traveled to the United States, where they were subsequently admitted to hospitals, treated, and discharged [14].

In the Republic of Korea, a man caused one of the most significant outbreaks of MERS-CoV outside of the Middle East, after visiting the Middle East and four hospitals in Seoul for his, at the time, unspecified illness, in May 2015 [15].

All told, by December 2019, MERS-CoV infection had a mortality rate of 34.5%: 851 deaths from 2,468 cases of MERS-CoV [16].

2019 novel coronavirus (2019-nCoV)

The 2019–20 China pneumonia outbreak in Wuhan was traced to a novel coronavirus [6], which was labeled as 2019-nCoV by the WHO [17,18].

Locations with confirmed 2019-nCoV cases (as of January 27, 2020)

Australia, Cambodia, Canada, China, France, Hong Kong, Japan, Macau, Malaysia, Nepal, Republic of Korea, Singapore, Taiwan, Thailand, the United States, and Vietnam [19].

Symptoms of 2019-nCoV

In certain 2019-nCoV infections, reported symptoms have ranged from little to no symptoms to severely ill and dying. Symptoms can include fever, cough, and shortness of breath, and may appear in 2–14 days after exposure. This symptom-appearance range is based on knowledge of MERS-CoV [20]. In some infected individuals, fever may not be present.

Prevention and treatment of 2019-nCoV

Prevention

Currently, no vaccine is available to inhibit 2019-nCoV or prevent 2019-nCoV infection. At this time, the only effective preventive measure is to avoid exposure to this virus. The following daily preventive measures have been published by the Centers for Disease Control and Prevention (CDC):

- Hand-washing for at least twenty seconds with soap and water, or use alcohol-based hand sanitizers.
- Avoid contacting the eyes, nose, and mouth with unwashed hands.
- Avoid close contact with people who are sick.
- If ill, remain at home.
- Cover a cough or sneeze with a tissue; discard the tissue in the trash.
- Clean and disinfect objects and surfaces that are touched frequently [21].

Regular prophylaxis may prevent the spread of the virus. As yet, there are no travel guidelines in place.

Treatment

There is no specific and recommended antiviral medication for 2019-nCoV infection. Supportive care for symptom relief is indicated for those infected with 2019-nCoV. For severe cases of 2019-nCoV infection, vital organ support should be considered. A healthcare provider should be contacted immediately by people believe they have been exposed to the virus [21].

Interim guidelines for healthcare professionals regarding 2019-nCoV

The range of clinical presentation of 2019-nCoV infection is limited. There are no vaccines or specific treatments for 2019-nCoV infection; in the case of infection, medical care is supportive, not curative.

According to the CDC, “clinical criteria for a 2019-nCoV patient under investigation have been developed based on what is known about MERS-CoV and SARS-CoV” and are subject to change as additional information becomes available [21]. Also, according to the CDC, “health care providers should obtain a detailed travel history for patients being evaluated with fever and acute respiratory illness” [21].

Criteria for evaluation of a person under investigation (PUI) for 2019-nCoV

The following criteria should be utilized in a PUI for 2019-nCoV exposure or infection. The criteria are guidelines for evaluation. Patients should be evaluated and findings discussed with public health departments on a case-by-case basis if the patient’s symptoms, clinical presentation, or exposure history (e.g., travel or contact with infected individuals) is suggestive [20]. According to the CDC: “Fever may not be present in some patients, such as the very young, elderly, immunosuppressed, or persons taking certain fever-lowering medications. Clinical judgment should be used to guide the testing of patients in such situations” [21,22].

Recommendations for reporting, testing, and specimen collection for 2019-nCoV (updated March 4, 2020, by the CDC; links available in the Supplementary Information section)

The CDC recommends the following reporting, testing, and specimen collection procedures:

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- Healthcare providers should immediately notify both infection control personnel at their healthcare facility and local or state health department in the event of a PUI for 2019-nCoV. State health departments that have identified a PUI should immediately contact the CDC's Emergency Operations Center (EOC) at 770-488- 7100 and complete a 2019-nCoV PUI case investigation form [21].

To increase the likelihood of detecting 2019-nCoV infection and coronavirus disease 2019 (COVID-19), the CDC further recommends the following:

- Collecting and testing multiple clinical specimens from different sites, including all three specimen types: lower respiratory, upper respiratory and serum specimens. Additional specimen types (e.g., stool and urine) may be collected and stored. Specimens should be collected as soon as possible once a PUI is identified, regardless of the time of symptom onset. Additional guidance for the collection, handling, and testing of clinical specimens is available [22].

The CDC has also provided notes of clarification and caution as follows:

- For biosafety reasons, it is not recommended to perform virus isolation in cell culture or initial characterization of viral agents recovered in cultures of specimens from a PUI for 2019-nCoV [21]. At this time, diagnostic testing for 2019-nCoV can be conducted only at the CDC.
- Testing for other respiratory pathogens should not delay specimen shipping to the CDC. If a PUI tests positive for another respiratory pathogen, after clinical evaluation and consultation with public health authorities, they may no longer be considered a PUI [22].

These are current recommendations, which will likely change based on future events and the progression, containment, or possible coinfections of 2019-nCoV.

Conclusion

Coronaviruses can infect humans, resulting in COVID-19. Also, they can infect other mammals, and birds. The virus, 2019-nCoV, is thought to have originated in Wuhan, China, possibly from the ingestion of snakes, although some authors have refuted that theory. Coronaviruses have a nonstructural protein, which allows the virus to encode the highest number of genes in a small number of nucleotides. 2019-nCoV is predated by SARS-CoV and MERS-CoV and shares some of these viruses' characteristics and presentations. Symptoms of 2019-nCoV can include fever, cough, and shortness of breath, and may appear in 2–14 days after exposure. However, not all infected individuals exhibit these symptoms, particularly fever. Currently, there is no vaccine to prevent or drugs to treat 2019-nCoV specifically. Prophylaxis is limited to avoiding contact with affected individuals and diligent personal hygiene. Healthcare providers and emergency department personnel should remain knowledgeable and adept regarding the interim guidelines in screening, reporting, testing, and specimen collection for 2019-nCoV, which have been outlined in numerous resources published by the Centers for Disease Control and Prevention, the World Health Organization, and other country-specific resources. Extreme caution is advised in evaluating patients under investigation and retrieving specimens.

Conflict of Interest Statement

The authors declare that this paper was written in the absence of any commercial or financial relationship that could be construed as a potential conflict of interest.

Supplementary Information

- Link to the CDC's Human Infection with 2019 Novel Coronavirus Person Under Investigation (PUI) and Case Report Form: <https://www.cdc.gov/coronavirus/2019-ncov/downloads/pui-form.pdf> (Download fillable PDF form pdf icon[PDF – 211 KB]).
- Link to the CDC's recommendations for reporting, testing, and specimen collection: <https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-criteria.html>.

Interim Healthcare Infection Prevention and Control Recommendations for Patients Under Investigation for 2019-nCoV (links):

- Interim Health Care Infection Prevention and Control Recommendations for Patients Under Investigation for 2019 Novel Coronavirus(https://www.cdc.gov/coronavirus/2019-ncov/infection-control/control-recommendations.html?CDC_AA_refVal=https%3A%2F%2Fwww.cdc.gov%2Fcoronavirus%2F2019-ncov%2Fhcp%2Finfection-control.html).
- Guideline for Isolation Precautions: Preventing Transmission of Infectious Agents in Health Care Settings (<https://www.cdc.gov/infectioncontrol/guidelines/isolation/index.html>).
- CDC's Health Alert Network Update: Outbreak of Pneumonia Associated with Novel Coronavirus 2019 (nCoV-2019) in Wuhan, China (<https://emergency.cdc.gov/han/han00426.asp>).

Additional resources (links):

- Directory of Local Health Departments external icon (<https://www.naccho.org/membership/lhd-directory>).
- World Health Organization (WHO) Coronavirusexternal icon (<https://www.who.int/health-topics/coronavirus>).
- WHO guidance on clinical management of severe acute respiratory infection when novel coronavirus (nCoV) infection is suspected external icon ([https://www.who.int/internal-publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-\(ncov\)-infection-is-suspected](https://www.who.int/internal-publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected)).

References

1. Woodward A. "Both the new coronavirus and SARS outbreaks likely started in Chinese wet markets. Photos show what the markets look like". Business Insider (2020). <https://www.businessinsider.in/science/news/the-outbreaks-of-both-the-wuhan-coronavirus-and-sars-started-in-chinese-wet-markets-photos-show-what-the-markets-look-like-/articleshow/73535775.cms>
2. Westcott B and Deng S. "China has made eating wild animals illegal after the coronavirus outbreak. But ending the trade won't be easy". CNN Online (2020). <https://edition.cnn.com/2020/03/05/asia/china-coronavirus-wildlife-consumption-ban-intl-hnk/index.html>
3. Fehr AR and Perlman S. "Coronaviruses: An Overview of Their Replication and Pathogenesis". *Methods in Molecular Biology* 1282 (2015): 1-23. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4369385/>
4. de Groot RJ, et al. "Family Coronaviridae". In AMQ King, E Lefkowitz, MJ Adams, EB Carstens (eds.). Ninth Report of the International Committee on Taxonomy of Viruses. Elsevier, Oxford (2011): 806-828.
5. International Committee on Taxonomy of Viruses (2010). <https://talk.ictvonline.org/>
6. Sexton NR, et al. "Homology-Based Identification of a Mutation in the Coronavirus RNA-Dependent RNA Polymerase That Confers Resistance to Multiple Mutagens". *Journal of Virology* 90.16 (2016): 7415-7428. <https://www.ncbi.nlm.nih.gov/pubmed/27279608>

7. Zhu, *et al.* "A Novel Coronavirus from Patients with Pneumonia in China, 2019". *New England Journal of Medicine* 382 (2020): 727-733. <https://www.ncbi.nlm.nih.gov/pubmed/31978945>
8. Li F, *et al.* "Structure of SARS coronavirus spike receptor-binding domain complexed with receptor". *Science* 309.5742 (2005): 1864-1868. <https://www.ncbi.nlm.nih.gov/pubmed/16166518>
9. Douclef M. "Scientists Go Deep On Genes Of SARS-Like Virus". Associated Press (2012). <https://www.npr.org/sections/health-shots/2012/09/25/161770135/scientists-go-deep-on-genes-of-sars-like-virus>
10. "New SARS-like virus found in Middle East". Al-Jazeera (2012). <https://www.aljazeera.com/news/middle-east/2012/09/2012924182013530585.html>
11. Kelland K. "New virus not spreading easily between people: WHO". Reuters (2012). <https://www.reuters.com/article/us-virus-who/new-virus-not-spreading-easily-between-people-who-idUSBRE88R0F220120928>
12. Nouveau coronavirus - Point de situation: Un nouveau cas d'infection confirmé (Novel coronavirus - Status report: A new case of confirmed infection) (2013). <https://solidarites-sante.gouv.fr/archives/archives-presse/archives-communiqués-de-presse/annee-2013/article/nouveau-coronavirus-point-de-situation-un-nouveau-cas-d-infection-confirme>
13. "MERS Transmission". Centers for Disease Control and Prevention (2019). <https://www.cdc.gov/coronavirus/mers/about/transmission.html>
14. "Novel coronavirus infection - update". World Health Association (2013). <https://www.who.int/emergencies/diseases/novel-coronavirus-2019/events-as-they-happen>
15. "MERS in the U.S.". Centers for Disease Control and Prevention (2019). <https://www.cdc.gov/coronavirus/mers/index.html>
16. Sang-Hun Choe. "MERS Virus's Path: One Man, Many South Korean Hospitals". *The New York Times* (2015). <https://www.nytimes.com/2015/06/09/world/asia/mers-virus-path-one-man-many-south-korean-hospitals.html>
17. Fehr AR and Perlman S. "Coronaviruses: an overview of their replication and pathogenesis". *Coronaviruses: Methods in Molecular Biology* 1282 (2015): 1-23. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4369385/>
18. "WHO Statement Regarding Cluster of Pneumonia Cases in Wuhan, China" (2020). <https://www.who.int/china/news/detail/09-01-2020-who-statement-regarding-cluster-of-pneumonia-cases-in-wuhan-china>
19. Letchumanan V, *et al.* "The rising fear of Wuhan Virus '2019-nCoV'". *Progress in Microbes and Molecular Biology* 3.1 (2020): a0000053. <http://www.journals.hh-publisher.com/index.php/pmmmb/article/view/107>
20. "Middle East respiratory syndrome coronavirus (MERS-CoV)". WHO (2019). <https://www.who.int/csr/don/31-january-2020-mers-united-arab-emirates/en/>
21. "MERS Transmission". Centers for Disease Control and Prevention (2019). <https://www.cdc.gov/coronavirus/2019-ncov/index.html>
22. Coronavirus Disease 2019 (COVID-19). Centers for Disease Control and Prevention (2020). <https://www.cdc.gov/coronavirus/2019-ncov/hcp/clinical-criteria.html>

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