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CORONAVIRUS, ITS TYPES, BIOLOGICAL PROPERTIES, AND STRUCTURAL FEATURES

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Abstract
This article presents historical data, general concepts, sources, transmission routes, types, biological properties, biochemical composition, receptors, pathogenesis of cell entry, morphogenesis, and pathomorphological changes in their invisible diseases.

Keywords: Virus, coronavirus, source, RNA, receptor, pathogenesis, morphogenesis, pathomorphology.

INTRODUCTION

Coronaviruses are a large family of viruses that are widespread in many animal species, including camels, cattle, cats, and bats. The acute respiratory disease caused by the novel coronavirus (SARS-COV-2) is called coronavirus disease 2019 or COVID-19. This virus was first discovered in 2019 in the city of Wuhan, Hubei Province (PRC), and as of March 2020, it entered the Republic of Uzbekistan and continues to spread. Coronaviruses are transmitted from person to person through close contact, within a 2-meter distance, via the following routes: Airborne droplets (talking, coughing, sneezing), similar to the spread of influenza and other acute respiratory diseases; Airborne dust route (when there are dust particles in the air).

By contact **(**handshakes, handling household objects, etc.) The source of infection is an infected person, including during the latent (incubation) period of the disease (from 2 to 14 days). Coronaviruses are a large family of viruses that are widespread in many animal species, including camels, cattle, cats, and bats. The acute respiratory disease caused by the novel coronavirus (SARS-COV-2) is called coronavirus disease 2019 or COVID-19. This virus was first discovered in 2019 in the city of Wuhan, Hubei Province (PRC), and as of March 2020, it entered the Republic of Uzbekistan and continues to spread. Clinical signs of the new coronavirus infection include: fever, chills, cough, shortness of breath, chest tightness, sneezing, weakness, runny nose (similar to flu), sore throat, and muscle pain. The likelihood of developing acute respiratory distress syndrome is high (1,2). Given these transmission routes, aerosol procedures should be avoided when COVID-19 is suspected (or confirmed) during autopsies of deceased individuals. If aerosolization is likely, focus on protection measures against this process, such as appropriate technical control measures when using a vibrating saw, and it is necessary to use personal protective equipment (PPE).

Furthermore, due to the risk of infection through injury when working with biological material(s), strict adherence to standard precautions should be followed.

A virus (from Latin *virus*, meaning poison) is a tiny particle lacking a cellular structure, unlike microbes. They come in various shapes: spherical, rod-like, cubic, and others (3, 4, 5). For

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example, the viruses that cause flu, rubella, and measles are round in shape. Over the years, star-shaped viruses have also been discovered. Since they are similar to particles, they cannot be seen with the naked eye. They cannot even be observed through microscopes in medical laboratory settings. They can only be seen using an electron microscope, which can show sizes of at least 50,000 to 100,000 times, and with specially processed samples. Their size ranges from 20 nm to 350 nm. In fact, viruses are much smaller than microbes. It is believed that viruses formed millions of years ago from elements of cells of humans, animals, or insects, and later evolved into an autonomous system. Often, genetic and structural components resemble cellular elements of living organisms (6, 7, 8). Viruses reproduce inside the cells of all organisms (vertebrates, insects, plants). They cannot live outside living cells. Notably, viruses can even reproduce freely inside fungi and bacteria, causing harm to them. So, viruses are the smallest of all living particles and cannot live on their own. This is because they do not have the ability to synthesize necessary proteins, amino acids, and enzymes. In fact, all the products necessary for their survival, i.e., energy, come from other organisms. Thus, viruses are the smallest parasites in the world (a parasite lives off others). A fully formed viral particle is called a virion. Its structure consists of internal nucleic acid and an external shell (capsid). It is worth noting that only one of the nucleic acids in viruses is either DNA or RNA. Based on these characteristics, viruses are divided into groups. In general, it can be said that viruses are living protein particles with nucleic acid inside and a shell (capsid) outside. These particles always live in fear of penetrating a foreign cell, otherwise, they will perish. Viruses easily pass through bacterial filters, while microbes, on the other hand, are retained. Viruses are contained in the mucus of the mouth and nose when a person sneezes or coughs. They cannot pass through a fairly thick, 4-5-layer gauze mask. However, if the mask is worn for 3-4 hours, humidity increases. During this time, the person may experience difficulty breathing (8, 9, 10). After removing the mask, viruses can remain alive until the mask dries. The descendants of the coronavirus that is threatening the world today are actually known to science as the "human respiratory coronavirus" (HRCoV). British and American scientists presented them to science in the 1960s. These viruses are incompatible with some characteristics of other viruses that cause acute respiratory diseases. For example, the virus grows poorly in chicken egg embryo cells. But this virus grows well in tissue cultures (living cells) taken from the trachea and bronchi of human embryos. In fact, coronaviruses, like the nose, throat, larynx, and bronchi of humans, especially the alveolar cells of the lungs, reproduce in these places and cause severe diseases, such as pneumonia (11, 12, 13). It is no longer a secret that these viruses are transmitted through the air, via droplets.

When boiled, coronaviruses die instantly. They are not resistant to external environments. However, their longevity is closely related to the external temperature. They can survive for extended periods at temperatures of minus 20 degrees Celsius. They are resistant to solvents such as ether, alcohol, ethanol, ultraviolet rays, and both acidic and alkaline environments. Therefore, you can easily use ordinary household soap. Sunlight also has a strong virus-killing effect when exposed to high and dry temperatures. This is why coronavirus infections are seasonal. More precisely, they spread rapidly in the form of epidemics, predominantly in the autumn, winter, and cool spring months. Human respiratory coronavirus infections die within 10–12 minutes under the influence of ultraviolet rays (bactericidal lamps). However, it should be noted that the process

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depends on the humidity of the air. Their mortality rate increases in dry heat, especially when the temperature ranges from 25 to 35 degrees Celsius (14).

The presented data clearly indicate that disinfection measures, particularly maintaining a distance of 1.5–2 meters between individuals and wearing masks, significantly reduce the spread of infection among the general population. Quarantining the patient, who serves as the source of infection, along with their close contacts, helps prevent the transmission of the coronavirus.b Moreover, viruses possess structural and regulatory genes, including operator and activator genes. As previously mentioned, viruses are composed of proteins, which, in turn, consist of multiple amino acid chains. These chains have a "C"-terminal at the beginning and an "N"-terminal amino group at the end. For replication, viruses must enter human cells. However, human cells cannot break the amino group chains on their own. Unlike microbial division, coronavirus replication follows a distinct mechanism. Microorganisms can proliferate freely in simple nutrient media, whereas coronaviruses reproduce exclusively within the living cells of an organism. Viruses depend on human cells for replication. During this period, microbes divide a hundred times, whereas viruses replicate a million times—and within 1–2 days, their numbers can reach a billion. Bacteria reproduce by dividing into two or three parts. However, after entering the host cell, coronaviruses synthesize their components separately, according to encoded genetic information. It is crucial to note that the virus is first absorbed and then penetrates the target cell. This process is facilitated by its crown-like spike proteins, which function as sensory receptors. These spikes enable coronaviruses to identify and attach to susceptible cells. Under these complex conditions, the outer envelope of the virus fuses with the membrane of the human cell. Once inside, the coronavirus sheds its external envelope, a process known as “uncoating.” This is how coronaviruses activate their parasitic nature. They exert a cytopathogenic effect on the cells, causing significant damage. A single viral particle replicates 1,000 times per cycle and up to 10,000,000 times within three cycles. Notably, once the viral envelope is shed, it is replaced within the host cells through the use of host proteins. As a result, the damaged cells fail to recognize the virus and lose their ability to mount a defense. Subsequently, the viruses leave the dead cells and invade new ones. This explains why the course and severity of the disease vary from country to country. Combating this microscopic yet highly insidious coronavirus requires immense resilience and patience. The key point is that without understanding the characteristics of these microscopic, pathogenic particles, it is extremely difficult to control them. Viruses have no color, no language—they attack relentlessly. However, the source of infection is well known, and transmission occurs via airborne droplets. Viral infectious diseases have long been a major concern in medicine. Billions of people worldwide have been infected with some form of viral illness. According to the World Health Organization (WHO), 80% of all infectious diseases are of viral origin. Coronavirus is caused by RNA-containing coronaviruses measuring 80–220 nm in diameter. There are four distinct coronavirus antigens. The viral envelope is covered with spike-like projections that facilitate attachment to host cells, explaining the virus family's name. *Alpha* (α) and *Beta* (β) coronaviruses replicate within the cytoplasm of epithelial cells in the upper respiratory tract, subsequently causing respiratory diseases in humans and gastroenteritis in animals. Within 4–6 hours of entering respiratory epithelial cells, the virus produces numerous virions, inducing abortive damage to macrophages and dendritic cells (which do not support viral replication) and

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triggering pro-inflammatory processes. Coronaviruses exhibit significant environmental resistance. They are capable of binding complement proteins in the blood of infected individuals and in hyperimmune serum, contributing to immune evasion. The virus adheres to target cells via glycoproteins on its surface. (1) It enters the cell either through direct fusion with the cytoplasmic membrane or via receptor-mediated endocytosis. (2) Once inside, the viral genomic RNA binds to ribosomes and serves as a template for synthesizing a full-length negative RNA strand. (3) This negative strand facilitates the production of RNA-dependent RNA polymerase, which is essential for replication. (4) Through transcription, the negative strand generates a positive RNA strand containing the viral genome, along with 5–7 subgenomic RNA segments. (5) Each subgenomic RNA is translated into a specific viral protein. (6) In the cytoplasm, the nucleocapsid (N-protein) associates with the genomic RNA, forming a helical nucleocapsid structure. (7) Structural glycoproteins S and M (or E1 and E2) migrate to the endoplasmic reticulum and the Golgi apparatus. (8) Viral nucleocapsids assemble within the endoplasmic reticulum membrane, which contains viral glycoproteins. (9) Newly formed virions travel to the host cell membrane. (10) The virions exit the host cell via exocytosis, ready to infect new cells. (11)

CONCLUSION

Virus (Latin: poison) – a small particle that lacks a cellular structure, unlike microbes. Viruses come in various shapes: spherical, rod-shaped, cubic, etc. They can only be seen using an electron microscope, which can detect sizes as small as thousands or even 50,000–100,000 times smaller, with the help of specially processed samples. Their size ranges from 20 nm to 350 nm.

The coronavirus generation is scientifically known as the "Human Respiratory Coronavirus" (HCoV). British and American scientists introduced it to science in the 1960s. These viruses differ from some other viruses that cause acute respiratory diseases. Coronaviruses primarily infect the alveolar cells of the nose, throat, larynx, and bronchi, particularly the lungs, where they multiply and cause severe illnesses such as pneumonia.

Coronaviruses (Latin: *Coronaviridae*) are a family of viruses that include 40 types of RNA viruses affecting both humans and animals. The name is derived from the virus's structure—its spike-like shape resembles the "solar corona." The official name of the coronavirus is COVID-2019, where CO stands for "coronavirus," VI for "virus," and D for "disease."

REFERENCES

1. Al-Hosani F, et al. Clinicopathological, immunohistochemical, and ultrastructural findings of a fatal case of Middle East respiratory syndrome coronavirus (MERS-CoV) in the United Arab Emirates, April 2014. Am J Pathol. 2016;186:652-8.
2. COVID-19: Safe handling and processing for laboratories. Public Health England, 2020.
3. Iskandarov A.I., Khvan O.I., Yadgarova Sh.Sh. Forensic medical examination of corpses of individuals suspected of coronavirus infection (COVID-19): Methodological recommendations. Tashkent, 2020.
4. Coronavirus Infection (Guideline). Tashkent, 2020. B.M. Tadzhiev, Kh.Yu. Akhmedova, M.S. Madaminov.

Web of Medicine: Journal of Medicine, Practice and Nursing
webofjournals.com/index.php/5

5. Clinical management of patients with severe acute respiratory infection when novel coronavirus (2019-nCoV) infection is suspected: Interim guidance. WHO, January 25, 2020.
6. Public recommendations for coronavirus infection prevention measures. Chinese National Health Commission, Center for Disease Control and Prevention, 2020.
7. Prevention, diagnosis, and treatment of novel coronavirus infection (COVID-19): Interim methodological recommendations. Ministry of Health of the Russian Federation, April 28, 2020.
8. Infection prevention and control for the safe management of bodies in the context of the COVID-19 epidemic: Interim guidance. WHO, March 24, 2020.
9. Centers for Disease Control and Prevention (CDC). Interim guidance for collection and submission of post-mortem specimens from deceased persons under investigation (PUI) for SARS-CoV-2 (COVID-19), February 2020. (As of March 22, 2020).
10. Centers for Disease Control and Prevention (USA). Post-mortem care and safe autopsy procedures for Novel H1N1 Influenza, 2009. (As of March 22, 2020).
11. Centers for Disease Control and Prevention: National Vital Statistics System. Guidance for certifying deaths due to coronavirus disease 2019 (COVID-19). Accessed April 7, 2020.
12. World Health Organization. Water, sanitation, hygiene, and waste management for the SARS-CoV-2 (COVID-19) virus: Interim guidance. March 19, 2020. (As of March 22, 2020).
13. World Health Organization. Coronavirus disease (COVID-19) situation reports. April 3, 2020.

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