

The Novel Coronavirus: A Major Global Health Concern

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Abstract

Today, Coronavirus (Cov) is one of the most dangerous diseases worldwide, and many people suffer from it. Coronavirus as a deadly virus was first recognized and spread in the City of Wuhan, Province of Hubei, China. This virion contains nucleocapsid, which is consists of phosphorylated nucleoprotein (N) and genomic RNA. The RNA of coronaviruses is enveloped, not fragmented, and is a positively sensitive single-stranded RNA that is known to be the largest viral genome in various sizes from 26 to 32 kV. Cov usually tends to provoke mild to severe respiratory disease. The symptoms of Cov may comprise headache, cough, fever, sore throat, runny nose, and a discomfort sensation. People with chronic diseases and health care staff are at greater risk of infection. Some compounds, such as mycophenolic acid and cyclosporine A, RNAi, and monoclonal antibodies have shown inhibitory effects against Cov. This article briefly discusses the nature, symptoms, transmission, treatment, prevention, and protection of this deadly virus.

Keywords: Coronavirus, SARS, MERS, Symptoms, Treatment

Introduction

At the end of 2019 and the beginning of 2020, numerous human cases of the new coronavirus infection have been reported in the wholesale market of Huanan seafood (Southern Chinese seafood market) in Wuhan, China. The RNA of coronaviruses is enveloped, not fragmented, and is a positively sensitive single-stranded RNA that is known to be the largest viral genome that has different sizes from 26 to 32 kV. This virion contains nucleocapsid, which is consists of phosphorylated nucleoprotein (N) and genomic RNA, which is located within the phospholipid layers and is covered by two types of spike protein: The hemagglutinin esterase dimer (HE) that found in some coronaviruses and the spike glycoprotein (S) found in all coronaviruses. Enzymatic protein (E) and the membrane protein (M), which is a kind of transient membrane glycoprotein, is found between the S proteins within the membrane of the virus (Fig. 1). Subfamilies of coronaviruses are serologically and genetically divided into four categories: γ , α , β , and δ . The virus can also be classified into four A-D viral strains. There are about 30 species of coronavirus that infect mammals, humans, chickens, and other kinds of animals. Human coronavirus infections are arising from β - & α -CoVs. Coronaviruses are common human pathogens and account for 30% to 60% of China's population are positive for anti-CoV antibodies. CoV usually triggers the respiratory system of mammals, like humans. Besides, acute respiratory distress syndrome, cold, and pneumonia are related to CoV, and further, it is able to gut damage. In 1937, the flu virus was first isolated from the birds which have bronchitis infection. Such viruses are accounted for between 15 to 30 percent of the current cold. Over the past 70 years, researchers have been discovered that CoV is able to infect rats, turkeys, mice, horses, pigs, cats, dogs, and cows.

Coronavirus can cause Middle East Respiratory Syndrome (MERS) and severe chronic respiratory syndrome (SARS), and

also can infect a variety of species. In 2012, MERS was detected in Saudi Arabia for the first time. Unlike other identified Cov, both of the SARS and MERS viruses can affect the lower respiratory tract following the upper respiratory tract inflammation which leads to severe lung disorder and death in many cases. Six human Cov have been recognized. The chronic respiratory syndrome has an outbreak from China and stimulates infection in 37 countries that 774 persons killed. In the 1960s, human coronaviruses were first recognized in the nose of common cold patients. The significant percentage of common colds of 229E and OC43 were induced by two human coronaviruses. These viruses are named focused on the crown appearance on their exterior surface. In Latin, corona means "crown" or "halo". In humans, the infection is most common in the early spring and winter. A person can catch a cold created by a coronavirus and then catch it once more near four months afterward. It's only because of the coronavirus antibodies has a short lifespan. Antibodies toward one species of coronavirus can often be inactive compared to other forms. Host chemicals induce the immune response during virus infection.

However, it should be noted that immunopathogenesis is associated with out-of-control immune responses, which may lead to decreased lung capacity, dysfunction, and lung tissue damage. CoV' genomes encode a range of peripheral proteins, un-structured proteins, and proteins that have structural roles. The peripheral proteins of coronavirus are distinctive even in a similar category and perform various roles, like the host's response to infection. Intestinal and respiratory disorders are usual in animals and humans, respectively. Historically, coronaviruses have been believed to provoke major agricultural diseases and humans cold. SARS-CoV appeared in China in 2002. The SARS coronaviruses outbreak continued eight months and generated 8098 reported individual instances globally that 774 cases had fatalities. Approximately, ten years following the appearance of SARS-CoV, the MERS-CoV started to emerge within Saudi Arabia.

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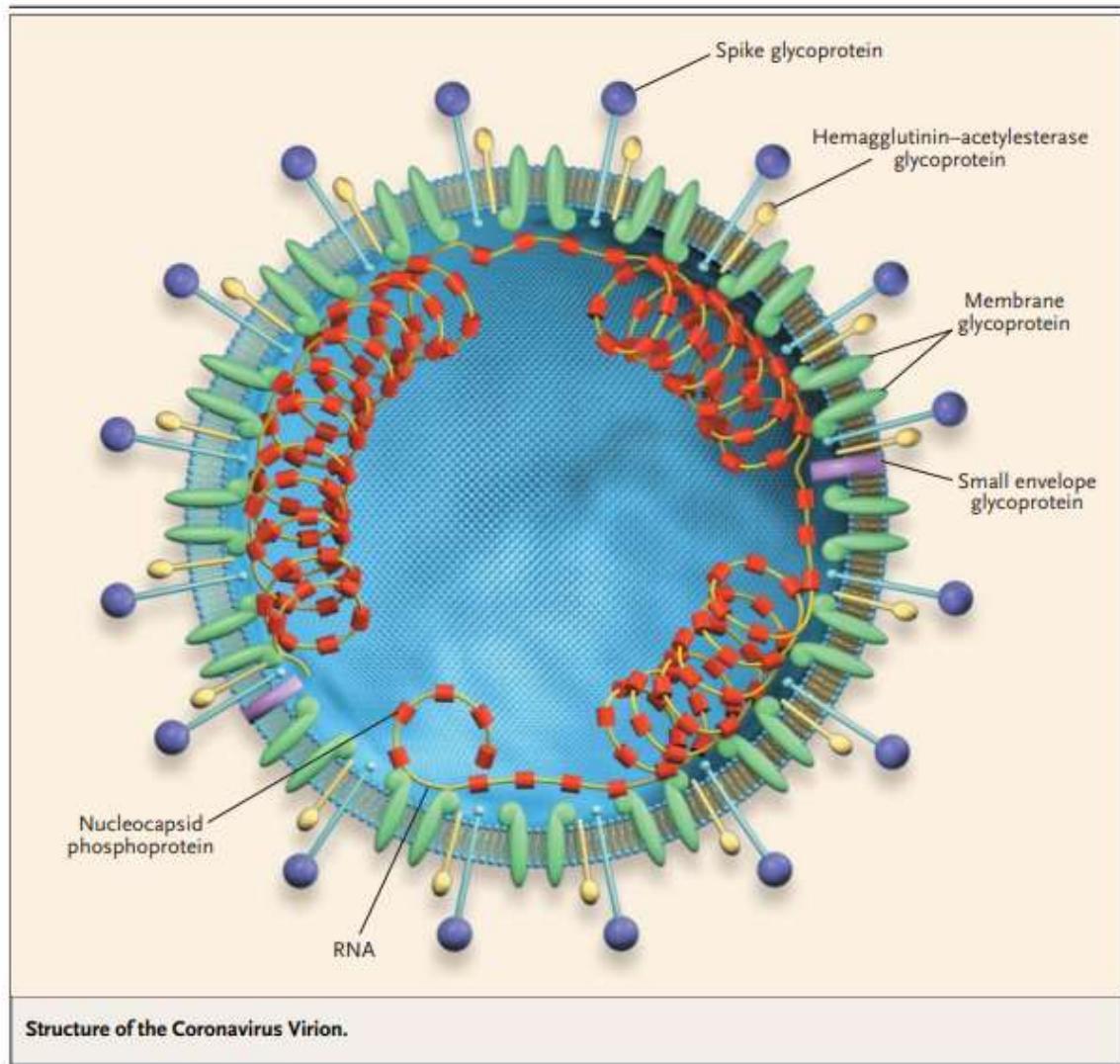


Figure 1: Coronavirus and its components

MERS coronaviruses tend to the epidemic with 2,260 infections reported in 27 countries in which 803 of them were lethal. The human coronaviruses NL63, 229E, HKU1, and OC43 are already four types of current human common cold viruses. Also, two new coronaviruses including MERS-CoV and SARS-CoV can trigger highly infectious breathing diseases. Because of their tracking impact on the leukocytes in the host lungs, chemical tactics combat are important for immune responses to virus infections. The absence of immunity or immune system changes may enhance viral proliferation and provoke destruction. In many species, including humans, coronavirus can trigger respiratory infections, central nervous system diseases, and intestinal diseases. The advent of SARS-CoV made a significant contribution to the detection of medicines in lab animals, like specific pegylated-interferon- α , monoclonal antibodies, and siRNA against SARS-CoV. Phylogenetic evaluation of the replicase gene utilizing a retrovirus indicated that three types of coronaviruses were detectable.

Bats seem to be the source of many novel viruses, including coronaviruses that cause significant human illness and infection in agricultural species. This involves CoVs which

cause swine acute diarrhea syndrome, MERS, SARS, and porcine epidemic diarrhea. Bats that are affected spontaneously or via laboratory experiments may not exhibit medical symptoms of the sickness. Such findings prompt investigators to assume that bats may be some CoVs' reservoir or ancestral host. Bats have been considered to produce a wide range of coronaviruses, although it is still unclear the processes through which the virus is transferred to humans or animals. There is documentation to suggest that seasonal variations in the proliferation of viruses may happen. Nevertheless, the association between the level of reproduction of viruses and the dissemination of viruses for bats has not been studied. CoV usually needs an intermediate host in bats before spreading into mammals, like those seen in MERS-CoV and camels.

Unlike a lot of information about the study of other bat pathogenic viruses including Marburg, Hendra, Nipah, and Ebola, we have relatively limited evidence on how directly or indirectly coronaviruses are transferred to humans. Bats have a large variety of extremely pathogenic viruses. Study toward identify the processes in that bats suppress infection is an upcoming field that may be challenging because of a shortage of assays that require suitable development *in vivo* and *in vitro*.

experiments. A few of these researchers have concentrated on corticosteroid-treated bats that are mainly in line with filovirus and henipavirus infections. Additional experiments are necessary for determining virus-host relationships between coronaviruses and bats, specifically isolated bats containing CoVs, in evaluating why bats are the appropriate source for coronaviruses, and how to manage the pathogens to reduce serious clinical implications. However, merely six percent of the total coronaviruses sequences in GenBank are related to bats.

Symptoms

Common human coronavirus, like HKU1, OC43, NL63, and 229E, usually tends to provoke mild to severe respiratory disease. Many people sometime in their lifetime are infected by the virus. These conditions usually last only a short time. The average incubation period of the disease is about 5 to 7 days (with a range of 2 to 11 days). The symptoms of CoV can contain headache, cough, runny nose, fever, a discomfort sensation, and sore throat. Approximately 5 days later, symptoms of acute respiratory infection begin. People with chronic diseases and health care staff are at greater risk of infection. Human coronavirus may also induce infections of the lower respiratory tract, including bronchitis and pneumonia. It will be more frequent in patients with weak immune systems, pulmonary heart disease, infants, and the elderly. Elderly people, people with weakened immune systems, and infants are

more prone to this disease. As can be seen from Figs. 2, CoV pathogens can continue to stay undiagnosed in the preliminary stages till acute pneumonia, breathing difficulties, kidney degeneration, pain and suffering, and even dying.

Symptoms of MERS syndrome generally include shortness of breath, cough, fever which often progress to pneumonia. Other symptoms of respiratory tract infections, including sputum production, mucus secretion from the nose, headaches, wheezing, muscle aches, chest pain, and malaise may be present in MERS patients. Physical symptoms at the analysis time may include abnormal heart rate, high fever, tachycardia, low blood pressure, and shortness of breath. Shortness of breath is the most common complication of the infection, and Seventy-one percent of cases also move toward pneumonia. Approximately three to four of every ten MERS cases perish in ICU. MERS cases mostly occur in the Arabian Peninsula. Symptoms of SARS commonly include body aches, chills, and fever that usually progresses to pneumonia. Complications of MERS include simultaneous fungal, viral, pneumonia, bacterial infections, mental disorder, septic shock, possibly stillbirth, and delirium. In addition to respiratory involvement, patients infected with the MERS virus may also have symptoms of gastrointestinal involvement. Diarrhea is the most common symptom, occurring in 25.5-6.7% of severe cases. Abdominal pain, vomiting, and nausea may also occur. Genome recognition of virus has been documented in fecal samples but there are no long-term experiments on virus excretion pattern.

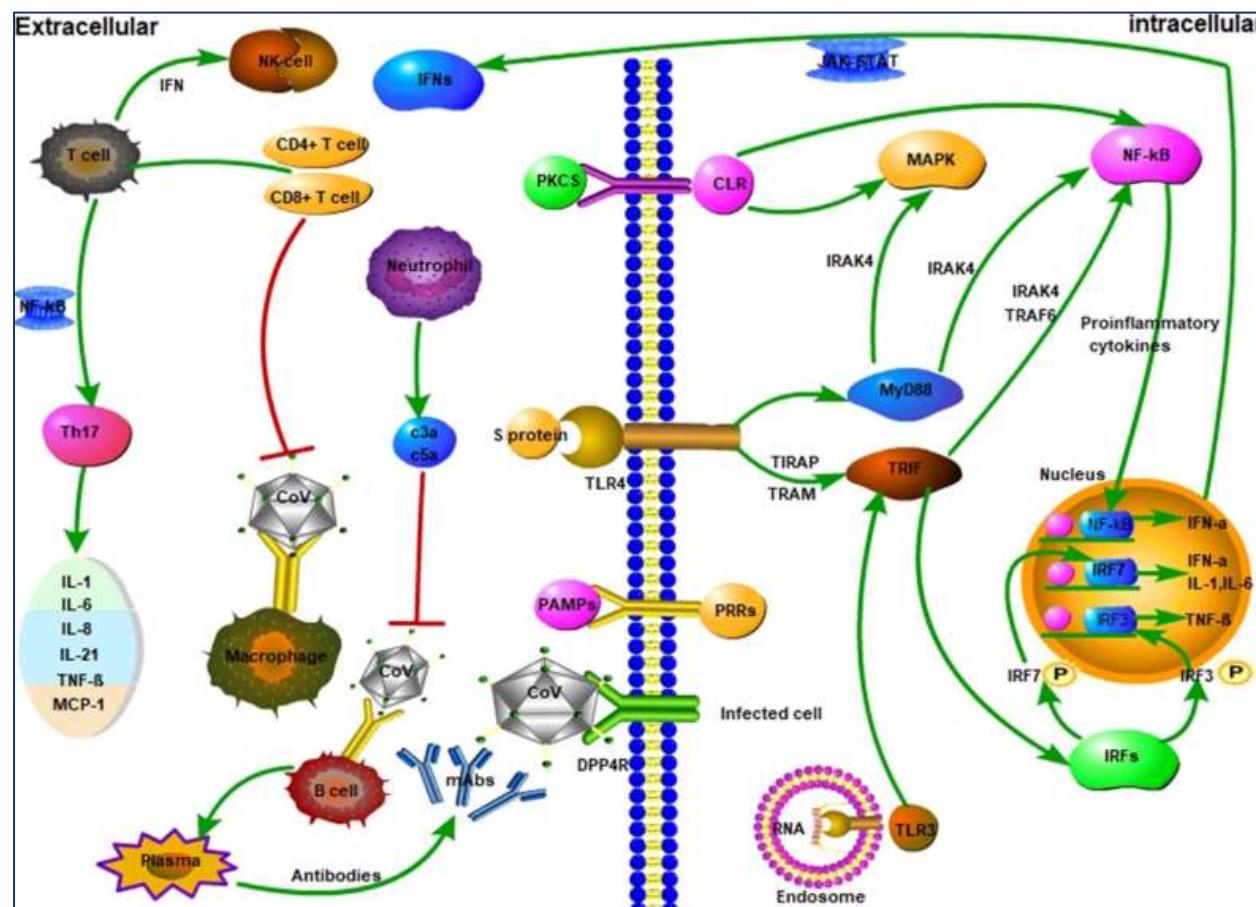


Figure 2: The immune reactions against pathogenic coronavirus in the infected person.

Disease transmission

Most of the MERS cases have been reported from South Korea, and Saudi Arabia followed by Qatar, Jordan and the United Arab Emirates, and a few cases in Egypt, Oman, Tunisia, Germany, France, Iran, Algeria, Italy, Greece, Kuwait, Netherlands, Malaysia, Philippines Lebanon, Austria, Yemen, Turkey, the United Kingdom, and the United States have been observed. The United States and the United Kingdom have reported that the presence of health care workers is the most important risk factor for MERS infection. Nosocomial transmission of the infection is 1-fold higher than in the general population. Other factors such as high temperature and low humidity are also important. Human viruses are usually transmitted through a person infected with others through the air through sneezing, coughing, and close contact with people, including touching an object or surface containing the virus, especially when touching the inside of the mouth, nose, and eyes before washing hands. Humans are typically afflicted by coronavirus during the winter or autumn in the United States. Small kids seem to be more vulnerable to the infection. Phylogenetic analyzes show a close genetic link between the MERS virus and beta-coronaviruses that detected in insectivorous bats. Since the detection of the MERS virus, very similar sequences of the coronavirus have been identified in bats in Africa, Europe, Asia, and America, indicating the widespread circulation of MERS-related viruses in bats. However, the complete sequence of MERS coronavirus was not separated from any bat source. Direct contact between humans and bats is limited, and therefore, often an intermediate host type plays a role in transmitting viruses from bats to humans.

Prevention and treatment

There is already no vaccine available to defend human coronavirus contamination. Here are some tips to help prevent coronavirus infection: (a) stop rubbing your mouth, nose, or eyes with your hands and (b) clean the hands for twenty secs using soapy water.

Protection

When performing a procedure that generates aerosols (such as bronchoscopy, aspiration, cardiopulmonary resuscitation, and suctioning), precautions should be taken to prevent the transmission of infection through the respiratory tract and airways. All patients with symptoms of acute respiratory infection in whom MERS infection has been confirmed or suspected should be quarantined in a room with a proper ventilation system. To further protect these recommendations can help: (a) avoid close contact with others; (b) clean and disinfect objects and surfaces; (c) stay at home while you are sick; and (d) clothe your nose/mouth with a towel anytime you sneeze /cough. Then immediately throw the tissue in the garbage and wash the heads.

Treatment

There is no specific treatment for obstructive diseases caused by human viruses. However, coronavirus MERS is easily inhibited in cell culture by type I interferons (alpha interferons and especially beta interferons). Recently, some compounds such as mycophenolic acid and cyclosporine A, have shown inhibitory effects against MERS coronavirus. Fusion peptide inhibitors also reduce the proliferation of the virus in the cell culture, which can be used as a new approach

in the treatment of this infection. Monoclonal antibodies and serums obtained from people who are recovering from MERS and recovering from infection may also help treat infected patients. SARS is characterized by a resistance to atypical pneumonia that is rapidly progressing to routine antibiotic treatment. Consequent clinical initiatives for SARS cases are primarily focused on the utilization of corticosteroids and ribavirin. Ribavirin, that prevents adenosine monophosphate dehydrogenase activity, has always been believed to be an antiviral drug. Nevertheless, its effectiveness in SARS cases stays uncertain and no major antiviral behavior has been demonstrated in laboratory experiments. Recent studies have shown that ribavirin even increases SARS-CoV infection in mice. In total, such results may not justify the utilization of ribavirin for the treatment of SARS within mammals. The application of steroids to SARS cases may be largely focused on the premise that many other clinicians in late-onset disorder undergo medical impairment while SARS-CoV becomes untraceable. In many instances, the combined usage of other medications skews the outcome following to produce the drugs and make it complicated to evaluate whether steroids have a protective effect. While efforts have been made to combat diseases with antiviral drugs and corticosteroids, quarantine and isolation have been largely effective in ultimately controlling the disease epidemic at the time. The important role that coronavirus key proteins play in regulating virus transcription and replication by polypropylene procedure, along with the lack of close cellular homologs, indicates that such components as an effective potential purpose to antiviral drug engineering. An effective inhibitory pathway related to the main suppression pathway of protease in the Transmissible gastroenteritis virus and SARS coronavirus has been demonstrated. In cell-based experiments, an improvement paradigm was developed by the immediate weakening of the key CoV component, powerful antiviral activity, and also relatively poor cellular health effects. More improvement may move rapidly to the short term recognition of a single element with a therapeutic effect toward CoV-related diseases. A Phe-Phe dipeptide inhibitor, anhydride niclosamide, and Cinanserin have been discovered to prevent viral replication and suppress the major protease activity in Vero cells. A variety of substances can meddle within the lifespan of SARS-CoV as given in Figs. 3. Laboratory studies have shown that there is antiviral activity against SARS-CoV, so Lopinavir/ritonavir formulation has been regarded as an effective therapy for the first time.

Since RNA interference (RNAi) in herbs as well as other species generates efficient antiviral defensive strategy, many findings have concentrated on the effect of RNAi to hinder pathogenic infection. To determine the probability of reproduction of SARS coronaviruses, unique siRNAs were produced to trigger the spike genes. Such siRNAs significantly inhibit spike protein gene transcription in cells that afflicted with SARS coronavirus. Judging by the morphological changes, the three molecules considerably hinder the cytopathic activity of viral replication and propagation. Furthermore, several siRNAs prevent infectious disease and inhibit replicate of various forms of SARS that can be an alternative for potential therapeutic application. Due to the effective treatment capacity of siRNA, Strong siRNA inhibitors against SARS coronaviruses have been investigated through targeting their genomes in protein-coding sequences and SARS-CoV nsp12.

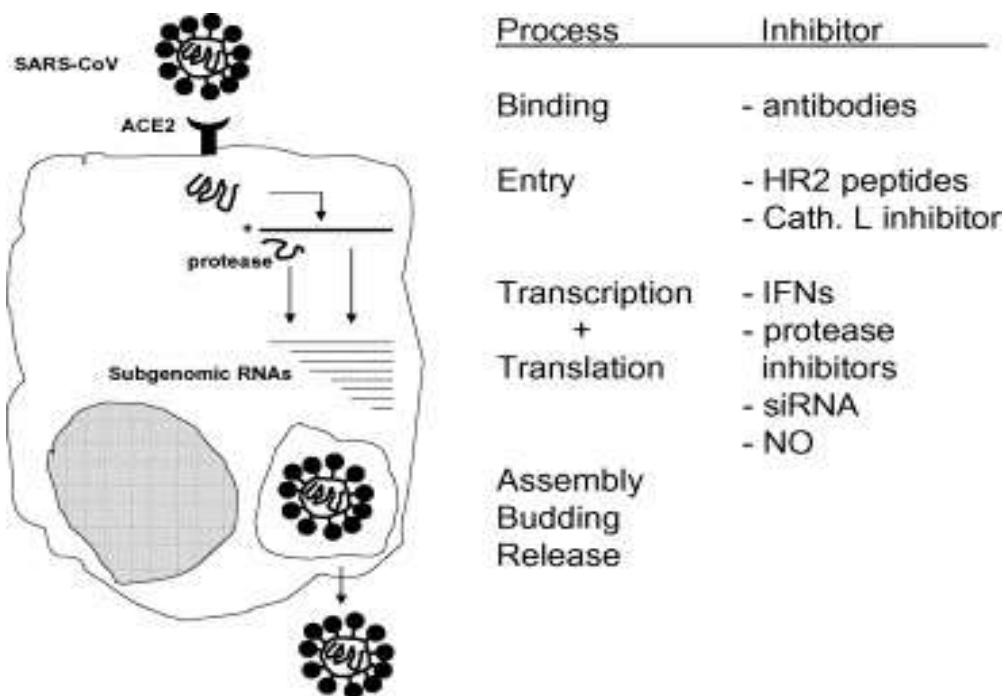


Figure 3: Diagram description regarding the SARS-CoV lifespan & virus reproduction suppressors

The following recommendations can be effective in treating this disease: (a) drink plenty of fluids; (b) using an air moisturizer or warm bath to help calm sore throats or even coughs; (c) taking pain relievers and fever pill (Advice: Don't offer aspirin to kids); and (d) stay home and relax.

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