



## A REVIEW ON COVID 19: SPREAD AND ITS ADVERSE IMPACT ON GLOBAL ECONOMY

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### ABSTRACT

Coronaviruses is one of the virus from several life-threatening viruses. They have infected a variety of human and animal hosts that may cause upper respiratory tract infections, pneumonia in humans. The first human coronavirus was first identified as cause of the common cold in 1960. The genome of coronavirus is a single-stranded positive-sense RNA. It is a negative strain virus of about 60-220 nm in diameter and has club-shaped projection on surface. This review discuss the current knowledge on structure of coronavirus, life cycle of virus, treatment and impact of corona on world economy. There is no specific vaccine or treatment for COVID19 infection. Also discuss the impact of corona on world economy, impact on hospitals and health care centers and on pharma industries and stock markets.

**KEYWORDS:** Coronavirus, RNA, COVID19, SARS, MERS, PCR, world economy.

### INTRODUCTION

Coronavirus (COVID 19) family of viruses noted for holding stains that doubtless deadly diseases in mammals and birds. Corona viruses are species in the genera of virus belonging to one of two subfamilies Coronavirinae. Corona viruses can cause multiple system infections in various animals and mainly respiratory tract, gastro-intestinal, central nervous system infections in humans, livestock, avian, bat, mouse and many other wild animals such as Severe Acute respiratory syndrome (SARS) and Middle East respiratory syndrome (MERS).<sup>[1-3]</sup> Since 2002 outbreaks of the Severe acute respiratory syndrome (SARS) and in 2012 Middle East respiratory syndrome (MERS), the possibility of corona virus transmission from animals to human has been proved.<sup>[4,5]</sup> There are six known HCoV have been identified, namely HCoV-229E, HCoV-NL63 ( $\alpha$ -coronavirus), HCoV-OC43, HCoV-HKU1( $\beta$ -coronavirus), severe acute respiratory syndrome coronavirus (SARS-CoV) and Middle East respiratory syndrome coronavirus (MERS-CoV) are globally circulated in the human population.<sup>[6]</sup> In severe cases, especially in elderly, children and immunocompromised patients these four HCoVs can cause life-threatening pneumonia and bronchiolitis.<sup>[7,8]</sup>

### History of Coronavirus

The first human Coronavirus was first identified as a cause of the common cold in 1960. In 2001 the study is

carried out in Canada more than 500 patients showed flu-like symptoms. The virological analysis showed that 3.6% of cases were positive for (HCoV-NL63) stain by polymerase chain reaction (PCR). Until 2002, coronavirus was considered as relatively simple and nonfatal virus however an outbreak in 2002-2003 in Guangdong province in china, which resulted in spread to many other countries like Thailand, Vietnam, Taiwan, Hong Kong, Singapore and US of America, caused severe acute respiratory syndrome (SARS) and middle east respiratory syndrome (MERS) in 2012. The evolution of this virus demonstrated that coronavirus is not stable and adapts to come more virulent and lethal to humans. This type of coronavirus is returned into existence with novel features named as COVID 19.

The coronavirus (2019-nCoV) is a respiratory illness first detected in Wuhan city, Hubei Province, China in December of 2019 and now spread in various countries. The possibility of transmission from animal to human is confirmed. On 12 January 2020, the World Health Organization (WHO) temporarily named the virus (2019-nCoV).<sup>[9]</sup> The death rate appears to be higher than that of seasonal flu, but it also varies by location as well as a person's age, underlying health conditions and other factors. According to a study published on 18 Feb 2020 due to an outbreak, the death rate reached 2.9% whereas it was just 0.4% in the province in China. The scientist is 't confirm that where the virus is originated. the

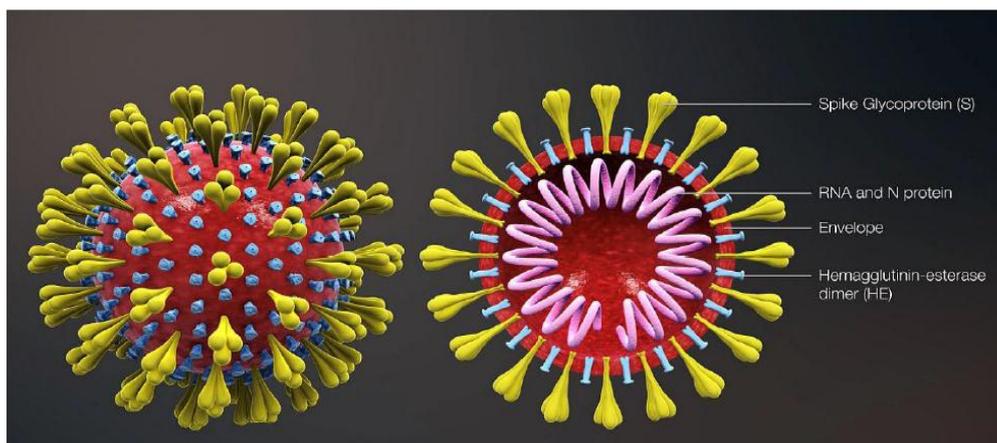
research comparing the genetic sequence of SARS-CoV-2 with a viral database suggested that it originate from the bat. since no bat is marketed as seafood in Wuhan. The researchers suggested that an intermediate animal, possibly the Pangolin (an endangered mammal) is responsible for the transmission to humans. There are currently no medical treatment and vaccines available, but the numbers of scientists and labs are working on various types of treatment.<sup>[10]</sup>

**Structure of Coronavirus**

The coronavirus is a member of the subfamily Coronavirinae viruses in the family of Coronaviridae of the order Nidovirales which causes respiratory and intestinal infection. The genome of coronavirus is a single-stranded positive-sense RNA. Coronavirus is a negative strain virus of about 60-220 nm in diameter and has a club-shaped projection on the surface. Coronavirus has 26 to 32 kilobase pairs of DNA per viral genome and both SARS and MERS have 11 open reading frames (ORFs) each of these sections of DNA can be translated into proteins. Both non-structural and structural proteins are encoded by ORFs. These ORFs convert the

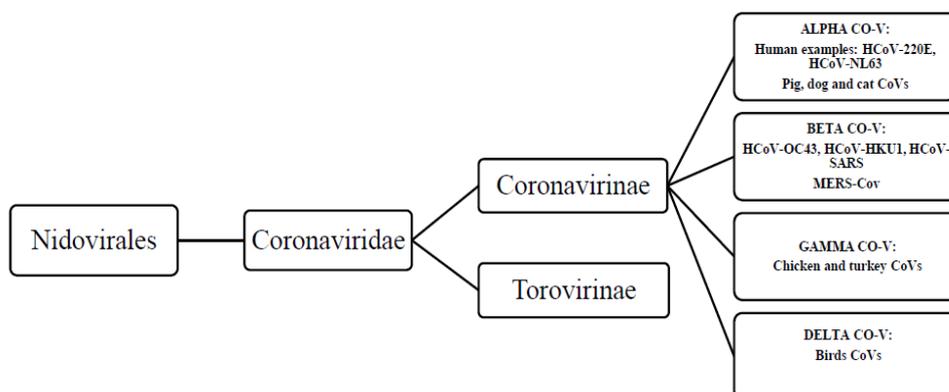
information of the features like a spike (S), membrane (M), envelope (E), and nucleocapsid (N). The structural proteins are essential for viral infection and propagation which performing different functions like promoting viral assembly and release, packaging the virus into virions and shipping the virions.

When the RNA is complexed with the nucleoprotein it forms extended helical nucleocapsid which is 9-11 nm in diameter. This is enclosed within a lipid bilayer membrane envelope associated with a transmembrane protein. The spikes are composed of a smaller amount of glycosylating protein and the haemagglutinin esterase is the protein found in the virus envelope.<sup>[11]</sup> All the structural and extra proteins are translated from the subgenomic RNAs of coronavirus.<sup>[9]</sup> The S protein is responsible for interacting with the host surface receptors for viral attachment and entry. The SARS is entered into the cell via binding angiotensin-converting enzyme found on the surface of alveoli, trachea, bronchial gland whereas MERS binds with dipeptidyl peptidase 4 present not only in lung epithelium but also the kidneys, small intestine, liver, and prostate.



**Fig. 1: Structure of Coronavirus.**

**Classification of coronavirus**



**Sign and Symptoms<sup>[12]</sup>**

- Fever
- Dry Cough
- Shortness of breath
- Pneumonia or Bronchitis

### Life Cycle of Coronavirus

Coronaviruses exploit the host cell machinery for their replication and spread. Here, we describe the CoV

infection cycle: attachment; entry into the host cell; translation of the replicase-transcriptase; replication of genome and transcription of mRNAs and assembly.<sup>[13]</sup>

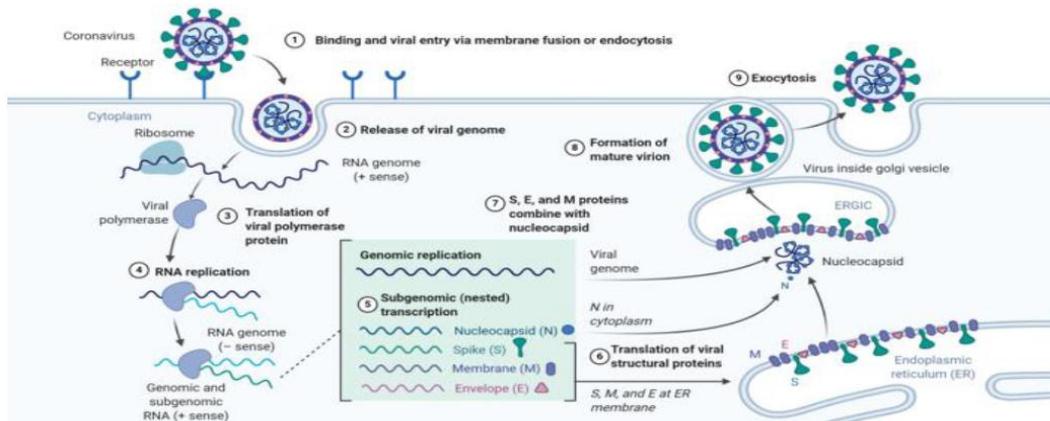


Fig: 2 Coronavirus Life Cycle.

#### Attachment and Entry

For attachment of the virus to the host cell receptors, i.e. Spike (S) receptor-binding protein is responsible. HE protein and S protein is sufficient for attachment leading to infection have demonstrated by Popova and Zhang. The expression of several coronavirus S proteins from various vectors has shown that it is the S protein that induces membrane fusion, observed as syncytium formation, a prerequisite of which is attached to a cell.<sup>[14]</sup> The host receptor is a major determinant of pathogenicity, the host range of the virus and tissue tropism. The S protein comprises two domains i.e. S1 and S2. The interaction between the S1 domain and its cognate receptor triggers a conformational change in the S protein, which then promotes membrane fusion between the viral and cell membrane through the S2 domain. The main host cell receptors utilized by all human coronaviruses are known: aminopeptidase N by HCoV-229E, angiotensin-converting enzyme 2 by SARS-CoV and HCoV-NL63, dipeptidyl peptidase 4 (DPP4) by MERS-CoV and 9-O-acetylated sialic acid by HCoV-OC43 and HCoV-HKU1. Some Coronaviruses may also gain entry into the cell via the non-endosomal pathway, or a combination route of entry, apart from the conventional endosomal route of entry. The low pH in the cellular environment and endosomal cysteine protease cathepsins may help to facilitate membrane fusion and endosomal CoV cell entry. Other host proteases, such as transmembrane protease serine 2 (TMPRSS2) and airway trypsin-like protease TMPRSS11D, could also perform S1/S2 cleavage to activate the S protein for non-endosomal virus entry at the cell plasma membrane during HCoV-229E and SERS-CoV infection. Besides, MERS-CoV is also activated by furin, a serine endopeptidase that has been implicated in the cell entry of the RNA viruses and S1/S2 cleavage during viral egress.

To restrict viral entry, many host cells utilize their own factors. Using a cell culture system and pseudo type

virus, many groups have identified a family of interferon-inducible transmembrane proteins (IFITM), which could inhibit global circulating HCoV-229E and HCoV-NL63 S protein-mediated entry, also the highly pathogenic SARS-CoV and MERS-CoV. IFITM3 blocks the enveloped virus entry by preventing fusion of the viral envelope with the plasma membrane or endosomal membranes through modulating the host membrane fluidity.

#### Coronavirus Replication

Following the release and uncoating of viral nucleocapsid to the cytoplasm, CoV replication begins with the translation of ORF 1a and 1b into polyproteins pp1a and pp1ab.<sup>[6]</sup> In order to express both polyproteins, the virus utilizes a slippery sequence (5'-UUUAAAC-3') and an RNA pseudoknot that cause ribosomal frameshifting from the rep 1a reading frame into the rep1b ORF. [Fehr AR, Perlman] Polyproteins pp1a and pp1ab are cleaved into at least 15 nsp, which assemble and form a full-length negative-strand template for the synthesis of new genomic RNAs and overlapping subgenomic negative-strand templates. These subgenomic mRNAs are transcribed and translated to produce the structural and accessory proteins. Several heterologous nuclear ribonucleoprotein (hnRNA) family members are essential for efficient RNA replication. Other RNA-binding proteins have also been suggested to play a role in CoV replication, such as m-aconitase and poly-A-binding protein (PABP), DDX1, PCBP1/2.<sup>[13]</sup>

#### Coronavirus Assembly and Egress

The assembly of virions has quickly ensued with the accumulation of new genomic RNA and structural components. The helical nucleocapsid containing the genomic RNA interacts with other viral structural proteins i.e. S, E, M proteins to form the assembled virion, in this phase of the infection cycle. The assembly of CoV particles is completed through budding of the helical nucleocapsid through membranes early in the

secretory pathway from the endoplasmic reticulum to the Golgi intermediate compartment (ERGIC). In this phase of the infection cycle, the contribution of the host has been explored. It is known that the M protein orchestrates the entire assembly process by selecting and organizing the viral envelope components at the assembly sites and by mediating the interactions with the nucleocapsid to allow the budding of virions. The E protein to assemble into a mature virus, such as the M protein interacts with different viral structural proteins. The interaction generates the scaffold of the virion envelope and induces the budding and release of the M protein-modified membrane and with the S protein to assemble to spikes into the viral envelope. Following assembly and budding, the virions are transported in vesicles and eventually released by exocytosis. An inhibition of a Valosin-containing protein (VCP/p97) in recent study resulted in virus accumulation in early endosome in infectious bronchitis virus (IBV), suggesting a role for VCp in the maturation of virus-loaded endosomes.

### Diagnosis

In the United States, the Center for Disease Control and Prevention (CDC) recommends a collection of specimens to test for SARS-CoV-2 from the upper respiratory tract (nasopharyngeal and oropharyngeal swab) and, if possible, the lower respiratory tract (sputum, tracheal aspirate, or bronchoalveolar lavage). The induction of sputum is not indicated. Stool and urine can also be collected. Respiratory specimen collection should be performed under airborne precautions.

SARS-CoV-2 RNA is detected by polymerase chain reaction (PCR) technique; in the United States, testing is performed by the CDC or a CDC-qualified lab. A positive test for SARS-CoV-2 confirms the diagnosis of COVID-19. If initial testing is negative but the suspicion for COVID-19 remains, the WHO recommends resampling and testing from multiple respiratory tract sites. Negative reverse-transcription polymerase chain

reaction (RT-PCR) tests on oropharyngeal swabs despite CT findings suggestive of viral pneumonia have been reported in some patients who ultimately tested positive for SARS-CoV-2.<sup>[15]</sup>

### Treatment

There is currently no specific vaccine or treatment recommended for COVID19 infection and for severe cases current treatment includes care to support vital organ function. Several therapeutic options including ribavirin, interferon alfa, and lopinavir/ ritonavir are given in combination. Interferons with ribavirin showed a limited effect on coronavirus infection. In the other way therapies with plasma and antibody obtain from the convalescent patient has proposed as a treatment. Identifying and control the source of infection, early diagnosis, reporting, isolation, supportive treatments is the best way to deal with severe infections of CoVs and timely publishing epidemic information to avoid unnecessary panic. For individuals, good personal hygiene fitted masks, ventilation and avoiding crowded places will help to prevent CoVs infection.<sup>[10]</sup>

According to president trump referred especially to two potential treatment that has been identified by medical researchers and clinicians, that have undergone various degrees of investigation and testing in the ongoing war against COVID 19. France has examined the effectiveness of anti-malarial drug chloroquine and hydroxychloroquine the study showed the positive effect of hydroxychloroquine in reducing both the duration and symptoms of COVID 19 if it is given in the combination with azithromycin.

### Spreading of corona in worldwide

The global mortality rate for COVID19 is 3.4%, WHO said on 5 March. This virus causes more severe illness than flu-like pneumonia, a severe respiratory condition, shortness of breath. Here's a look at the number of cases in hotspot outside mainland China, according to WHO on 14 March 2020.

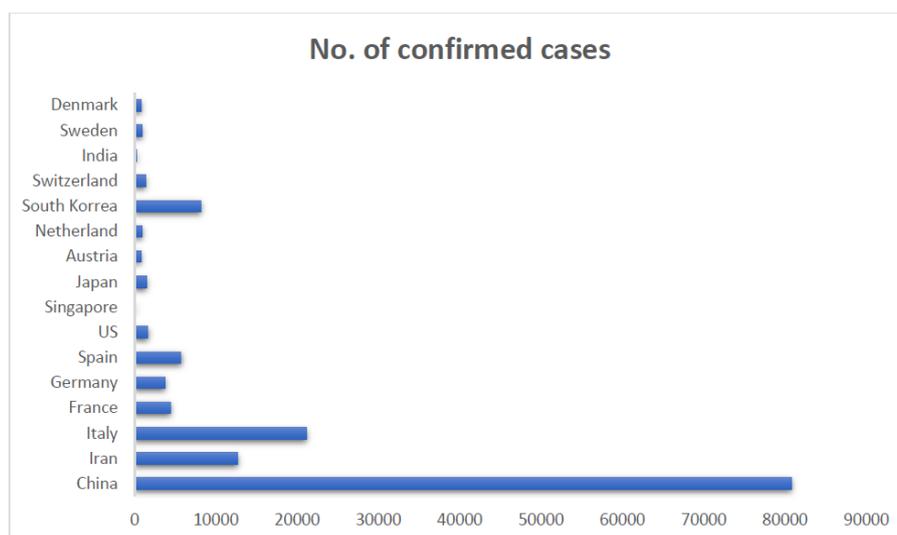


Fig. 3: Number of cases confirmed in different countries.

### Transmission of Coronavirus

- The new coronavirus spreads moistly through person to person contact within about 6 feet (1.8 meters) radius according to the Centre for Disease Control and Prevention (CDC).
- It might also be spread by touching a surface where the virus has recently landed then touching one's mouth, eyes or nose.
- People with COVID 19 which is a disease caused by the coronavirus spread viral particles through coughing and sneezing. The particles can land in the mouth or nose of those nearby.

### Practice good hygiene and health habits

- Wash your hands often and thoroughly with soap/handwash and water for at least 20 seconds or use an alcohol-based hand sanitizers(with at least 60% to 95% alcohol).
- Avoid touching your eyes, nose or mouth as you can pick viruses that way.
- Avoid unprotected contact with pets(Dog or)Cat and wild animals.
- Cover your coughs and sneezes with an elbow sleeve or tissue.
- Keep the distance while talking in the group of peoples.
- wash the clothes with hot water and disinfectant like Dettol regularly.

- Clean frequently touched surfaces and objects like a doorknob and countertops. Push the doors with elbow.
- Clean the floor surface with a disinfectant containing 62% to 71% ethanol, 0.5% hydrogen peroxide or bleach can efficiently inactivate coronavirus within a minute.

### Impact of corona on world economy

Fear of the coronavirus outbreak means that some people are choosing to avoid activities that might expose them to the risk of infection, such as going out shopping. "Workshop of the World" such as factories pauses their work and decreases the activities trying to prevent the spreading of COVID 19. Only those workers and employees are allowed who is healthy and remaining are allowed to work from home.

Businessmen and investors are worried because of the huge impact on the market due to coronavirus spread outside of China. Big hit to the stock market where shares in companies are brought and sold can also affect the investment of individual savings. The last week of Feb 2020 showed the worst performance for the major stock market since the 2008 financial crisis.

## OECD downgrades growth forecasts

Economic growth (GDP) expected to slow down in 2020

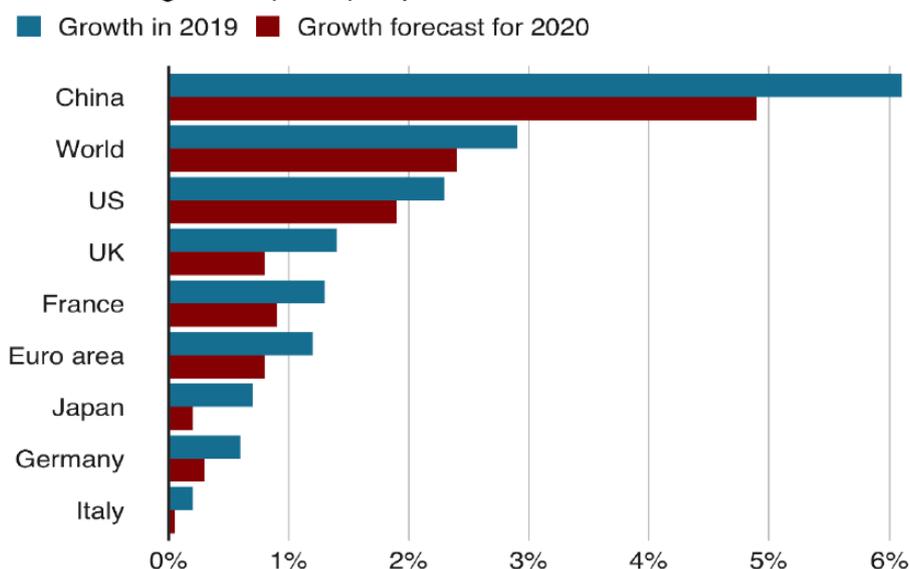


Fig. 4: Economic Growth Forecasts.

## Coronavirus impact on stock markets



Fig. 5: Coronavirus Impact on Stock Markets.

### IMPACT ON PHARMA INDUSTRIES AND MARKETS

**WHO calls on industry and governments to increase manufacturing by 40 percent to meet rising global demand**

According to the Dinesh Dua chairman of Pharmexil which function under the Ministry of Commerce and Industry said the prices of APIs get increases now a day because most APIs are imported from China and Due to coronavirus spread in whole china the trades between India and China are stopped. We are trying to import a large number of APIs from other countries which lead to an increase in prices of medicine in the upcoming months.

According to the data available with the Pharmaceutical Export Promotion Council (Pharmexil), the cost of paracetamol has gone up from Rs 250-300 kg to 400-450 kg. "Similarly, 'montelukast sodium' (an anti-asthma drug) is trading between Rs 52,000 and Rs 58,000 per kg, compared with Rs 33,000-38,000 per kg a few months ago. Similarly, the prices of vitamins and penicillin have increased by 40-50%.

Top drug makers in India like Zydus, Dr. Reddy's, Lupin, Glenmark, Mylan, Pfizer, and Biocon held a meeting on 19 Feb. 2020 to overcome such type of problem.

#### Impact on hospitals and health care centers

The World Health Organization has notified that severe and setting disturbance to the global supply of personal protective equipment (PPE) caused by increasing the demand, panic buying, hoarding, and misuse is putting the lives at risk of newly introduce coronavirus and another infectious disease. Due to limited supplies of gloves, medical mask, respirator, and goggles gown and apron the shortage of doctors and nurses increasing day

by day to care for COVID19 patients. WHO and ministry of health recall the doctor who is retired and on leave for providing service for infected patients in an isolated ward.

### CONCLUSION

Coronaviruses (CoVs) are a diverse family of viruses. These viruses infect a variety of human and animal host cells and carry out their infection and replication. Above we discuss the CoV infection cycle: attachment, entry into the host cell, translation, replication of genome and transcription of mRNAs and assembly. There is no specific vaccine or treatment recommended for COVID19 infection. For severe cases treatment includes ribavirin, interferon alfa and lopinavir/ritonavir are given in combination. But, this is controlled by good personal hygiene, avoid contact with wild animals. Focus on the impact on global stock market. Global stock markets have fallen sharply as investors continue to worry about the broader economic effects of the coronavirus. The deadly virus outbreak, which has killed more than 4,000 people and infected more than 116,000 has caused around the world. On the advice of health authorities, millions of people are avoiding school journeys, shopping runs and office commutes. India, the world's fifth largest economy and a major importer of electronics goods from China, stands to be affected by the higher prices of Chinese electronic components caused by supply shortage. 2020 showed the worst performance for the major stock market since the 2008 financial crisis.

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