GRAND OPENING OF MAGAZINE

Dept. of Microbiology

Japanese Encephalitis

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05.09.2020

WHAT IS JAPANESE ENCEPHALITIS?

Japanese Encephalitis(JE) is an infection of the brain caused by the Japanese Encephalitis virus(JEV).

- History
- Signs & Symptoms
- Transmission(Spread)
- JE is South-East Asia Region
- JE in INDIA
- Diagnosis & Treatment
- Contribution of ICMR-RMRC Towards Prevention & Control of JE

History

- History of clinical recognition and recording of Japanese encephalitis(JE) dates back to the 19th century.
- The first clinical case of Japanese encephalitis was recorded in 1871.
- In 1924 Japanese Encephalitis Virus(JEV) was isolated from human brain.
- The role of *Culex tritaeniorhynchus* mosquito as a vector and the involvement of wading ardeid birds and pigs as reservoir hosts was demonstrated in 1938.

Signs & Symptoms

- The incubation period is between 4-14 days .
- Most JEV infections are mild (fever and headache) or without apparent symptoms, but approximately 1 in 250 infections results in severe clinical illness.
- In children, gastrointestinal pain and vomiting may be the dominant initial symptoms
- Severe disease is characterized by rapid onset of high fever, headache, neck stiffness, disorientation, coma, seizures, spastic paralysis and ultimately death.
- The case-fatality rate can be as high as 30% among those with disease symptoms.
- Of those who survive, 20%–30% suffer permanent intellectual, behavioural or neurological sequelae such as paralysis, recurrent seizures or the inability to speak.

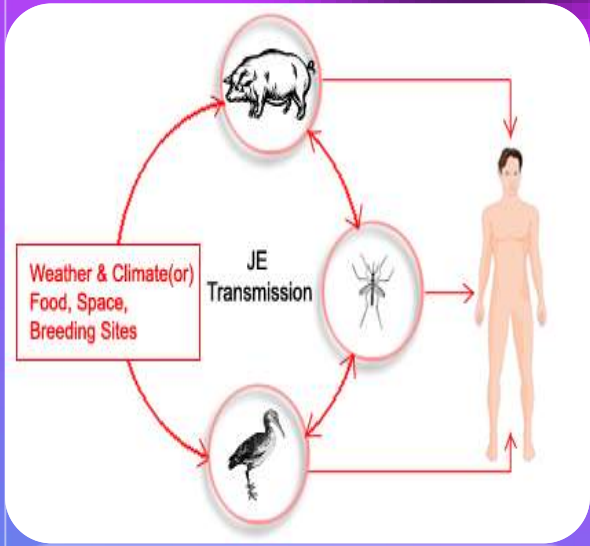
Transmission

Japanese encephalitis (JE) virus, a flavivirus, is closely related to West Nile and St. Louis encephalitis viruses. JE virus is transmitted to humans through the bite of infected *Culex* species mosquitoes, particularly *Culex tritaeniorhynchus*.

The virus is maintained in a cycle between mosquitoes and vertebrate hosts, primarily pigs and wading birds. Humans are incidental or dead-end hosts, because they usually do not develop high enough concentrations of JE virus in their bloodstreams to infect feeding mosquitoes.

JE virus transmission occurs primarily in rural agricultural areas, often associated with rice production and flooding irrigation. In some areas of Asia, these conditions can occur near urban centers.

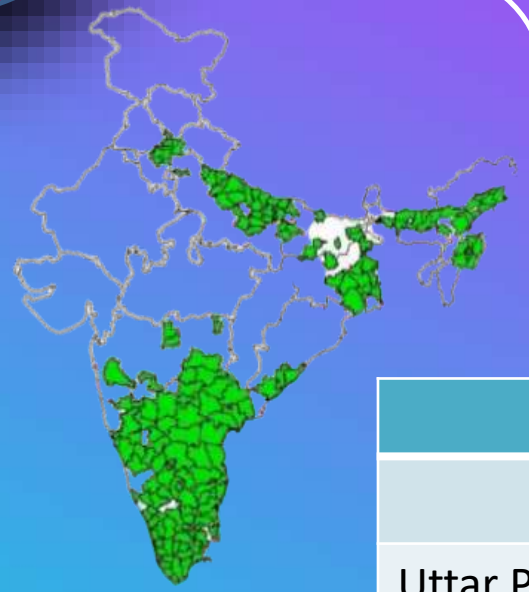
In temperate areas of Asia, JE virus transmission is seasonal. Human disease usually peaks in the summer and fall. In the subtropics and tropics, transmission can occur year-round, often with a peak during the rainy season.



It is estimated that annually more than 50,000 cases of Japanese Encephalitis and more than 10,000 deaths from JE occur in Southeast-Asia. India, Nepal, Thailand and Sri Lanka have regularly reported have regularly reported JE since 1985. Small scale studies on occurrence of JE have been reported from Bangladesh, Bhutan, Indonesia, Myanmar etc.

JE in South-East Asia Region

JE Scenario in INDIA



- In INDIA, the first human case was reported from Arcot district of Tamilnadu in 1955.
- Until 1973, the disease was confirmed to southern parts of India, with low prevalence; subsequently the disease spread to various other parts of India.
- The first outbreak of JE was recorded in 1973 from Burdwan and Bankura districts of West Bengal.
- The first epidemic of JE was reported in 1978 in Uttar Pradesh.
- In India, while 24 states are epidemic for JE, Uttar Pradesh contributed more than 75% of cases during the recent past.

JE Cases & Deaths in 2011

	Cases	Deaths
Uttar Pradesh	3490	579
Total	7838	1137

Diagnosis

Individuals who live in or have travelled to a JE-endemic area and experience encephalitis are considered a suspected JE case. A laboratory test is required in order to confirm JEV infection and to rule out other causes of encephalitis. WHO recommends testing for JEV-specific IgM antibody in a single sample of cerebrospinal fluid (CSF) or serum, using an IgM-capture ELISA. Testing of CSF sample is preferred to reduce false-positivity rates from previous infection or vaccination

Surveillance of the disease is mostly syndromic for acute encephalitis syndrome. Confirmatory laboratory testing is often conducted in dedicated sentinel sites, and efforts are undertaken to expand laboratory-based surveillance. Case-based surveillance is established in countries that effectively control JE through vaccination.

Treatment

There is no antiviral treatment for patients with JE. Treatment is supportive to relieve symptoms and stabilize the patient.

An early warning model for the outbreak of JE has been developed by ICMR-RMRC(Indian Council of Medical Research-Regional Medical Research centre), Dibrugarh with the help of Remote Sensing(RS) & Geographical Information System(GIS) in collaboration with NE-SAC, Shillong. The JE prediction/forecast model is being applied successfully to 3 most JE prone districts of Assam- Dibrugarh, Sivasagar & Tinsukia which have a similar topography, mosquitogenic conditions and pig rearing practice. The model can predict a) onset of JE 2-3 months in advance b) onset time of JE occurrence, and c)Intensity of JE cases. A 70-85% concordance between predicted & observed JE cases in the predicted districts has been observed. However, with mass JE vaccination campaigns in these areas, the model needs to be adjusted for the intervention method as a confounding factor.

Vaccination against JE among adult population was undertaken in Feb-March 2014. With this intervention, early warning/forecast model for the disease became irrelevant hence was discontinued.

Contribution of ICMR-RMRC Towards Prevention & Control of JE

অদৃশ্যের পরিচয়

ভূমিকা : বিজ্ঞান প্রযুক্তি দৃশ্যমান বস্তু সম্পর্কে যেমন তথ্য দিয়েছে তেমন অদৃশ্য কিছু বস্তুকেও আমাদের চোখের সামনে এনেছে । পত্রিকাটি অদৃশ্য কিছু মজাদার ও বিস্ময়কর ব্যাকটেরিয়া ও ভাইরাস সম্পর্কে বলা আছে

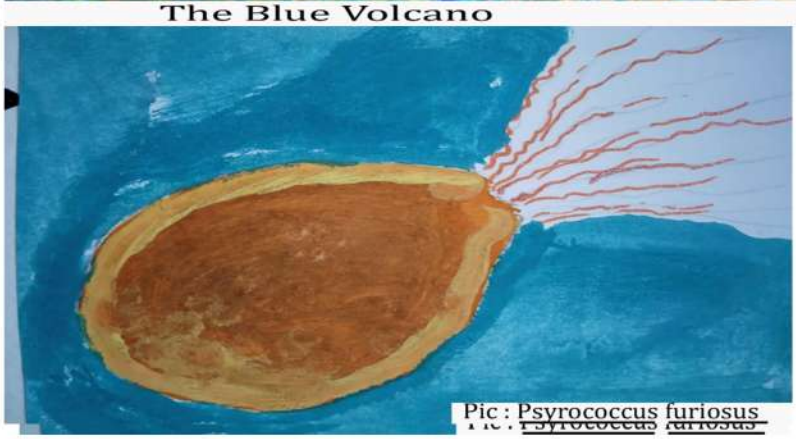
B.Sc Bio General 5th Sem Student দের পক্ষ থেকে এই দেওয়াল পত্রিকাটি প্রকাশ করা হল Microbiology র সমস্ত Sir & Mam দের ধন্যবাদ আমাদের প্রেরোনা দেওয়ার জন্যে । পাঠক পাঠিকাদের অনুরোধ অনিচ্ছাকৃত ভুল মার্জনীয় ।

আন্টার্কটিকা মহাদেশ

Marburg Virus

- আমরা জানি, আন্টার্কটিকা চির বরফাবৃত । কিন্তু বিশ্ব উষ্ণয়নের ফলে আজ বরফ গলতে শুরু করেছে। তার সাথে সাথে ভেসে আসছে বরফ সুপ্তাবস্থায় থাকা নানা ব্যাকটেরিয়া, ভাইরাস। যা মানব জাতিকে ধংসের পথে চালনা করছে
- এমন ই একটা মানুষঘাতি ভাইরাস হল Marburg sp.

The Blue Volcano



Pic : Psyrococcus furiosus

আকৃতি ও পরিচয় : ভাইরাস টি Filoviridae. গোত্র ভুক্ত । লম্বা তন্তু যুক্ত লেজ, দৈর্ঘ্য বড় । ১৯৬৭ সালে জার্মানির বিজ্ঞানিরা উগান্ডা থেকে আগত এক বানরের দেহে এই ভাইরাস টি পর্যবেক্ষন করেছিলেন । তারা বলেছিলেন এটি Fruit bat এবং বানরের দেহে বেশি করে দেখা যায় । এর কোনো প্রতিকার আজও নেই ।

চরিত্র : ১০০০ nm লম্বা এই ভাইরাসটি প্রানী দেহে এক মারাত্মক রোগ সৃষ্টি করে যাকে বলে **Hemorrhagic Fever** ।

- সরাসরি রক্ত রসের সাথে মেশে এবং Vascular system কে আক্রান্ত করে । অভ্যন্তরীন রক্ত চলাচল প্রক্রিয়া ব্যাহত করে ।
- আক্রান্ত প্রানীর সর্দি কাশি, বমি ভাব, বুকে ব্যাথা, ডাইরিয়া এছাড়াও অগ্নাশয় ও শরীরের অন্যান্য অঙ্গ নস্ট করে দিতে সক্ষম ।
- এই ভাইরাসের আক্রমনে মৃত্যুর সম্ভাবনা ৮০% । এই তথ্যটি ২০০৫ সালে WHO ঘোষনা করেছিল ।

- সালফিউরিক গ্যাসের দহনের ফলে উৎপন্ন আলো এই নীল আভার সৃষ্টি করে এটা আসলে কোনো লাভা নয় ।
- এই গ্যাস গুলি উচ্চ তাপমাত্রায় আগ্নেয় গিরির ফাটল থেকে সৃষ্টি হয় এবং বায়ুর সংস্পর্শে এসে আগুন জ্বলে ওঠে ।
- Kawah Ijen

অবস্থান : ইন্দোনেশিয়ার জাভা দ্বীপপুঞ্জ ।

পরিচয় : গরম তরলে এই ব্যাকটেরিয়া দৃশ্যমান । এটি Hyper Thermophilic জাতীয় ব্যাকটেরিয়া ।

আকৃতিতে অনিয়মিত Cocci জাতীয় ব্যাকটেরিয়া ।এগুলি আয়তন ০.৮ থেকে ২mcm । এগুলি S layer দ্বারা আবৃত, ফ্লাজেলায় পোলার গ্রুপিং দেখা যায় । Ph 5-7 এর মধ্যে থাকে

- কার্বনডাই অক্সাইড ও হাইড্রোজেন হল এর মেটাবলিক পদার্থ ।
- অত্যান্ত তাপ সহায়ক তাই PCR এ সহায়ক ।
- এর কোনো ক্ষতিকারক দিক দেখা যায়না ।

সুপার হিরো দের নাম সবাই শুনেছি । নীচে দেওয়া কিছু সুপার ব্যাকটেরিয়া সম্পর্কে জেনে নেওয়া যাক ।

Deinococcus radiodurans

- এই ব্যাকটেরিয়া পৃথবীর সবচেয়ে বেশি বিকিরন ক্ষমতা সয্যকারী ।
- 1.5 million roods of gona radiation এরা সয্য করতে পারে । যা মানুষকে ১০০০ বার মারতে সক্ষম ।
- এদের মত অন্য কোনো Living Organism এত পরিমান বিকিরণ সয্য করতে পারেনা ।

Ideonella sukaiensis

- এটি প্লাস্টিক ভোয্য ব্যাকটেরিয়া নামে পরিচিত ।
- সাদা প্লাস্টিক সবই পলি ইথিলিন টেরোপথ্যালেপ (PET) নিয়ে গঠিত ।
- এরা সহজেই PETase উৎসেচক ক্ষরন করে । MHET [Mono(2-hydroxyethyal) Terepthalic acid] তৈরি করে । এটি আবার অন্যান্য উৎসেচক দ্বারা ভেঙে শক্তি ও কার্বন তৈরি করে ।
- এটি ভবিস্যতে প্লাস্টিক দূষন প্রতিরোধে সক্ষম ।

Geobactor metallireducon

- এই ব্যাকটেরিয়া নিজের দেহে শ্বসন ক্রিয়া সম্পন্ন করে প্রচুর মুক্ত ইলেকট্রন তৈরি করে ।
- এই ব্যাকটেরিয়া গুলি নিজে ঋনাত্মক চার্জ হয়ে থাকে ।
- এরা ধাতু (লোহা, মাঙ্গানিজ) এর উপর থাকে । পিলি দিয়ে অতিরিক্ত ইলেকট্রন ধাতুতে সঞ্চার করে ফলে ধাতুটি পরিবর্তিত হয়ে যায় ।

Coulo bactor Crescentus

- এরা আদ্র যায়গায় জন্মায়
- প্রাকৃতিক আঠার মত কাজ করে ।
- এরা এত শক্তভাবে আটকে থাকে যে এদের সরাতে প্রচুর শক্তি প্রোয়োগ করতে হয় ।
- এরা বিশ্বের সবথেকে শক্তিশালি আঠার থেকে ৭গুন বেশি জোরাল । কয়েকটি গাড়ি কেও চাকিয়ে নিতে পারে।

The pandemic "COVID-19"

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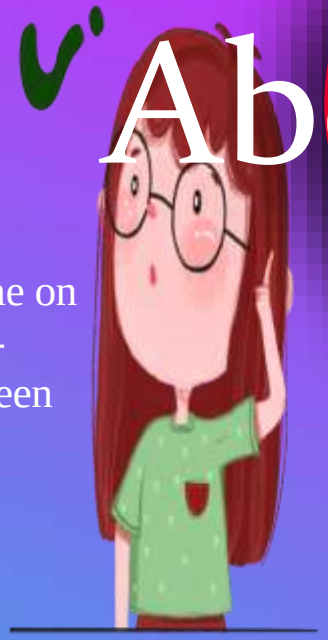
About

• In human and birds, corona viruses cause respiratory track infection that can range from mild to lethal

•Severe Acute Respiratory Syndrome Coronavirus 2(SARS-CoV-2) is the strain of Coronavirus that causes corona virus disease 2019(COVID-19).

• The World Health Organization(WHO) declared the outbreak a Public Healthy Emergency of International Concern on 30 January 2020,and a pandemic on 11 March 2020.

•The coronaviruses were originally grouped into the family Coronaviridae on the basis of the crown or halo-like appearance given by the glycoprotein-studded envelope on electron microscopy. This classification has since been confirmed by unique features of the chemistry and replication of these viruses.



- The earliest report of an illness caused by corona virus occurred in the late 1920s,when an acute respiratory infection of domesticated chickens emerged in North America.
- Human Corona Viruses discovered in the 1960s using difficult methods in the United Kingdom and United States. Other Human Corona Viruses like 229E & OC43 continued to be studied in subsequent decades.
- Other Human Corona Viruses have since been identified, including SARS-CoV in 2003, HCoV NL63 in 2003, HCoVHKU1 in 2004,MERS-CoV in 2013 and SARS-CoV-2 in 2020.

History

Structure

::External::

a) Corona viruses are roughly spherical on particles with bulbous surface projections.

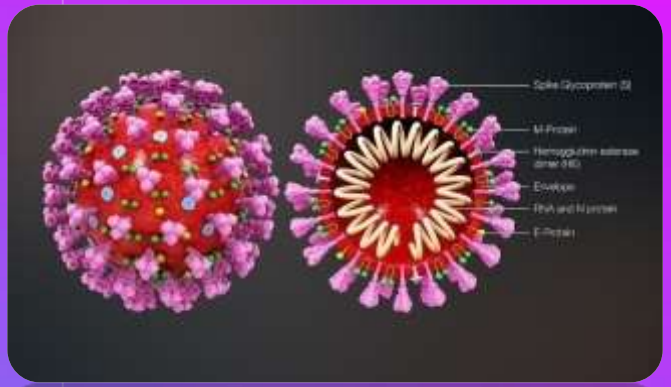
b) The average diameter of the virus particle is around 125 nm.

c) The spikes are 20 nm long there present 74 spikes and the diameter of envelope is 85 nm. The viral envelope consists of a lipid bilayer, in which the membrane(M), envelope(E) and spike(S) structural proteins are anchored.

::Internal::

- The corona virus's surface spikes are homotrimers of S protein, which is composed of an S1 and S2 subunit. S1 subunit forms the head of the spike and has the Receptor Binding Domain(RBD). The S2 subunit form the stem which anchors the spike in the viral envelope and helps membrane fusion between the virus and host cell.

Inside the envelope, there is the nucleocapsid, which is formed from multiple copies of the nucleocapsid(N) protein, which are bound to the positive sense single stranded RNA genome. The genome size ranges from 26.4 to 31.7 kilobases, it is one of largest amount of RNA viruses. The genome has a 5' methylated cap and 3' polyadenylated tail. The genome organization is 5' leader UTP replicase (ORF1ab)-spike(S)-envelope(E)-membrane(M)-nucleocapsid(N)-3' UTR- poly(A) tail.



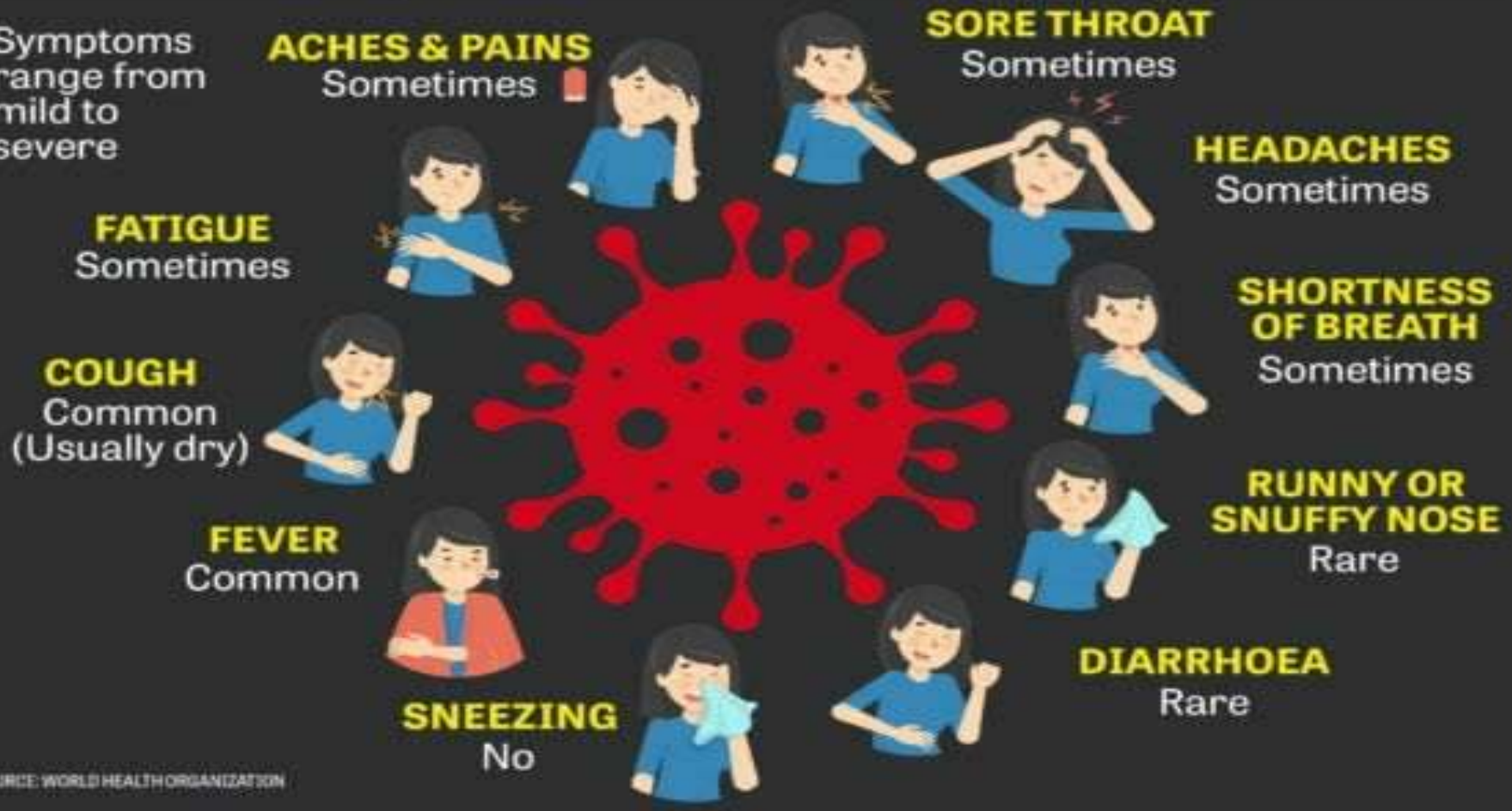
Genome

Multiplication

It is thought that human coronaviruses enter cells, predominantly, by specific receptors. Aminopeptidase-N and a sialic acid-containing receptor have been identified to act in such a role for 229E and OC43 respectively. After the virus enters the host cell and uncoats, the genome is transcribed and then translated. A unique feature of replication is that all the mRNAs form a “nested set” with common 3′ ends; only the unique portions of the 5′ ends are translated. There are 7 mRNAs produced. The shortest mRNA codes for the nucleoprotein, and the others each direct the synthesis of a further segment of the genome. The proteins are assembled at the cell membrane and genomic RNA is incorporated as the mature particle forms by budding from internal cell membranes.

What are the symptoms of coronavirus?

Symptoms range from mild to severe



SOURCE: WORLD HEALTH ORGANIZATION

Healthcare:

- Overload on doctors and other medical professionals, who are at a very high risk.
- Patients with other disease and health problems are getting neglected and disruption of medical supply chain.

Economy:

- Losses in national and international business.
- Poor cash flow in the market.

Social:

- Disrupt of cultural celebration and festivals.
- Cancellation of large scale sports, movies and play theaters.
- Social distancing with our family members.

Education:

- Due to this lockdown examination is postponed.
- To be accustomed to the online-offline education system.
- Lack of technology and internet connectivity, online classes are not good as expected.

Impact on HUMAN LIFE

To prevent the spread of COVID-19::

- Clean your hands often. Use soap and water, or an alcohol-based hand rub.
- Maintain a safe distance from anyone who is coughing or sneezing.
- Wear a mask when physical distancing is not possible.
- Don’t touch your eyes, nose or mouth.
- Cover your nose and mouth with your bent elbow or a tissue when you cough or sneeze.
- Stay home if you feel unwell.

If you have a fever, cough and difficulty breathing, seek medical attention.

Prevention

Vaccination

The World Health Organization (WHO), the Coalition for Epidemic Preparedness Innovations (CEPI), and the Gates Foundation are committing money and organizational resources for the prospect that several vaccines will be needed to prevent continuing COVID-19 infection. The CEPI, which is organizing a US$2 billion worldwide fund for rapid investment and development of vaccine candidates, indicated in April that a vaccine may be available under emergency use protocols in less than twelve months or by early 2021. On 4 May 2020, the WHO organized a telethon which received US$8.1 billion in pledges from forty countries to support rapid development of vaccines to prevent COVID-19 infections. At the same time, the WHO also announced the deployment of an international "Solidarity trial" for simultaneous evaluation of several vaccine candidates reaching Phase II–III clinical trials.

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