

**15/MHS06/005**  
**MEDICAL LABORATORY SCIENCE**

**MLS 406**

**QUESTION.**

1. Discuss the ethology, origin, structure and pathophysiology of COVID-19.

**ANSWER.**

COVID-19 is an acute respiratory disease caused by novel corona virus SARS-COV-2, this virus belongs to the Betacoronavirus genus which was originated from bats. The betacoronavirus can infect mammals are zoonotic pathogens, and can cause severe respiratory disease in humans.

COVID-19 also known as Corona virus is a family of viruses that includes the common cold, SARS and MERS. The most recent outbreak involves a new strain that previously had not been identified in humans.

It is a disease which causes respiratory illness with symptoms such as a cough, fever , and in more sever cases difficulty in breathing. This virus can be spread primarily through contact with an infected person when they cough or sneeze, it c an also be spread when an infected individual touches an object or surface and then a person touches it and touches either their eyes, nose ,or mouth.

This virus can either b e contacted wither by Fecal oral route or Respiratory droplet

This Fecal oral route is gotten when an infected individual uses the toilet but doesn't properly washes his/her hands and contaminates everything they touch then another individual touches it and inoculates their body, while then respiratory droplet can be spread either air borne and if an individual sneezes it can spend over 3 hours airborne and if the droplet gets on a surface it can spend up to 24 hours on a surface .

## ***ETHOLOGY***

Droplet transmission occurs when a person is in in close contact, with someone who has respiratory symptoms e.g. coughing or sneezing and is therefore at risk of having his/her mucosae or conjunctiva exposed to potentially infective respiratory droplets. Droplet transmission may also occur through fomites in the immediate environment around the infected person. Therefore, transmission of the COVID-19 virus can occur by direct contact with infected people and indirect contact with surfaces in the immediate environment or with objects used on the infected person.

It's unclear exactly how contagious the new coronavirus is. It appears to spread from person to person among those in close contact. It may be spread by respiratory droplets released when someone with the virus coughs or sneezes. It may also be spread if a person touches a surface with the virus on it and then touches his or her mouth, nose or eyes.

## ***ORIGIN***

Corona virus can be divided in four genera, which includes alpha, beta , gamma and delta. Alpha and beta cov are able to infect mammals while gamma and delta tends to infect birds. Recently six covs have been identified as human susceptible virus, among which alpha covs HCov-229E and HCov-NL63, and Beta Covs HCov -HKU1 and HCOV- OC43 with low pathogenicity, cause mild respiratory symptoms similar to a common cold, respectively.

The other two known beta Covs, SARS-COV and MERS-cov lead to severe and potentially fatal respiratory tract infections.

Based on the virus genome sequencing results and evolutionary analysis, bat has been suspected as natural host of virus origin, and SARS Cov-2 might be transmitted from bats via unknown intermediate hosts of infected humans. It is clear now that SARS-COV to infect humans.

Severe acute respiratory (SARS) and middle east respiratory (MERS) are also caused by coronavirus which jumped from animals to humans.

## **STRUCTURE**

The structure of COVID 19 consist of a spike Protein, Hemagglutinin-esterase dimer, a Membrane glycoprotein, an Envelope protein, a Nucleocapsid protein, and Ribonucleic acid.

**SPIKE PROTEIN:** Is heavily glycosylated, utilises an N-terminal signal sequence to gain access to the endoplasmic reticulum and mediate attachment to host receptor, it is the largest structure and makes the distinct spikes on the surface of the virus. For most corona viruses the spike protein is cleaved by a host cell furin-like protease into two separate polypeptides S1 and S2.

**HEMAGGLUTININ-ESTERASE DIMER PROTEIN:** this is present in a subset of betacoronaviruses. The protein binds sialic acids on surface glycoproteins. The protein then activates the Spike protein mediated cell entry and virus spread through the mucosa.

**NUCLEOCAPSID PROTEIN:** This binds to the ribonucleic in vitro and is heavily phosphorylated. This binds the viral genome in a beads on a string type conformation. This protein helps tether the viral genome to replicase-transcriptase complex and subsequently package the encapsulated genome into viral particles.

**MEMBRANE PROTEIN:** this is the most abundant structural protein and it does not contain signal sequence and exists as a dimer in the virion. It may have two different conformations to enable it to promote membrane curvature as well as bind to nucleocapsid.

**RIBONUCLEIC ACID:** this is the genome of the virus.

**ENVELOPE PROTEIN:** this can be found in small quantities in within the virus, its most likely a transmembrane .protein and with ion channel activity. The protein facilitates assembly and release of the virus and has other functions such as ion channel activity. It is not necessary for viral replication but it is for pathogenesis.

## ***PATHOPHYSIOLOGY***

The lung is the most effected organ, because once this virus enters into the respiratory system it tacks the alveoli then attaches to the type 2 nemocytes. The virus has different spike protein but the most important spike protein is the S-Spike because this S-spike binds to a specific receptor on the nemocytes and this is called ACE type 2 which binds and allows the virus to engulf into the cell, once this occurs it releases its RNA because inside the virus has a positive sense single stranded RNA (+SSRNA), it releases SSRNA into an actual cytoplasm of the type 2 nemocytes and once it is released it can use the host cell ribosomes and if it uses the host cel ribosome it can take mRNA and convert it to proteins. In order for more viruses to be produced the SSRNA will bind to the nuclear capsid, spike proteins, and enzymes, but this c an destroy the type 2 nemocytes and if this gets destroyed its going to release a specific inflammatory mediator and its going to signal the macrophages and when this macrophages gets stimulated it will secrete cytokines and this will cause some problems which will produce ; interleukin 1, interleukin 6 and tumour neurotic factor alpha. And when this enters into the blood stream it causes the endothelia cells to undergo dilation which then causes the smooth muscles to dilate but increases the capillary permeability by c causes the epithelia cell to contract.

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