



## Lecture Eight

# Viruses of Medical Importance

## 1- Coronaviruses

By

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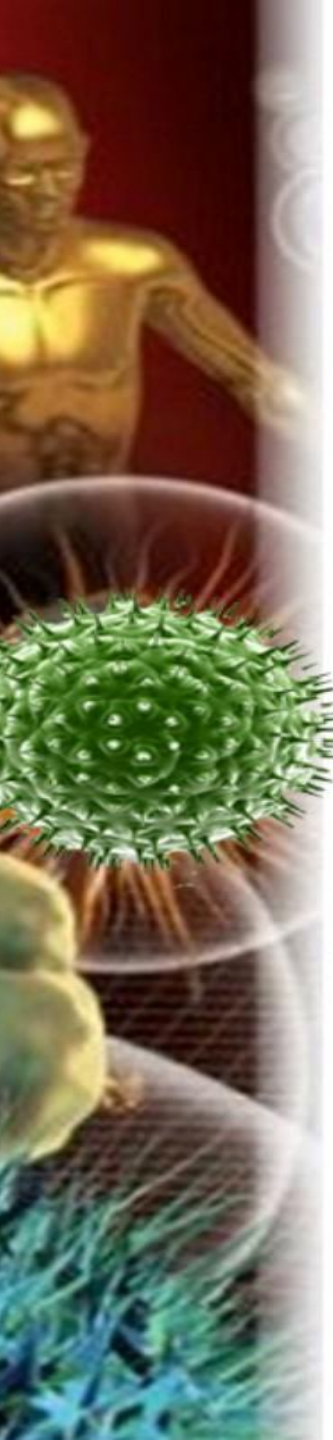
# **Learning outcomes**

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## **By the end of this lecture students should**

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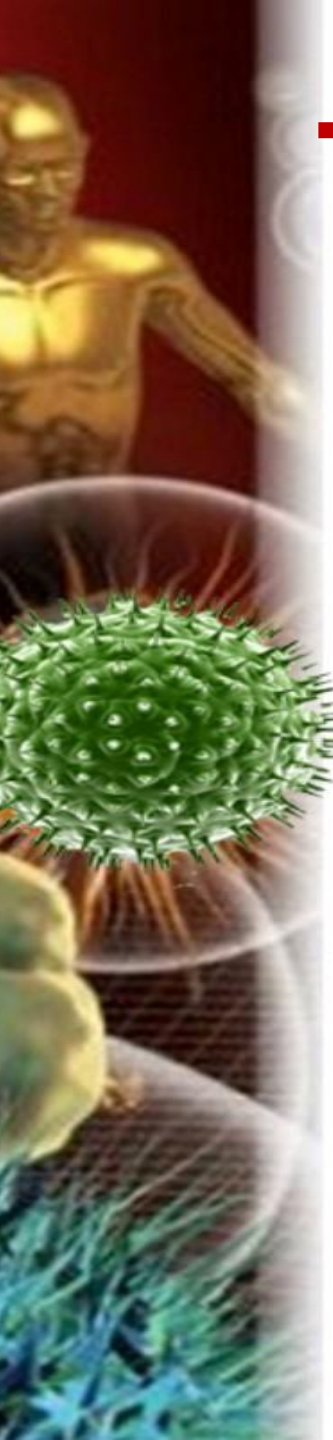
- Know the history of coronaviruses and the emergence on new species.
- Has the knowledge of SARS-CoV and MERS-CoV epidemiology and animal reservoirs.
- Recognize different symptoms associated with coronaviruses.
- Be aware of different ways for prevention and control of coronaviruses' infections.



# Historical Background

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- The first coronavirus to be isolated was infectious bronchitis virus (IBV) from chickens, 1937.
- Coronaviruses were first isolated in humans in the 1965.
- Until 2003, two coronaviruses, 229E and OC43 were known as the causes of 25% of common cold.
- An epidemic caused by previously unknown coronavirus was recorded in China at 2002/03



# Historical Background

- Two new coronaviruses have been identified at 2004 and 2005 as causes of common cold.



**NL63 and HKU1**

- On Sept. 2012, a novel coronavirus was identified to cause lethal pneumonia



**MERS-CoV**

# Taxonomy (ICTV, 2018)



Order: Nidovirales (7 suborders)

Suborder: Cornidovirineae (1 family)

Family: Coronaviridae (4 genera)

Subfamily: Orthocoronavirineae

Genus: Alphacoronavirus

Subgenus: Duvinacovirus (**229E**)

Subgenus: Setracovirus (**NL63**)

Genus: Betacoronavirus

Subgenus: Merbecovirus (**MERS-CoV**)

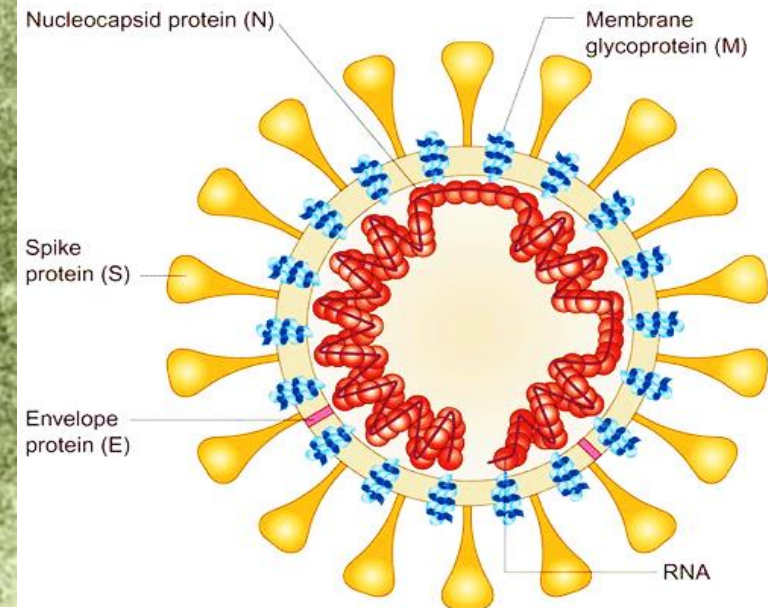
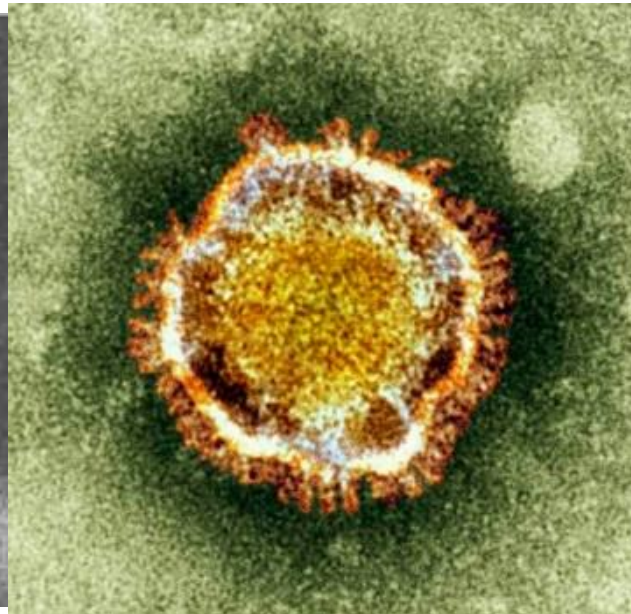
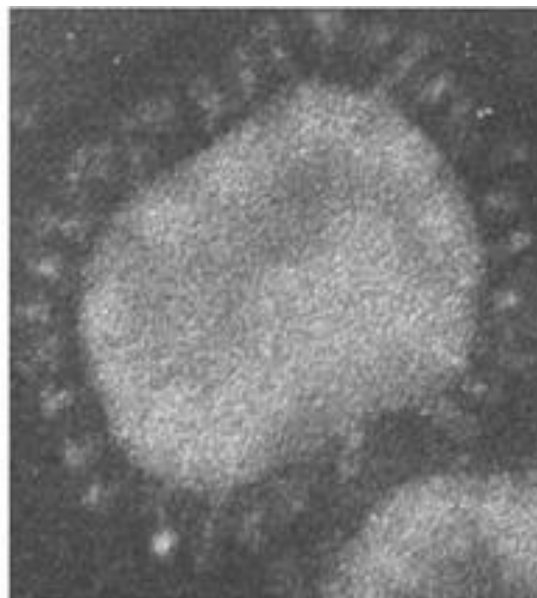
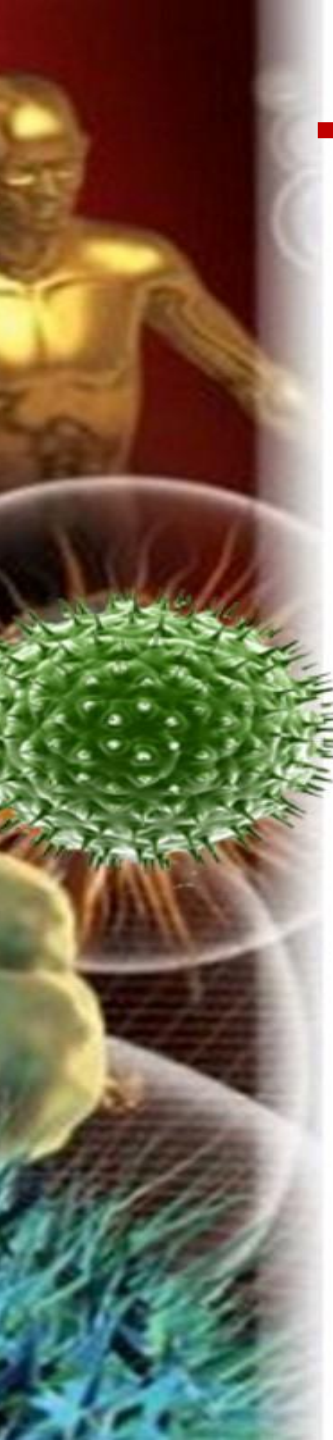
Subgenus: Sarbecovirus (**SARS-CoV**)

Subgenus: Embecovirus (**HKU1**)

Subgenus: Embecovirus (**OC43**)

# Virus Morphology and Characteristics

- The name 'Corona' is derived from Latin, which means: **Crown or Corona of the sun**
- **Spherical – medium sized (120-160 nm in diameter).**



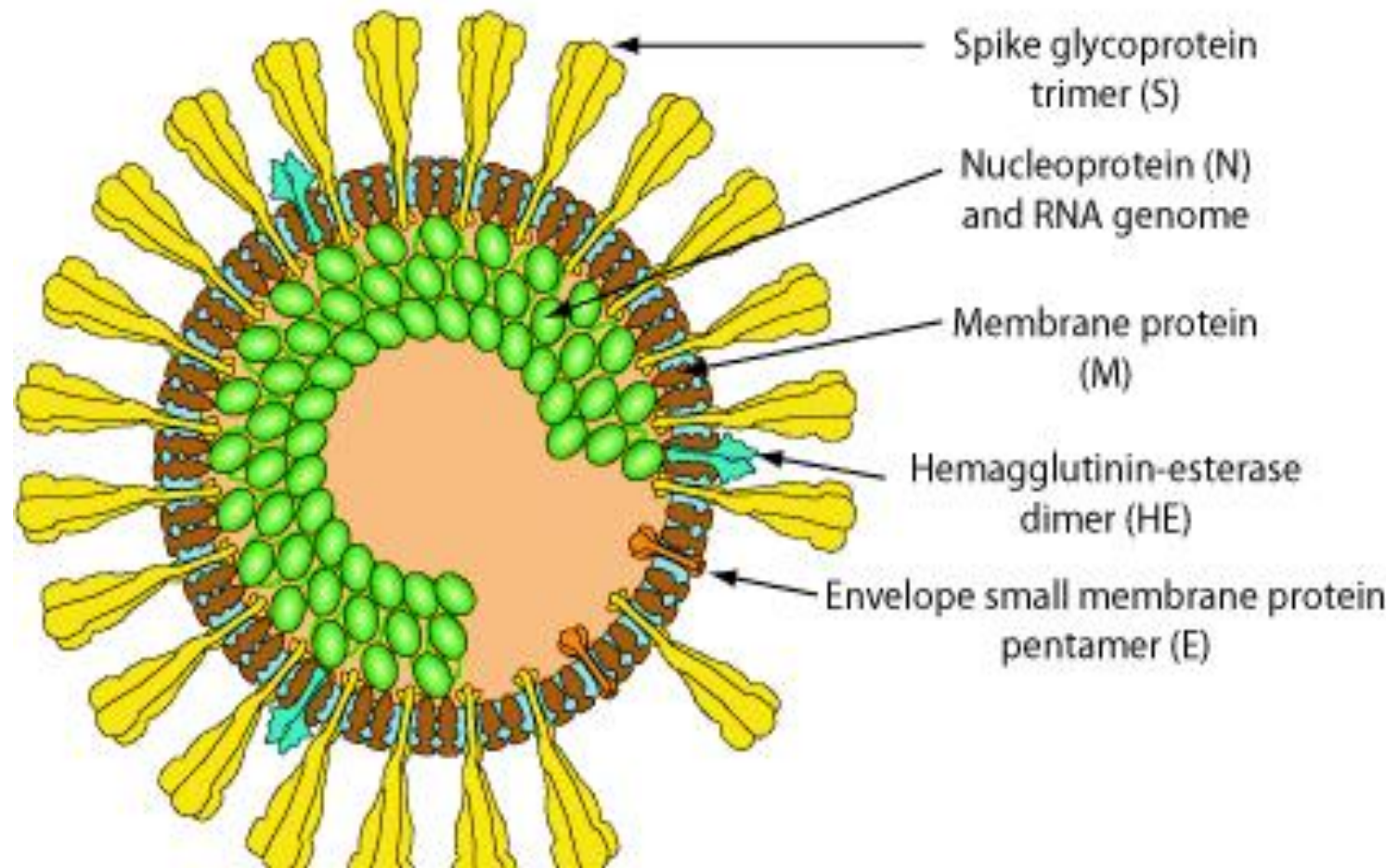
# Virus Morphology and Characteristics

➤ **Genome:** RNA – single stranded – positive sense – Linear – non-segmented – 27-32 kb long

➤ **Capsid:** Helical

➤ **Replication:** Cytoplasm

➤ **Envelope:** Present



# **Epidemiology and Transmission**

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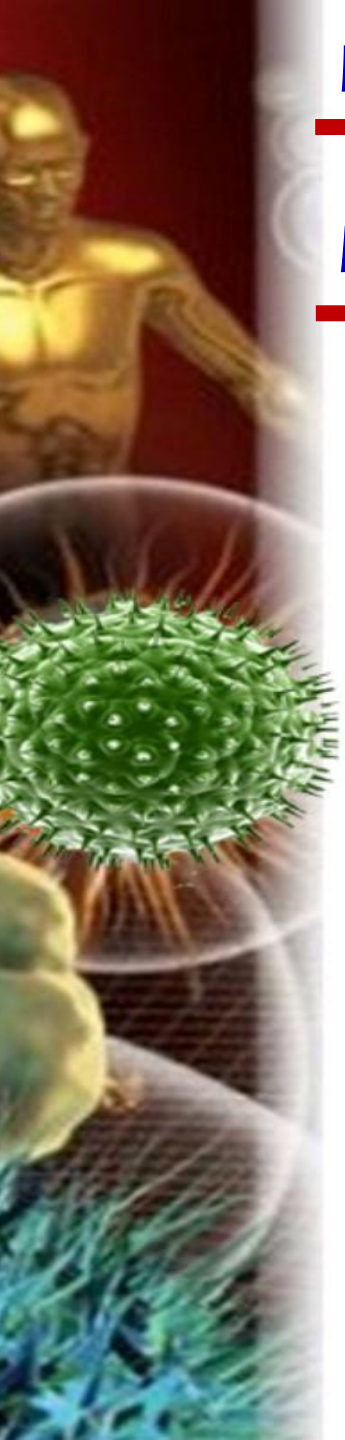
## **Mode of transmission**

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- Inhalation of respiratory droplets and aerosols
- Contamination of food and water
- Infected fomites (surfaces, tools, cloths, blankets, ... etc)

**Seasonal:** Most common in winter months.

- Widespread worldwide
- Coronaviruses (229E and OC43) account for approximately 25% of common colds and are second only to rhinoviruses as the causative agent.
- Can cause pandemics (e.g. SARS – MERS)





# Epidemiology and Transmission

## (A) Severe Acute Respiratory Syndrome (SARS)

- SARS-CoV firstly detected in in Guangdong Province, China in **November 2002**.
- Within weeks, the virus spread to affect about **8000 patients** in **29 countries** across **five continents**, associated with an overall **fatality rate of 9.6%** (774 deaths).
- A virus closely related (99.8% nucleotide identity) to SARS-CoV was detected in **palm civets** and other small mammal markets in southern China where live game animals are sold as exotic foods for human consumption.



# Epidemiology and Transmission

## (B) Middle-East Respiratory Syndrome Coronavirus (MERS-CoV)

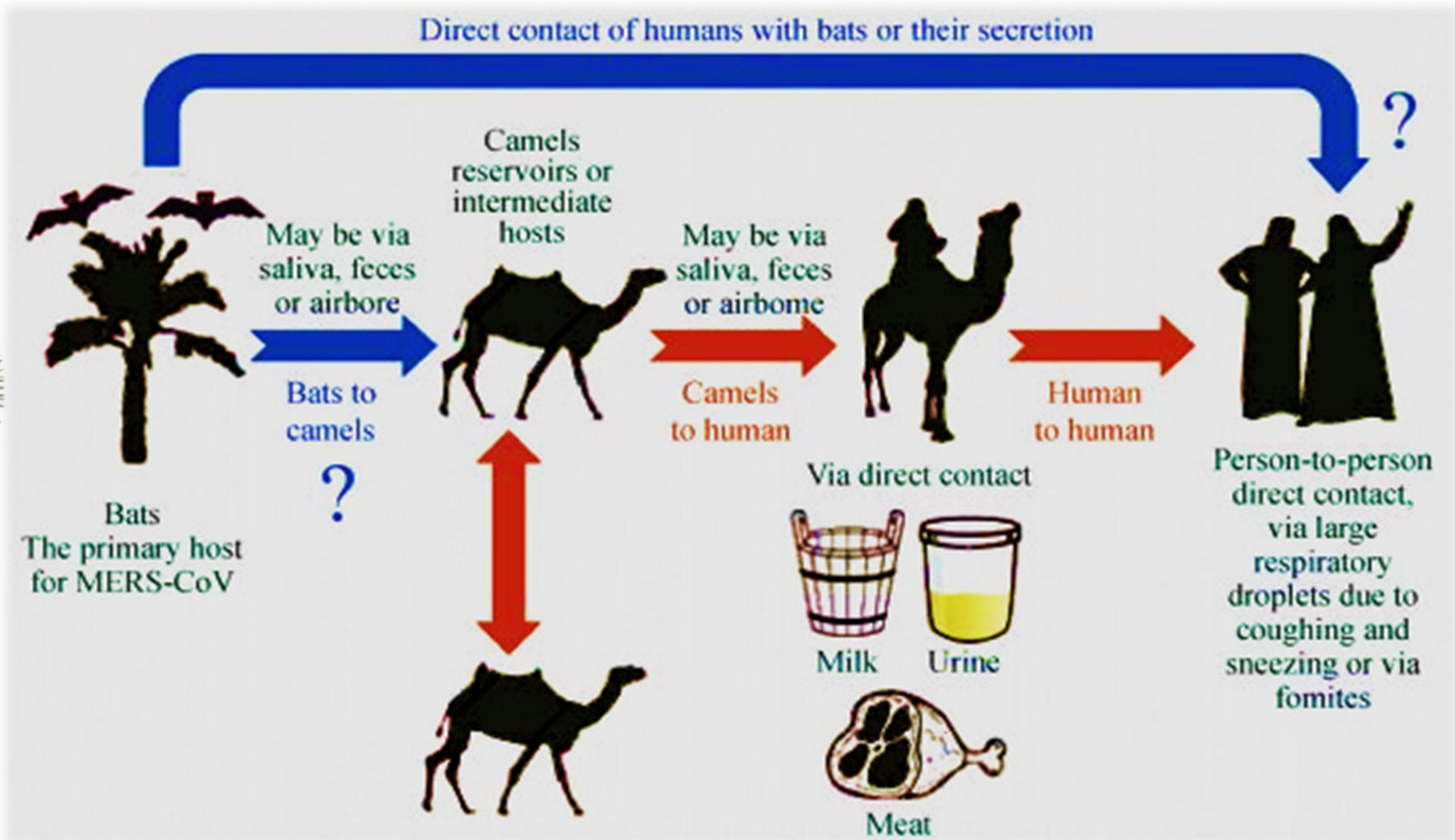
- It was firstly detected in a patient with atypical pneumonia and renal failure in Jeddah, KSA.
- Till now, more than **2,279 confirmed cases** and about **806 deaths** in **27 countries** were recorded (**35.3% mortality rate**)
- The majority of these cases were reported in Saudi Arabia, **1901 cases, 732 deaths** (**38.5% mortality rate**).

# Epidemiology and Transmission

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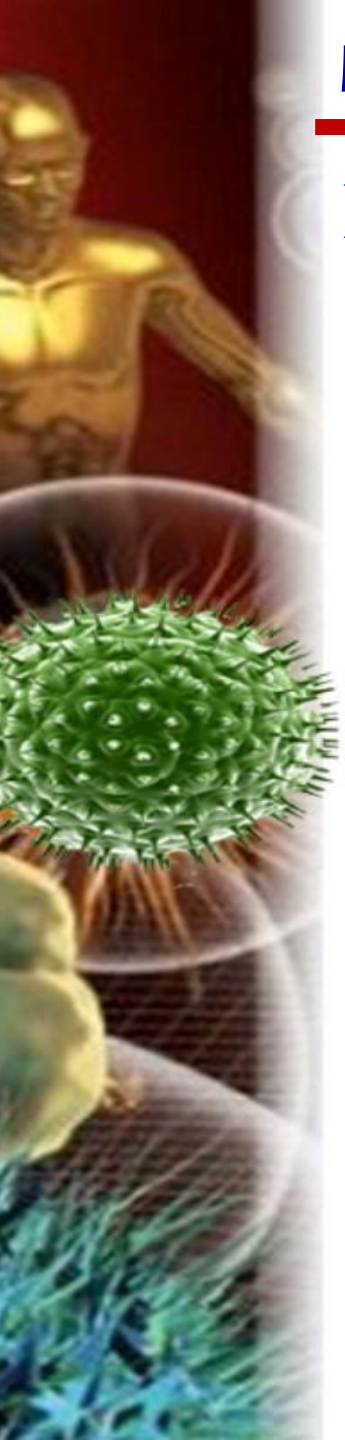
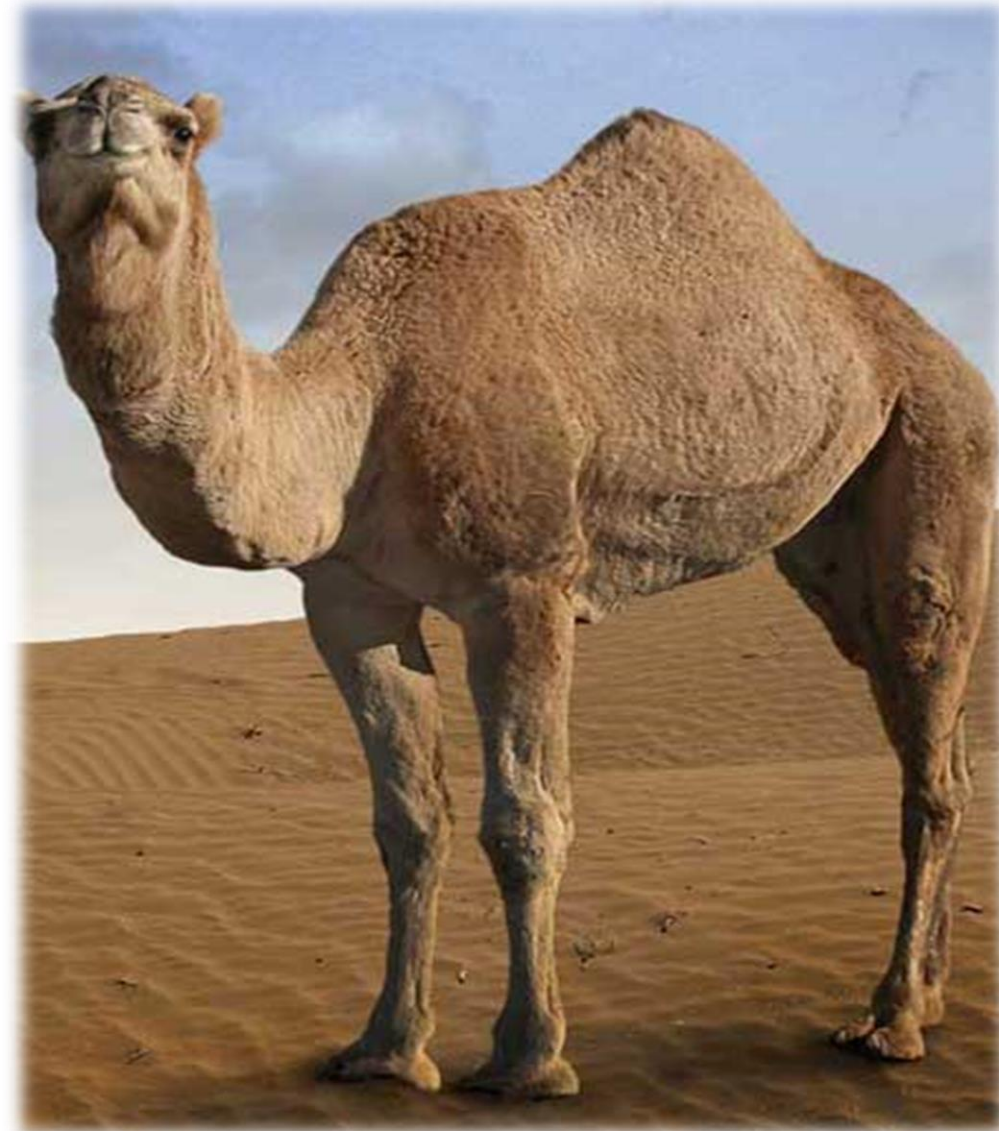
# Epidemiology and Transmission



# Epidemiology and Transmission

➤ Evidences that dromedary camels play an important role in transmission in the region:

1. Detection of the Virus in dromedary camels in Qatar, Saudi Arabia, UAE, Oman and Egypt
2. **Antibodies** have been found in camels in Jordan, Tunisia, Ethiopia, Nigeria, Egypt, Oman, Kenya, Saudi Arabia, Canary Islands, UAE...
3. **Sequence analysis** revealed that MERS-CoV isolated from humans and camels are very close to each other.



# Symptoms

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- Incubation Period: 2-4 days (**Short**)
- Subclinical or mild infections are common (**no symptoms**)
- The symptoms are those of a nasal discharge, mild sore throat, sneezing, general malaise, perhaps with headache and lasts for an average of six to seven days.
- In people with cardiac, pulmonary and immune diseases, they may develop lower respiratory tract illness (pneumonia)
- Sometimes, they may cause gastro-intestinal problems (e.g. diarrhea)

# Symptoms



## MERS symptoms

- Usual symptoms of common cold.
- Symptom of severe respiratory tract illness:  
**High fever – cough – difficult breathing – chest pain**
- Some people has gastro-intestinal symptoms:  
**Diarrhea – nausea – vomiting**
- In severe cases, it may develop renal failure
- Death rate 35-40%

# Prevention and Control

## 1- Hygienic measures





# **Prevention and Control**

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## **2- Treatment**

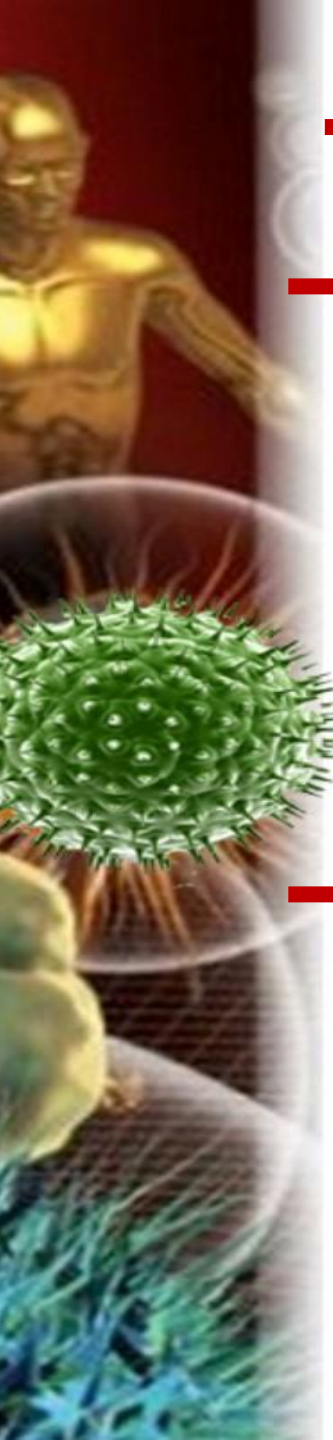
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- No specific antiviral drugs are available.
- Treatment by relieving symptoms (e.g. anti-cough).
- Severe cases (ICU to support vital organs).

## **3- Vaccines**

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- No vaccines are available to-date.
- Trials for development of MERS vaccine ongoing.





Thank  
You