Middle East Respiratory Syndrome (MERS)

AETIOLOGY

Classification of the causative agent

Middle East respiratory syndrome (MERS) is a recently emerging viral respiratory disease of humans and animals which is caused by a novel coronavirus called Middle East respiratory syndrome virus or MERS-CoV. Accumulating evidence points to Dromedary camels as being reservoir of this virus.

The Middle East respiratory syndrome corona virus (MERS-CoV), is an enveloped, non-segmented, positive-sense, single-stranded RNA virus of the genus Betaoronavirus. It was first reported in 2012 in Saudi Arabia and since July 2015, cases of MERS-CoV have been reported in over 21 countries; and hence the MERS-CoV has become of great concern of public and animal health importance.

Resistance to physical and chemical action

Temperature/ pH:	MERS-CoV remains viable at 48 hours at 20^0 C and 40% relative humidity, comparable to an indoor environment on plastic and metal surfaces. In aerosol experiments, MERS-CoV retains most of its viability at 20^0 C and 40% relative humidity, however viability decreases at higher temperatures or higher levels of relative humidity
Chemicals/ Disinfectants:	Inactivated by common disinfectants such as house hold bleach (Chlorox), ice-cold acetone, ice cold acetone/methanol mixture (40:60), ethanol, paraformaldehyde and glutaraldehyde.
Survival:	Virus can survive more than 7 days in respiratory secretions at room temperature, for at least 4 days in diarrheal stool, undiluted urine and human serum at room temperature, up to 9 days in suspension, 60 hours in soil/water, more than a day on hard surfaces such as glass and metal and 6 days in dried state. The virus does not survive well after drying on paper, but lasts longer on disposable compared to cotton gowns.

EPIDEMILOGY

- Middle East respiratory syndrome (MERS) is a zoonotic disease that can affect humans.
- Dromedary camels act as reservoirs of MERS-CoV and 99% similarities found in genomes of MERS-CoV strains isolated from dromedary camels and humans suggest intermixed multiple transmission events.
- Although MERS-CoV has been shown to spread between people who are in close contact, however person-to-person transmission appears to be very low.
- In humans, typical MERS symptoms include fever, cough and shortness of breath. Gastrointestinal symptoms or pneumonia are common but not always present. Asymptomatic cases have also been reported positive for MERS.
- Over 2000 cases of MERS have been reported by 2017 with case fatality rate of approximately 35%.
- MERS bears high social and economic costs due to human mortality, losses of camels and cost of implementation of preventive and control measures both in camels and humans.

Hosts

- There is growing serological and molecular evidence that the dromedary (*Camelus dromedaries*) is a host species for the MERS-CoV in Arabian Peninsula and Africa.
- Humans are susceptible to MERS-CoV, particularly who remain in close contact with camels.
- Reservoir hosts are camels and bats are also suspected to harbor MERS-CoV.

Transmission

- Although camels are suspected to be the primary source of transmission of infection for humans, the role of bats has not been documented.

- MERS-CoV is thought to spread from infected person to others who remain in close contact through respiratory secretions, however the precise ways the virus spreads are not currently well understood.

Sources of Virus

- The main source of the virus is respiratory secretions of an infected dromedary camel.
- Bats may act as source of virus, but not have been documented.
- Respiratory secretions of infected person.

Occurrence

Most cases or case clusters of MERS-CoV have been identified in the Arabian Peninsula, but have also been detected in Jordan, Qatar, the United Arab Emirates, Tunisia, Morocco, France, Italy, Germany and UK.

Cases outside the Middle East appear to be geographically linked to the Middle East.

DIAGNOSIS

Although dromedary camels get infected with MERS-CoV but do not exhibit classical clinical sings of disease. However, minor clinical signs of disease, consisting of rhinorrhea with mild elevation in body temperature have been observed in adult dromedary camels experimentally infected with a human isolate of MERS-CoV.

The incubation period in humans is usually 5 to 6 days, but may range from 2 to 14 days. Clinically, in humans MERS-CoV infection is characterized by severe acute respiratory illness with symptoms of fever, cough or/and shortness of breath. Gastrointestinal symptoms including diarrhea and nausea/vomiting have also been observed. Severe cases of MERS-CoV are followed by pneumonia and kidney failure. Decreased immunity or having pre-existing medical conditions, such as diabetes, cancer, chronic lung, heart or kidney disease increases risk of MERS-CoV. However, some individuals may show mild cold-like symptoms or no symptoms at all.

Clinical diagnosis

- Clinically, camels do not show signs of illness, however mild respiratory distress with increased temperature may be evident.
- In humans, wide clinical spectrum of MERS-CoV infection has been reported ranging from asymptomatic infection to acute upper respiratory illness, progressive pneumonitis, respiratory failure, septic shock and multiorgan failure resulting in death.

Lesions

- No gross postmortem lesions have been characterized in camels or humans.
- Histological changes in experimentally infected adult dromedary camels consisted of degeneration of the pseudostratified epithelium lining the nasal turbinate, trachea and bronchus.

Laboratory diagnosis

Laboratories working with MERS-CoV or suspect material must comply with national biocontainment and biosafety regulations and they should also comply with the guidelines for Risk Group 3, as described in Chapter 1. 1. 3 *Biosafety and biosecurity in the veterinary diagnostic microbiology laboratory and animal facilities* of the OIE *Manual of Diagnostic Tests and Vaccines for Terrestrial Animals (Terrestrial Manual).*

Samples

- Nasopharyngeal (NP) swabs are preferred samples for laboratory detection of MERS-CoV infection in camels.
- Samples should be collected aseptically and transported using standard transport media.
- Shipment of the samples should be carried out in accordance to the guidelines given in OIE Terrestrial Manual.

Procedure

Camel samples suspected for MERS-CoV infection can be screened by using commercially available OIE approved Rapid Immunochromatgraphic Assay kit. The presence of MERS-CoV in suspected samples can be confirmed by using molecular techniques such as RT-PCR.

PREVENTION AND CONTROL

- No vaccine or specific treatment for MERS is currently available for animals as well as humans, however supportive treatment is based on the clinical condition of the patient.
- General hygiene measures should be practiced before visiting farms, barns or other places where dromedary camels and other animals are present.
- Consumption of raw or undercooked animal products, including milk and meat should be avoided.
- People with diabetes, renal failure, chronic lung disease and immunocompromised persons should avoid contact with camels or drinking raw milk.

REFERNCES AND OTHER INFORMATION

- Yusof MF., et al. (2017) – Emerging Microbes & Infections, vol. 6: 1-10.
- Li Yan., et al. (2017) – Plos One, 1-19.
- Macky IM. and Arden KE. (2017) – Viruses, vol. 9: 1-14.
- Widagdo W., et al. (2016) – One Health, vol. 3: 11-16.
- Salama AM., et al. (2015) – Zoonses and Public Health, 1-13.

- Yusof MF., et al. (2015) – Virus Genes, 1-5.
- Song D., et al. (2015) – Journal of Clinical Mirobiology, vol. 53, no. 4: 1178-1182.
- Alagalii AN., et al. (2014) – mBio, vo. 2, issue 2: 1-6.
- Chu DKW., et al. (2014) – Emerging Infectious Diseases, vol. 20, no. 6: 1049-1053.
- Brand JM., Smits SL and Haagmans BL. (2014) – Journal of Pathology, vol. 235: 175-184.
- Adney DR., et al. (2014) – Emerging Infectious Diseases, vol. 20, no. 12: 1999-2005.
- Doremalen NV., Bushmarker T and Munster VJ. (2013) – Rapid Communications, 1-4.
- World Health Organization (WHO) – Key Facts about Middle East respiratory syndrome coronavirus (MERS-CoV) - http://www.who.int/mediacentre/factsheets/mers-cov/en/
- Center for Disease Control and Prevention (CDC) - Middle East respiratory syndrome coronavirus (MERS-CoV) - https://www.cdc.gov/features/novelcoronavirus/index.html
- European Centre for Disease Prevention and Control (ecdc) - Key Facts about Middle East respiratory syndrome coronavirus (MERS-CoV) - https://ecdc.europa.eu/en/middle-east-respiratory-syndrome-coronavirus/factsheet
- World Organization for Animal Health (2013) – Manual of Diagnostic Tests and Vaccines for Terrestrial Animals. OIE, Paris.