30 | MIDDLE EAST RESPIRATORY SYNDROME-RELATED CORONAVIRUS

30.1 | Disease agent

- MERS-CoV

30.2 | Disease agent characteristics

- Family: *Coronaviridae*; Subfamily: *Orthocoronavirinae*; Genus: *Betacoronavirus*.
- Virion morphology and size: Enveloped, quasi-spherical particles, 80–160 nm in diameter, with spikes that project 5–7 nm from the virion envelope. A flexible helical nucleocapsid is present that forms coils that fold back on themselves.
- Nucleic acid: monopartite, positive-sense, single-stranded, polyadenylated and capped RNA, 26–32 kb in length, the largest of all RNA genomes.
- Physicochemical properties: sensitive to detergents and organic chemicals such as ether and chloroform. pH and temperature stabilities are variable among the coronaviruses, but most are sensitive to heat, nonionic detergents, formaldehyde, oxidizing agents and UV irradiation.

30.3 | Disease names

- MERS (Middle East Respiratory Syndrome)

30.4 | Priority level

- Scientific/Epidemiologic evidence regarding blood safety: Absent
- Public perception and/or regulatory concern regarding blood safety: Low
- Public concern regarding disease agent: Low

30.5 | Background

- Middle East respiratory syndrome coronavirus (MERS-CoV); previously known as novel coronavirus 2012 and HCoV-EMC/2012 (a strain of CoV isolated from the sputum of the first person to become infected with what was later named MERS-CoV)
- Identified in April 2012 in Saudi Arabia but may have emerged a year earlier based on genetic sequences.
- Most cases or case clusters of MERS have been identified in the Arabian Peninsula, particularly Saudi Arabia, and travel-associated cases have also occurred in multiple countries including the US, France, Italy, Germany, and the UK.
- In South Korea, a large outbreak of 185 cases occurred with the index case being a traveler returning from the Middle East. Secondary and tertiary cases occurred among household and healthcare contacts.
- Between 2012 and October 12, 2022, over 2600 laboratory-confirmed cases of MERS-CoV infection were reported to the WHO, of which 84% were reported in Saudi Arabia including 933 deaths yielding a crude case-fatality rate of 34%.
- Median age is approximately 50 years (range 0–109 years) with male predominance.
- Dromedary camels appear to be the primary animal host for MERS-CoV.

30.6 | Common human exposure routes

- Camel-to-human transmission of MERS-CoV has been documented and direct contact with dromedary camels is considered a risk factor (e.g., direct contact with camel secretions or consumption of raw dromedary products such as unpasteurized milk).
- Human-to-human transmission is thought to occur primarily from contact with an infected person's respiratory secretions.

30.7 | Likelihood of secondary transmission

- There is no evidence of sustained community transmission. However, transmission has occurred in several clusters among household contacts and within healthcare facilities.

30.8 | At-risk populations

- Family members or other persons in close contact with a case
- Visitors or residents in the Middle East, particularly those with close contact with dromedary camels
- Nosocomial outbreaks with transmission to healthcare personnel highlight the importance of adherence to infection control procedures.
- Patients with chronic diseases (e.g., heart, kidney, or respiratory diseases; diabetes) and those with immune deficiency (congenital or acquired), malignancy and terminal illnesses, or pregnant women may be at increased risk for infection, severe disease, or both.

30.9 | Vector and reservoir involved

- Dromedary camels

30.10 | Blood phase

- Viremia has been reported in approximately 1/3 of patients at or soon after diagnosis. The duration of viremia and prevalence of asymptomatic viremia are unclear.

30.11 | Survival/persistence in blood products

- Unknown

30.12 | Transmission by blood transfusion

- Not reported

30.13 | Cases/frequency in population

- Between 2012 and 2022 over 2600 cases of MERS-CoV infection have been reported worldwide, predominantly (84%) from Saudi Arabia.
- One seroepidemiological study in Saudi Arabia of 10,009 individuals detected a seroprevalence of 0.15%, suggesting that unrecognized and asymptomatic infections occur. In one outbreak, 25% of cases were reported to be asymptomatic.

30.14 | Incubation period

- Median is 5 days (range 2–14)

30.15 | Likelihood of clinical disease

- Poorly characterized pauci- or asymptomatic infection is known to occur, but frequency is not well described, and case counts likely reflect reporting bias towards more severe disease.

30.16 | Primary disease symptoms

Common signs and symptoms include fevers, chills, nonproductive cough, dyspnea, and myalgia. Other symptoms may include dizziness, nausea/vomiting, diarrhea, abdominal pain, sputum production, sore throat, coryza. Atypical presentations without fever and with diarrheal illness preceding respiratory symptoms have been reported.

30.17 | Severity of clinical disease

There is a wide spectrum of disease severity ranging from asymptomatic infection to progressive respiratory failure and death.

30.18 | Mortality

- The case-fatality rate is 35% (913 deaths among 2600 cases reported to WHO) but likely biased by underreporting of milder infections. The elderly and patients suffering from comorbidities are the most at risk for death outcome after development of severe clinical symptoms such as severe pneumonia and extrapulmonary manifestations.

30.19 | Chronic carriage

- No evidence for chronicity

30.20 | Treatment available/efficacious

- Supportive care with hospitalization in the intensive care unit for patients with respiratory failure.

30.21 | Agent-specific screening question(s)

- No specific question is in use.
- Not indicated because transfusion transmission has not been demonstrated.
- Neither the CDC nor the FDA has recommended a question. If necessary, prospective donors could be asked if they have been in close contact with a symptomatic traveler who has developed fever and acute respiratory illness within 14 days of traveling to areas with extensive activity.

30.22 | Laboratory test(s) available

- No FDA-licensed blood donor screening test exists.

- Diagnostic nested PCR and real-time PCR assays have been used.
- For detection, it is strongly recommended that lower respiratory specimens such as sputum, endotracheal aspirate, or bronchoalveolar lavage should be used when possible since viral loads are low in the upper respiratory tract in oropharyngeal samples.

30.23 | Currently recommended donor deferral period

- No FDA Guidance or AABB Standard exists.

30.24 | Impact on blood availability

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

30.25 | Impact on blood safety

- Agent-specific screening question(s): Not applicable
- Laboratory test(s) available: Not applicable

30.26 | Leukoreduction efficacy

- Unknown

30.27 | Pathogen reduction efficacy for plasma derivatives

- Riboflavin and UV light inactivation methods have demonstrated activity against MERS-CoV in plasma products.
- Amotosalen/UVA treatment inactivates MERS-CoV infectious particles in fresh-frozen plasma to undetectable levels.
- Multiple pathogen reduction steps used in the fractionation process have been shown to be effective in the removal of enveloped viruses.

30.28 | Other prevention measures

- Contact and airborne transmission precautions with eye protection, in addition to standard precautions, are recommended for healthcare personnel caring for known or suspected MERS patients. Regard all specimens as potentially infectious.
- Vaccine candidates are under study, but none are available.

SUGGESTED READING

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