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| **Brighton Collaboration Viral Vector Vaccines Safety Working Group (V3SWG)****Standardized Template V2.1 for Collection of Key Information for Risk Assessment of Viral Vaccine Vector Candidates** |
| **5. Target Pathogen and Population** | **Information** | **Comments/Concerns** | **Reference(s)** |
| **5.1** What is the target pathogen? | Middle East respiratory syndrome virus (MERS-CoV) | MERS-CoV, a member of the subfamily *Coronavirinae*, is an enveloped, +ssRNA virus of the genus *Betacoronavirus* and subgenus *Merbecovirus*. The virus enters host cells after binding the virus spike glycoprotein to the dipeptidyl peptidase 4 (DPP-4) receptor. | de Groot et al. J Virol 2013;87:7790, doi:10.1128/JVI.01244-13 |
| **5.2** What are the disease manifestations caused by the target pathogen in humans, for the following categories: |  |  |  |
| * In healthy people
 | Clinical spectrum of MERS ranges from asymptomatic infection (25%) to acute upper respiratory illness, rapidly progressive pneumonitis, respiratory failure, septic shock, and multi-organ failure resulting in death. Mild and asymptomatic infections have occurred predominantly among young and healthy persons, including healthcare workers. |  | Arabi et al. New Engl J Med 2017;376:584, doi: 10.1056/NEJMsr1408795Oboho et al. New Engl J Med 2015;372:846, doi:10.1056/NEJMoa1408636KCDC. Osong Public Health Res Perspect 2016;7:138, doi:10.1016/j.phrp.2016.03.002 |
| * In immunocompromised people
 | Cancer or persons receiving immunosuppressive therapy are at increased risk of severe illness from MERS.  |  | Arabi et al. New Engl J Med 2017;376:584, doi: 10.1056/NEJMsr1408795 |
| * In neonates, infants, children
 | Childhood MERS-CoV infections are uncommon. Most cases are asymptomatic and tested positive during contact investigation of older adults. Severe cases can occur in children with underlying conditions. |  | Memish et al. Pediatr Infect Dis J 2014;33:904, doi:10.1097/INF. 0000000000000325 |
| * During pregnancy and in the fetus
 | Among the 9 reported cases of MERS-CoV infection during pregnancy, gestational age on confirmation for infection was 5 months to 38 weeks; maternal outcomes included ICU admission (5) and death (3), with preterm birth (5) and stillbirth (3) reported. |  | Jeong et al. J Korean Med Sci 2017;32:1717, doi:10.3346/jkms.2017.32.10.1717 |
| * In elderly
 | Older age (>50 years) and co-/multi-morbidities have been associated with severe MERS and death among infected patients. |  | Arabi et al. New Engl J Med 2017;376:584, doi: 10.1056/NEJMsr1408795KCDC. Osong Public Health Res Perspect 2016;7:138, doi:10.1016/j.phrp.2016.03.002 |
| * In any other special populations
 | People who have the following coexisting conditions are at increased risk of severe illness from MERS: diabetes, hypertension, cardiac disease, obesity, chronic respiratory disease, end-stage renal disease, or cancer or in persons receiving immunosuppressive therapy. |  | Arabi et al. New Engl J Med 2017;376:584, doi: 10.1056/NEJMsr1408795 |
| **5.3** Briefly, what are the key epidemiologic characteristics of the disease caused by the target pathogen (e.g. incubation period, communicable period*,* route/s of transmission,case fatality rate, transmissibility characteristics such as basic reproductive ratio *(*R0*)* etc.)? | Transmission of MERS-CoV has been documented for animal (dromedary camels) to human and human to human (in healthcare and household settings). The median incubation period for secondary cases associated with limited human-to-human transmission is estimated 5 days (range 2–14). The case-fatality proportion is approximately 35%. Overall, R0 is <1(range 0.8–1.3), but estimated to be 2–5 during hospital outbreaks in Saudi Arabia and South Korea. | Possible transmission routes include (1) droplet, (2) airborne, (3) direct contact transmission without a contaminated intermediate object or person, and (4) indirect contact involving transfer through an intermediate contaminated object or person. | Arabi et al. New Engl J Med 2017;376:584, doi: 10.1056/NEJMsr1408795Cauchemez et al. Lancet Infect Dis 2014;14:50, doi:10.1016/S1473-3099(13)70304-9Choi et al. J Hosp Infect 2018;99:162, doi:10.1016/j.jhin.2017.09.017 |
| **5.4** What sections of the population are most affected by the target pathogen (e.g. pediatric, pregnant, lactating women (breast feeding), adult, elderly) | Direct exposure to dromedary camels during the 2 weeks before onset of illness, diabetes mellitus, heart disease, and smoking are risk factors for primary MERS illness. Older adults with certain medical conditions or with multi-morbidities (see 5.2) are at increased risk for severe illness from MERS.  |  | Park et al. BMC Public Health 2018;18:574, doi:10.1186/s12889-018-5484-8Rasmussen et al. Microbiol Spectr 2016; doi: 10.1128/microbiolspec.EI10-0020-2016 |
| **5.5** What is known about the correlates of protective immunity to the target pathogen or to the disease? | Correlates of protection to MERS-CoV and their durability have not been established in humans. | Patients produce serum IgG and secretory IgA to MERS-CoV at a median of 16 days (IQR 13–19) after onset of illness. The presence of such antibodies, however, has not necessarily been followed by the elimination of viral RNA from the lower respiratory tract. Longer-term studies reported the presence of IgG and neutralizing antibodies up to 60 weeks after symptom onset. | Huang et al. Nat Commun 2020;11:4704, doi:10.1038/s41467-020-18450-4 |
| **5.6** Please describe any other key information about the target pathogen or population that may inform benefit risk | All reported MERS cases have been linked to countries in and near the Arabian Peninsula. Most infected people either live in the Arabian Peninsula, have recently traveled to the Arabian Peninsula, or have had contact with someone returning from the Arabian Peninsula before they became ill. |  | Schneider et al. Emerg Infect Dis 2015;21:1220, doi:10.3201/eid2107.141888 |
| **References** | **Information** |
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