

Update January 2019
Questions & Answers on Middle East Respiratory Syndrome Coronavirus
(MERS-CoV)

What is MERS-CoV?

MERS-CoV is a coronavirus (CoV) which causes Middle East Respiratory Syndrome (MERS), a severe respiratory disease, in humans. It was identified in humans in April 2012.

Sporadic human cases of MERS-CoV have occurred and continue to occur over a wide geographical distribution with the majority of cases reported from the Arabian Peninsula. Infections in dromedary camels also have been detected in a wide geographic distribution and widespread in some countries. Some human MERS-CoV cases could be linked to zoonotic transmission (transmission from animals to humans). In other cases, human infections are either linked to health care settings or remain unexplained. There is no evidence of sustained human to human transmission in the community but the clusters that have occurred in health care settings and households demonstrate that human to human transmission is possible.

The patterns of infection in humans include:

1. community acquired cases and reported links to dromedary camels
2. infections acquired through close human to human contact mostly in health care settings.

What are coronaviruses?

Coronaviruses are a family of RNA (ribonucleic acid) viruses. They are called coronaviruses because under an electron microscope the virus particle exhibits a characteristic ‘*corona*’ (crown) of spike proteins around its lipid envelope. Coronavirus infections are common in animals and humans, and there is a history of coronaviruses crossing species and adapting to new hosts. There are many species and strains of coronavirus which have different characteristics, causing a range of clinical signs – from very mild to severe disease – in humans and in different animal species.

MERS-CoV is genetically and biologically distinct from other known coronaviruses, e.g. the coronavirus causing Severe Acute Respiratory Syndrome (SARS) in humans.

Why the concern?

MERS-CoV is considered to be a serious public health threat to humans, because:

1. the infection can cause severe disease in humans
2. infection is confirmed to be widespread in dromedary camels in the Middle East and Africa
3. coronaviruses may adapt to new hosts, and then become more easily transmittable between humans

For these reasons, it is important to prevent spillover of these viruses into the human population.

What is the source of MERS-CoV?

Evidence suggests that MERS-CoV has adapted to dromedary camels which are a natural host for the virus. However, not all community acquired cases of MERS-CoV had reported prior animal contact and it is unclear how these persons were infected. Therefore, investigations of human cases of MERS-CoV infection should continue to include gathering information about potential sources of exposure, including other humans, dromedary camels (including certain raw products, such as raw milk and meat and secretions/excretions), other domestic and wild animals, as well as the environment, food and water.

The OIE together with its partner organisations, the World Health Organisation (WHO), the Food and Agriculture Organization of the United Nations (FAO) and national animal health authorities of affected countries is closely following investigations which aim to better understand the epidemiological aspects of the disease, including its transmission between animals and from animals to humans.

Are animals responsible for MERS-CoV infections in people?

MERS-CoV has been isolated from humans and dromedary camels and studies suggest that dromedary camels can be a source for human infections. MERS-CoV strains isolated from dromedary camels are genetically and phenotypically similar to those infecting humans. Joint human health and animal health investigations are needed to establish the mechanism of transmission and source for human infections with MERS-CoV when not acquired from another human.

There remains the possibility that other animal species may be involved in the maintenance and transmission of MERS-CoV, but evidence gathered so far does not point towards their epidemiological importance.

What is known about MERS-CoV in dromedary camels?

Between November 2013 and January 2019, Qatar, Oman, Jordan, Saudi Arabia, Iran and Kuwait have met their obligations to OIE by reporting that MERS-CoV has been identified in dromedary camels.

Other published studies have indicated that MERS-CoV or viral RNA from MERS-CoV have been identified in dromedary camels in countries in the Middle East and North Africa; antibodies to MERS-CoV have been identified in samples taken from dromedary camels in the Middle East and Africa. Similar strains of MERS-CoV have been identified in samples taken from dromedary camels and humans in the same locality and in some cases there has been an association between infections in humans and dromedary camels. So far, all human index cases outside the Arabian Peninsula have been epidemiologically linked to Middle East countries. However, zoonotic transmissions of MERS-CoV from dromedary camel to human outside the Arabian Peninsula cannot be excluded at this stage.

Serological studies suggest that antibodies to MERS-CoV have been detected with a prevalence range of 0-100% (varying within countries and between countries) in populations of dromedary camels in Middle East and African countries. This range of prevalence indicates the need to assess risk factors for infection between and within herds.

Infections with MERS-CoV have sometimes been associated with mild respiratory signs in dromedary camels, but this needs further investigation. Significant morbidity or mortality of unknown aetiology should be investigated.

Evidence from MERS-CoV infections in dromedary camels suggests that infection has resulted in virus shedding for a limited period. Reinfection has been shown to occur and immunity to infection is poorly understood. MERS-CoV has been identified in dromedary camels which have antibodies against the virus. The implications of these findings for management and control recommendations need further investigation.

OIE together with WHO and FAO reiterate the importance of the public health sector and the animal health sector working together to share data and design studies to develop a better understanding of the overall epidemiology of MERS-CoV.

Are other animal species involved?

Although genetically related viruses have already been detected in bat species, more evidence is needed to directly link the MERS-CoV to bats or other animal species.

According to published literature other species of animals (including sheep, goats, cattle, water buffalo and wild birds) have tested negative for the presence of antibodies to MERS-CoV. However, owing to the relatively small sample sizes the results of these studies cannot exclude infection in other animal species.

Recently there is a single report from Africa following surveillance of other domestic mammalian species like sheep, goat, cow and donkeys that are in contact with infected dromedary camels showed positive for MERS-CoV infection informing that domestic livestock in contact with MERS-CoV infected dromedary camels may be at risk of infection.

In countries where MERS-CoV is present, studies to assess the presence of MERS-CoV in wild and other domestic species should be conducted to detect possible infection in other hosts.

How can camels and other animals be tested for MERS-CoV infection or previous exposure?

Serological tests detect antibodies produced by the host against the virus but do not detect the virus itself. Depending on the test that is used, the presence of antibodies may indicate previous exposure to MERS-CoV or a similar virus. Virus neutralisation is the most specific assay.

RT-PCR (molecular) tests detect genetic material of the virus. Genome sequencing of the virus (parts of, or full genome) is the best way to confirm that the genetic material belongs to a MERS-CoV. Genetic data also provide important information about the evolution of the virus and how closely related MERS-CoV isolates are.

Specific confirmatory molecular and serology diagnostic tests are now available for MERS-CoV. Positive results from screening tests should be confirmed using a confirmatory test. Processing of samples and laboratory testing should be conducted under appropriate biorisk management conditions.

What action should be taken when an animal is confirmed to be positive for MERS-CoV?

Infection by MERS-CoV in animals is confirmed by a positive detection of the virus or genetic material belonging to the virus in a sample taken from an animal.

OIE Member Countries are obliged to report a confirmed case of MERS-CoV in animals to the OIE, as an “*emerging disease*” with zoonotic potential in accordance with [article 1.1.4](#) of the OIE *Terrestrial Animal Health Code*.

Positive findings should trigger joint animal-human investigations and initiate public health risk mitigation measures. Isolation of infected dromedary camel(s) should be done until RT-PCR testing is negative. Precautionary public health measures should be implemented to reduce the risk of human infection in accordance with WHO’s guidance on the WHO website (https://www.who.int/csr/disease/coronavirus_infections/transmission-and-recommendations/en/).

Is a vaccine or treatment currently available for MERS-CoV in animals?

There are no treatments available for MERS-CoV in animals. However, research for commercially licensed vaccines is underway to develop and assess potential intervention measures targeted at dromedary camels to prevent transmission of MERS-CoV among dromedary camels, and from dromedary camels to humans.

What is OIE doing?

OIE is working closely with its partner organisations FAO and WHO to collate and share data to gain a better understanding about the disease situation in animals and to assess implications for animal and human health.

OIE has consulted its *Ad Hoc* Group on MERS-CoV Infections in Animals and the *Ad hoc* Group on Camelid diseases to provide recommendations and guidance, including on priority research activities for the animal health sector, based on latest scientific information.

The OIE is also working closely with its Member Countries to provide technical support and to encourage reporting of MERS-CoV detections in animals. The OIE has updated the case definition for reporting confirmed MERS-CoV cases in dromedary camels.

OIE develops and publishes international standards and guidelines on the prevention, control and surveillance of animal diseases including zoonoses (animal diseases transmissible to humans). These science-based standards provide guidance on the best control measures which should be applied, where appropriate, to allow control of infection in the identified animal source and prevent geographic spread.

The OIE is the reference organisation for international standards relating to animal health and zoonoses under the World Trade Organization Sanitary and Phytosanitary Agreement (SPS Agreement). Decisions related to safe trade in terrestrial animals and animal products must respect the standards, recommendations and guidelines found in the [OIE Terrestrial Animal Health Code](#).

For further information about public health implications visit the [WHO website](#).
