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88

Middle East respiratory syndrome coronavirus (MERS-CoV)

Background (June 2023)

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MERS-CoV Overview

- MERS-CoV is one of three high impact zoonotic coronaviruses with pandemic potential that have emerged in recent years
- It was first reported in humans in 2012 in the Kingdom of Saudi Arabia (KSA) and Jordan
- The animal reservoir is dromedary camels, though MERS-CoV causes no apparent disease signs in dromedaries
- Human infection occurs directly from contact with dromedaries possibly indirectly, through consumption of camel-related products

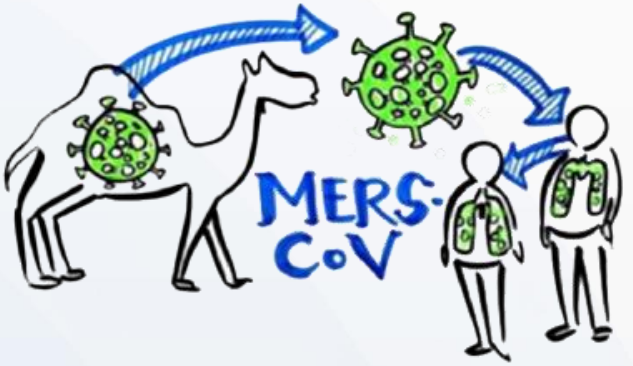


Image source: Sam Bradd, Drawing Change

MERS-CoV in Humans

- Human-to-human transmission, primarily in healthcare settings but also in households, has been observed
- Symptoms in humans range from mild to severe respiratory disease; some cases infected with MERS-CoV experience no symptoms at all
- The crude case fatality ratio (CFR) is high at approximately 36%
- Being of older age and having comorbidities are associated with a greater risk of fatality from MERS-CoV
- One of 9 WHO priority pathogens with pandemic potential, thus prioritized for research and development (R&D) activities

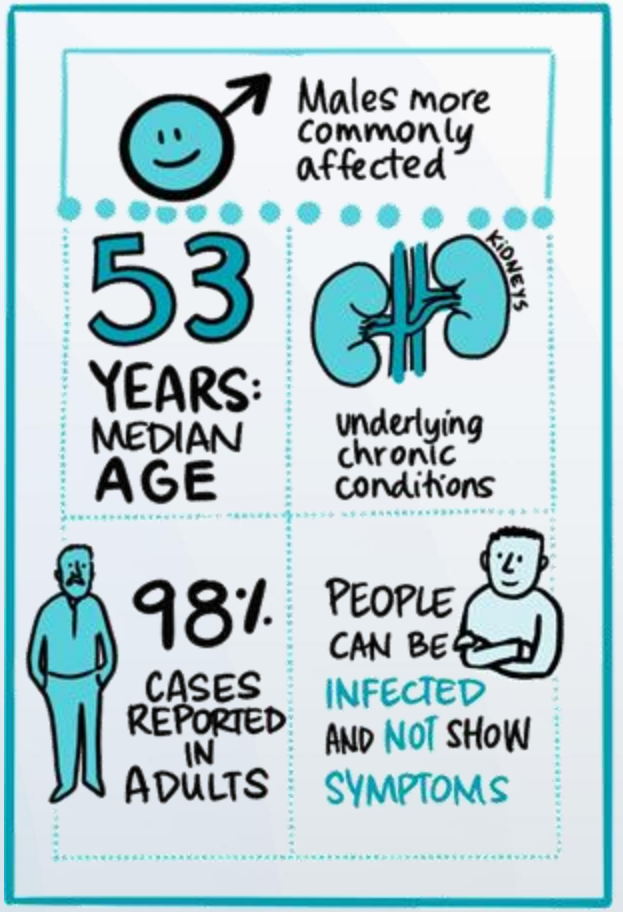
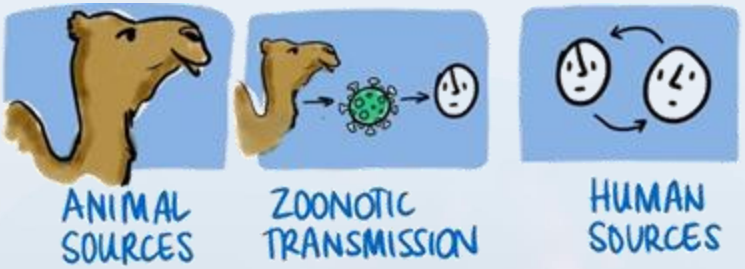


Image source: Sam Bradd, Drawing Change

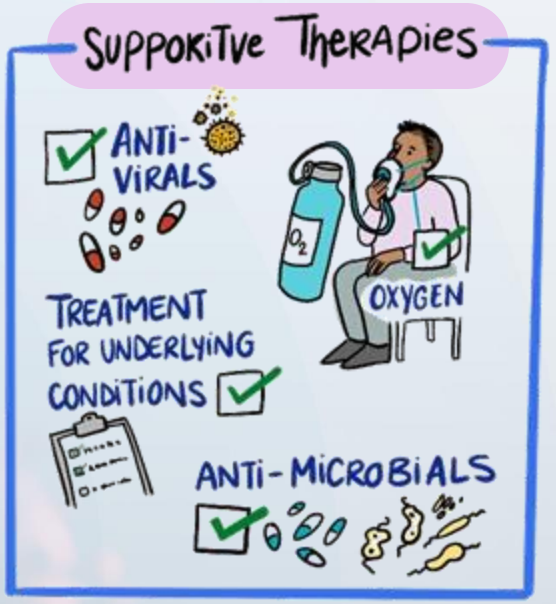
Prevention and clinical management of MERS-CoV

Improved infection prevention and control (IPC) measures in health care facilities have substantially reduced secondary transmission.



Extra caution must be taken when:

- Visiting camel farms or markets
- Consuming or handling raw dromedary products
- Coming into contact with an individual who has a known exposure to MERS-CoV



There are currently no licensed therapeutics or treatments for MERS-CoV; those infected can only be treated for their symptoms.

Image source: Sam Bradd, Drawing Change

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MERS is a global threat

Map source: WHO, Maria Van Kerkhove, *Updated risk maps in progress*

- There is a risk of international spread of any infectious disease, including MERS
- For example, a single imported MERS case in a traveler who had spent time in the Middle East sparked a major outbreak (**186 cases**) in the Republic of Korea from May to July 2015

Those at highest risk of infection include:

People in close contact with dromedary camels (e.g. farmers, abattoir workers, shepherds, camel owners) or consuming/handling raw dromedary products (e.g. milk or urine)

Health and care workers caring for MERS patients, especially if not adhering to infection prevention and control (IPC) measures

Image source: Sam Bradd, Drawing Change

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The Dromedary-Human Interface

- Camels play an important socioeconomic role in many cultures
- Dromedary camels do not show clinical signs when infected with MERS-CoV
- Detection of MERS-CoV in dromedary herds is through sampling and laboratory testing
- Infected camels should be isolated from the rest of the herd and humans until they test negative
- Immunity to MERS-CoV is not lifelong, and so dromedaries can be reinfected
- Vaccines, for dromedaries and for humans, are in development, but need further investment

Image source: Sam Bradd, Drawing Change

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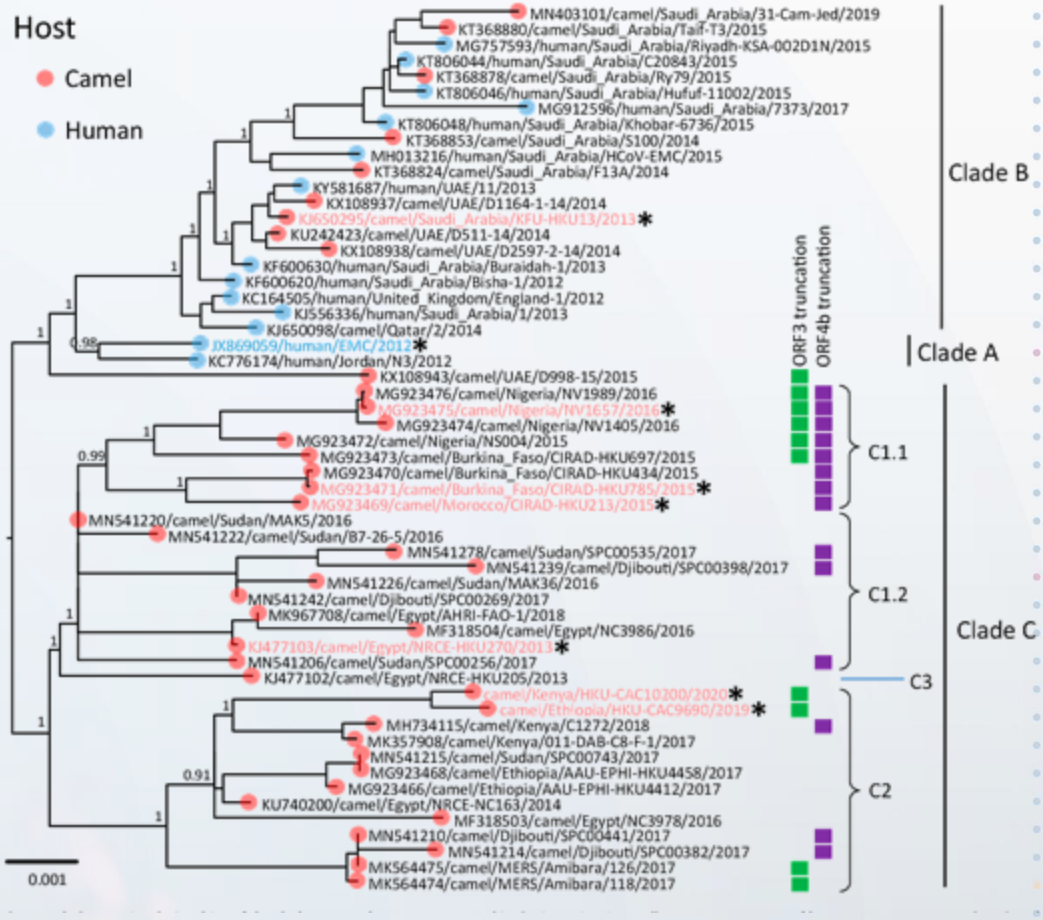
MERS in other Animal Species

- Other camelid species, like llamas and alpacas, have been found susceptible to MERS-CoV infection in affected areas or in laboratory experiments
- Bats, while thought to be the source of a MERS-CoV ancestor virus that then spilled over and adapted to camels, does not appear to play a role in the current epidemiology of the disease

MERS-CoV phylogenetic analysis

- MERS-CoV is enzootic in dromedary camels in large areas of **Africa,** the **Middle East** and **South Asia**: This results in vast geographic areas where dromedary camels can infect humans.
- There are phylogenetic differences in the virus detected globally:
  Arabian Peninsula:
  - Clade A (extinct)
  - Clade B

  Africa:
  - Clade C
- WHO strongly encourages undertaking genetic sequencing where possible **and** sharing of sequences and meta-data including uploading this to a publicly available database. Doing so enables these important analyses and risk assessment to be undertaken.



Source: Zhou et al., 2021

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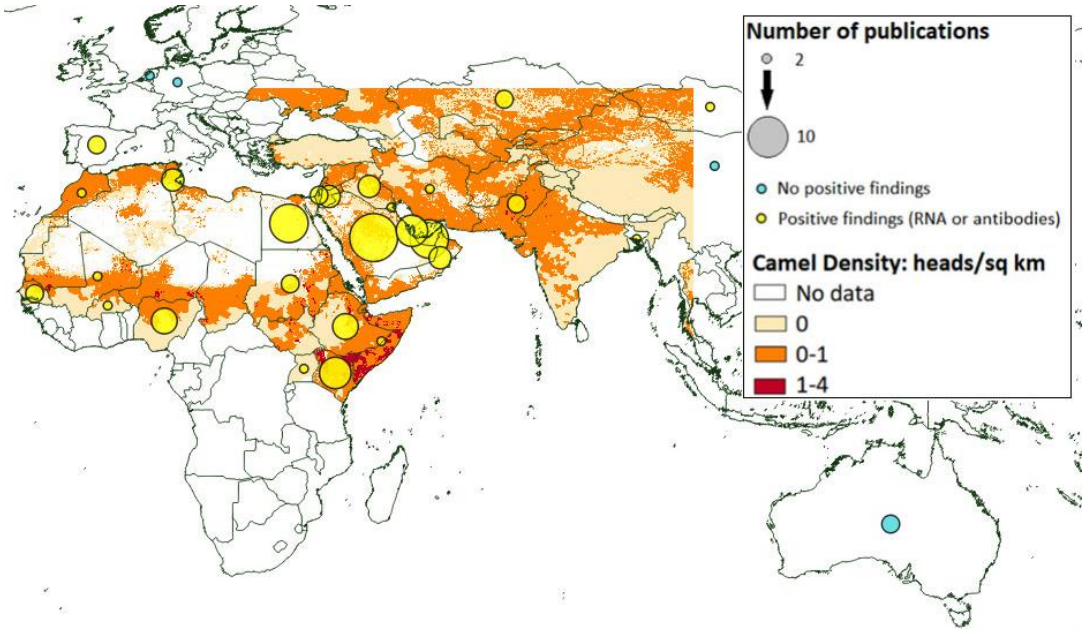
Circulation of MERS-CoV in dromedaries in Africa

- Possible hypotheses for the lack of human case reports from the Africa region include:
  - Lower viral replication levels in Clade C, which may suggest lower pathogenicity in humans
  - Lack of active human case finding (although sero-surveys provided evidence of past human exposure)
  - Differences in zoonotic transmission risk
  - Environmental differences
  - Behavioral differences
- This phenomenon is **not** due to a lack of exposure
- The risk of spillover is high, thus enhanced surveillance in this region is critically needed

MERS-CoV field studies conducted in camels



Map source: FAO
https://www.fao.org/animal-health/situation-updates/mers-coronavirus

Applying a One Health (OH) approach

For the effective surveillance, preparedness and response to MERS-CoV the One Health (OH) approach is key, and a multitude of players, institutions and organizations need to be engaged

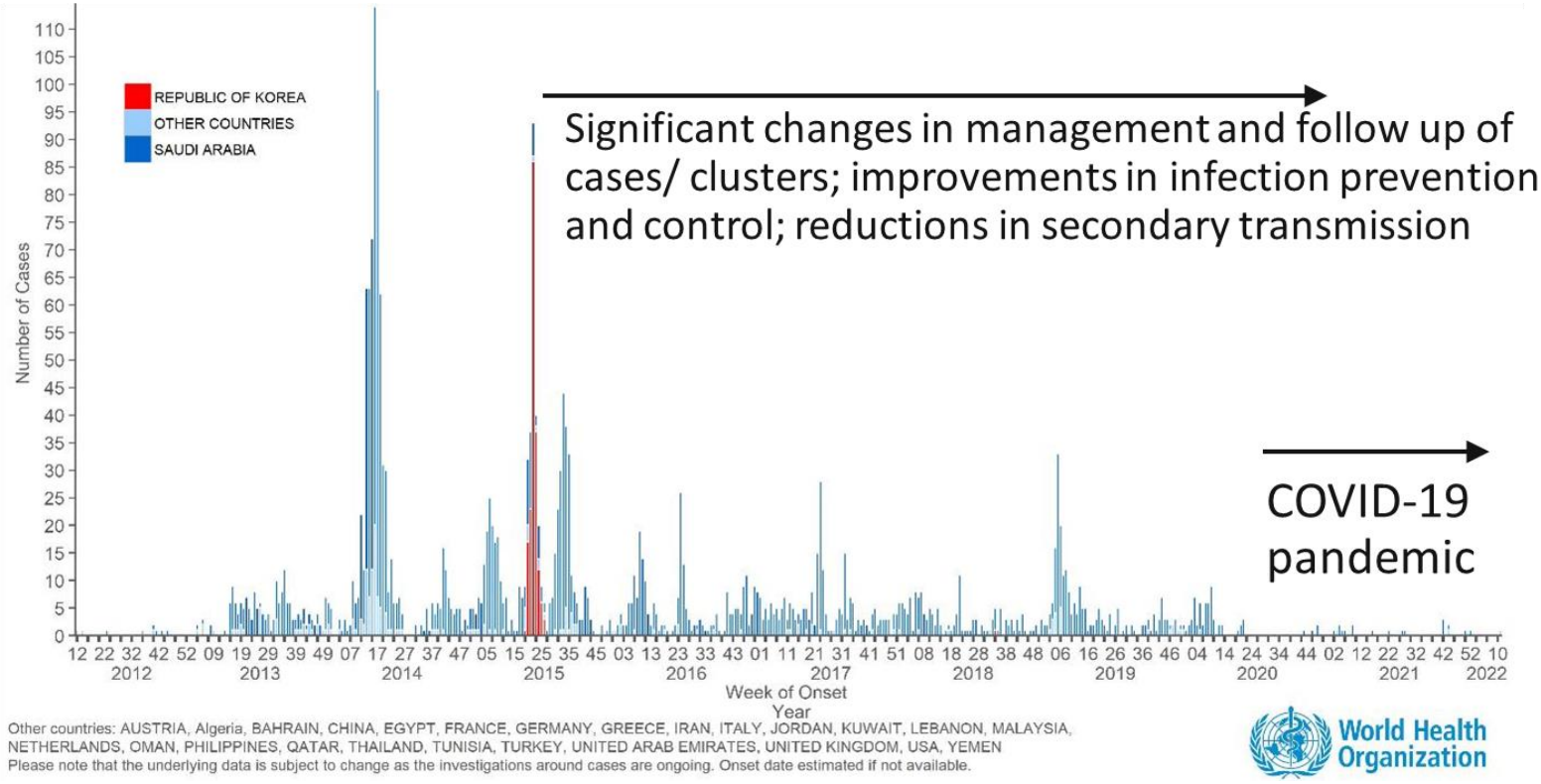
The Quadripartite:

- the World Health Organization (WHO)
- the Food and Agricultural Organization of the United Nations (FAO)
- the World Organization for Animal Health (WOAH)
- the United Nations Environment Program (UNEP)

is an example of an active OH collaboration working on and responding to the threats posed by MERS-CoV

Image source: Sam Bradd, Drawing Change

WHO MERS-CoV global epidemic curve



Since 2012, there have been approximately 2,600 confirmed human cases from 27 countries globally

Impact of the COVID-19 pandemic on MERS-CoV

- The substantial drop in the number of MERS cases reported to WHO since the beginning of the COVID-19 pandemic could be explained by:
  - **Surveillance** being pivoted to focus on SARS-CoV-2 resulting in reduced detection of MERS-CoV
  - **Public health and social measures (PHSM)** implemented to control the spread of SARS-CoV-2 also reducing opportunities for MERS-CoV to spread
- However, the COVID-19 pandemic has acted as a catalyst for infrastructure investments and capacity development. We must harness these advances in technology to address the outstanding research gaps in our fight against MERS-CoV.
- Further research is needed to understand any cross-protection between SARS-CoV-2 infection and MERS-CoV infection.

Image source: Sam Bradd, Drawing Change

MERS-CoV preparedness serves pandemic preparedness

One of the human **vaccines** in development for MERS-CoV was leveraged for the development of SARS-CoV-2 vaccines. This vaccine (Oxford-AstraZenica) was rolled out across the world within a year of the emergence of this new virus.

All of WHO's **guidance and information products** for MERS-CoV were adapted for what was initially called nCoV. This included testing platforms, surveillance protocols, clinical management for severe acute respiratory syndrome, readiness checklists, infection prevention and control (IPC).

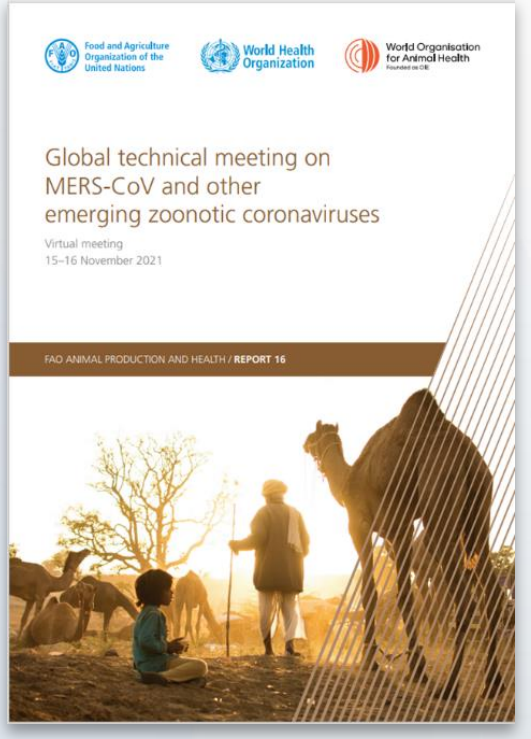
Global investments for MERS-CoV prevention and control were critical at the beginning of the COVID-19 pandemic response

MERS-CoV **expert networks** were initially called upon to provide technical advice to WHO across all aspects of the early response to SARS-CoV-2, particularly regarding the development of vaccines.

Mathematical models of disease transmission and control were often designed using the epidemiological information known from MERS-CoV, and/or results from similar analyses from MERS-CoV were used to contextualize results from the novel coronavirus SARS-CoV-2.

The 2021 Global Technical Meeting: highlighting global priorities for MERS-CoV Research and Development

- Increase MERS-CoV surveillance and reporting in camels and humans, with renewed emphasis across the Middle East and a particular focus in Africa.
- Integrate surveillance for MERS-CoV in humans into surveillance for respiratory pathogens in MERS-CoV-affected regions and at-risk areas for importation.
- Plan and strengthen One Health interventions with consideration given to community priorities and needs.
- Strengthen and test One Health data sharing mechanisms ahead of future MERS outbreaks.
- Re-evaluate and advocate for the feasibility of camel vaccines.
- Conduct studies to explore the acceptance of camel vaccination.
- Leverage the scientific achievements of the COVID-19 pandemic for other diseases, including MERS-CoV.



Further information: [Global technical meeting on MERS-CoV and other emerging zoonotic coronaviruses (who.int)]

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Further resources

- **MERS Fact sheet**
  https://www.who.int/en/news-room/fact-sheets/detail/middle-east-respiratory-syndrome-coronavirus-(mers-cov)
- **MERS Overview**
  https://www.who.int/health-topics/middle-east-respiratory-syndrome-coronavirus-mers
- **MERS global summary and assessment of risk**
  https://www.who.int/publications/i/item/WHO-MERS-RA-2022.1
- **EMRO MERS page**
  https://www.emro.who.int/health-topics/mers-cov/mers-cov.html
- **FAO MERS Update in animals**
  https://www.fao.org/animal-health/situation-updates/mers-coronavirus
- **WHO Disease outbreak news**
  https://www.who.int/emergencies/disease-outbreak-news
- **WOAH Chapter on MERS-CoV**
  https://www.woah.org/fileadmin/Home/eng/Health_standards/tahm/3.05.02_MERS-CoV.pdf

Image source: Sam Bradd, Drawing Change

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