Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

MERS-CoV enigma deepens as reported cases surge

Experts are puzzled by an explosion of new cases of MERS-CoV, as a WHO committee raises concerns over the handling of the outbreak. David Holmes reports.

Researchers are struggling to explain a rapid rise in reported infections with Middle East respiratory syndrome coronavirus (MERS-CoV). As of May 16, the number of laboratory confirmed cases globally had climbed to 614, with 181 deaths. 418 of those cases have been reported in the past 2 months, mostly in Saudi Arabia.

After it was first identified in Saudi Arabia in 2012, MERS infections have been reported throughout the Arabian peninsula and exported to at least ten other countries. Most confirmed cases of MERS-CoV infection have developed severe acute respiratory illness, but the virus also often causes kidney and other organ failure. The mortality rate is around 30%, and there is currently no vaccine or specific treatment available.

While stopping short of proclaiming the outbreak an international public health emergency, the WHO Emergency Committee on MERS-CoV announced on May 14 that its concern over the situation had "significantly increased", with particular worries over recent evidence that the infection is spreading in hospitals, and apparent "gaps in critical information".

One of the most crucial gaps is our lack of understanding of where the virus comes from, says Marion Koopmans, of the Netherlands National Institute of Public Health. So far, studies have more or less ruled out sheep, cattle, goats, and poultry as a source, but dromedary camels throughout the Arabian peninsula and in parts of North and East Africa have been shown to carry the virus. However, it is still too early to say definitively that they are the main source of primary infections in humans, says Koopmans. "I am convinced that people and dromedary camels share the same viruses, but how exactly this happens we do not know", she explains. "Camels shed virus from their nose, and sometimes in stool, which is dropped and may cause environmental contamination. Younger animals seem to be virus-positive more often than adult animals, so combined, the best bet would be to look for exposures (direct or indirect) to young camels as the highest risk factor."

> **"One of the most crucial gaps is our lack of understanding of where the virus comes from…"**

As young camels lose their maternal immunity they become more susceptible to MERS-CoV infection, and the fact that the latest surge in cases corresponds with similar smaller spikes throughout April and May in 2012 and 2013 in Jordan and Saudi Arabia also suggests that the breeding season could be a factor. However, a seasonal increase in exposure to young camels alone doesn't seem a sufficient explanation, according to Ziad Memish, Saudia Arabia's Deputy Minister for Public Health and professor in the College of Medicine at Alfaisal University in the capital Riyadh. "More than two-thirds of the primary human cases have no links to camels", he notes. One possibility is that another species is acting as an intermediary. Bats have been touted as a possible source after a bat of the *Taphozous* genus was found to harbour a fragment of the MERS sequence, but contacts between bats and people are so rare that it "would seem an unlikely explanation", says Koopmans. Another zoonotic infection, Nipah virus, has been shown to stem from the consumption of date palm sap contaminated by infected fruit bats, but Christian Dorsten, a virologist at the University of Bonn, Germany, who is working with local researchers in Saudi Arabia, says talk of a similar link between bats and MERS is far-fetched. "There are several aspects in recent hypotheses around MERS and bats that make no biological sense at all. For example, it is not true that *Taphozous* feeds on dates from which the virus could be acquired. *Taphozous* is insectivorous", he says.

Another possible explanation for the recent surge in cases is that the virus has acquired mutations enabling it to be transmitted more easily between people, but again, Dorsten notes, the facts tell a different story. Many of the recent cases occurred in the port city of Jeddah, and sequences taken of the Jeddah viruses show no hints of any relevant genetic changes says Dorsten. The Jeddah viruses do, however, seem to be a different strain from those causing infections elsewhere in the country, and are probably linked to a hospital-associated outbreak, according to Dorsten. "Without having seen epidemiological data, I predict that most cases detected in Jeddah will be linked quite directly to the outbreak in King Fahd Hospital from where it spread to other hospitals", he says.

The prevention of future outbreaks will hinge on countering the "surprising lack of information about how this virus is transmitted from animals to humans", says Maria Van Kerkhove, liaison between WHO and the UK MRC Centre for Outbreak Analysis and Modelling, Imperial College London. "Basic epidemiologic studies have still not been done to evaluate risk factors for infection", she says. "We know that infection control and prevention works to stop human-to-human transmission, but without stopping transmission from camels, we will continue to see more cases in the Middle East, some of whom will travel outside of the region."

David Holmes

James Hardy/PhotoAlto/Corbis

See **Editorial** page 1782

For more on **MERS-CoV in health workers** see **Comment** *Lancet* 2014; published online May 20. http://dx.doi.org/10.1016/S0140-6736(14)60852-7