Lack of Middle East Respiratory Syndrome Coronavirus Transmission from Infected Camels

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To determine risk for Middle East respiratory syndrome coronavirus transmission from camels to humans, we tested serum from 191 persons with various levels of exposure to an infected dromedary herd. We found no serologic evidence of human infection, suggesting that zoonotic transmission of this virus from camels is rare.

Cases of Middle East respiratory syndrome (MERS) in humans continue to be reported from the Arabian Peninsula and the Middle East. The largest number of cases has been reported by Saudia Arabia: 818 cases leading to 351 deaths as of December 5, 2014 (1). The causative agent is MERS coronavirus (MERS-CoV), which is endemic to and ubiquitous among dromedary camels in the Arabian Peninsula and East and North Africa; seroprevalence among adult animals is typically >90% (2). MERS-CoV infection causes mild upper respiratory illness in dromedaries and remains detectable in nasal swab specimens for ≈1 week (3).

To look for serologic evidence of MERS-CoV infection in humans extensively exposed to a herd of infected dromedaries, we assessed seroprevalence among persons in close contact with an infected herd of ≈70 animals in Al Hasa, Saudi Arabia, during peak calving season, December 2013–February 2014 (4). The study was approved by the King Faisal University Research Ethics Committee.

The Study
The dromedaries were maintained in a fenced enclosure with barns. MERS-CoV was first detected in this herd on November 30, 2013; by December 30, of 11 sampled dromedaries, 9 were positive for viral RNA by reverse transcription PCR. The viruses isolated in November and December were genetically identical, suggesting ongoing transmission arising from introduction of a single virus (4).

In February 2014, serum samples were obtained from persons with various levels of exposure to camels. Persons were divided into 5 groups.

Group 1 comprised 4 herdsman who were in daily contact with the infected herd (feeding, grooming, administering treatment when needed). They frequently consumed fresh unboiled milk from the camels, of which at least 1 dam and 7 calves were retrospectively confirmed to have been MERS-CoV infected (4).

Group 2 comprised 8 persons who had intermittent but regular (several times/week) direct contact with the infected herd (animal management, feeding, manure removal) and included veterinary staff and attendants. Because this herd was also used for veterinary teaching and research, animals were frequently handled for clinical examination and specimen collection. With the exception of disposable gloves, which were worn by the veterinarians during examinations, personal protective equipment (masks, gloves, eye protection) was not used.

Group 3 comprised 30 veterinary surgeons and clinical support staff working at the Clinical Research Center at the Faculty of Veterinary Medicine and Animal Resources, King Faisal University, Saudi Arabia, who were not exposed to the infected herd. This largest clinical veterinary center in southeastern Saudi Arabia also serves the adjacent countries of the United Arab Emirates, Qatar, Bahrain, Kuwait, and Oman. Camels from across Saudi Arabia and the Gulf states are brought to this research center. Although we did not conduct MERS-CoV testing on camels brought for routine clinical care, some animals may have been shedding MERS-CoV. Staff members came into daily contact with domestic livestock of all species, including dromedaries, of which at least 20 arrived daily for treatment. Disposable gloves were used for examinations, but no respiratory or eye protection was used.

Group 4 comprised 3 workers in a camel abattoir in Al Hasa, where 25–35 camels were slaughtered daily. These workers did not wear personal protective equipment.

Group 5 comprised 146 persons in the same (Al Hasa) region who were not exposed to camels in their professional work. This group served as negative controls.

Serum from these 191 persons was tested for MERS-CoV antibodies by using a pseudoparticle neutralization assay that has been previously described, validated, and demonstrated to be at least as sensitive as microneutralization
timed to coincide with the calving season. However, hu-

mans may be more common in other settings in which hu-

men disease is not directly proportional to potential

exposure to a virus that seems to be common in dromedary
camels. Infections in dromedaries in settings such as abat-
toirs are regularly documented; thus, the numbers of humans
exposed to virus-infected animals must greatly exceed the
number of humans with diagnosed MERS-CoV infection.
Conversely, some persons seem to acquire infection with ap-
parently minimal or no apparent exposure to camels, even
when secondary transmission from other infected humans is
excluded. This setting is analogous to that observed for avian
influenza (H5N1) virus, in which the virus can be ubiquitous
in live poultry markets in some settings but human infection
and disease remain stochastic and rare (i.e., not directly pro-
portional to exposure) (13). The biological basis for such an
epidemiologic pattern remains obscure for both viruses, avi-
an influenza (H5N1) and MERS-CoV, but the heterogeneity
of host susceptibility is a hypothesis to be explored (7,14). Further studies on the mechanisms by which MERS-CoV is
transmitted from dromedaries to humans, whether by direct
or indirect routes, and the heterogeneity of human suscepti-
bility to this virus are needed.

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