The Profile of MERS-CoV among Humans and Animals in Qatar: the Findings of the piloting Phase of the National Seroepidemiological Survey of Risk Groups in Qatar, 2014

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ABSTRACT

Background: In order to understand the epidemiology and modes of transmission of MERS CoV, the Supreme Council of Health is conducting a series of studies in collaboration with WHO and partners in the Netherlands. These studies are ongoing. As reported previously, MERS CoV continues to be present among dromedary camels in Qatar. Evidence of virus shedding has been found from camels sampled from different locations. Shedding most frequently occurs from nasal secretions, but approximately 20% of virus-positive animals also shed virus from faeces.

Slaughterhouse study: From 105 animals presented for slaughter, nasal, rectal and serum samples were collected prior to entering the slaughterhouse. Information on age and origin of the camel was collected from the drivers. During the process of slaughter, ticks were collected from the inguinal area, and nasopharyngeal, bronchial samples were collected for virological testing. From 52 animals lymph nodes were collected, as well as tissue sections from nasal septum, trachea, lung, tongue, liver, kidneys, different lymph nodes (lung, mesenteric inguinal), and – for males- testicular tissue. In addition, intestinal tissue was collected and pooled for different animals. From 29 camels urine was collected as well.

The analysis of antibody levels and virus shedding has been completed. Animals ranged in age from 5 months to 11 years, with >72% of animals below 1 year of age. Samples were collected in 2 batches in February and March 2014. More than 95% of

animals tested positive for antibodies. Animals with low antibody levels were 5, 6 and 9 months old. Evidence for MERS CoV presence was found for 64% of nasal swabs (Ct values ranging 12-35), 23% of nasopharyngeal swabs (17-38), 14% of rectal swabs (25-37), and 9% of bronchial swabs (17-37). In addition, 13% of lymph node samples tested positive for presence of viral RNA (Ct values ranging from 28-37). Preliminary sequence analysis showed the presence of at least 3 different virus variants in the sample set.

Milking camels: From 33 animals kept for milking on farms outside Doha nasal, rectal, and milk samples were collected. Milk samples were collected according to the local customs, which is milking after reunion of camels with their crias, and samples were collected during April. Evidence for virus shedding was observed in 21% these animals (n=7). Of these, 4 (57%) also had evidence for viral RNA in milk samples. All milk samples tested positive for MERS CoV antibodies, whereas milk collected from milking camels kept in the Netherlands tested negative.

Serology: Serum samples were collected from persons in close contact with animals as well as construction workers with no animal contact. In total, 8 animal workers at the central animal market, 109 slaughterhouse workers, and 90 persons from farms with camels and 10 persons from farms with sheep outside Doha, as well as 56 construction workers were tested by microarray for antibodies to MERS CoV spike protein, based on a previously published method. For comparison, antibody reactivity of other persons unrelated to the region from investigations in Europe (n=126), as well as samples from returning travellers with respiratory complaints and testing negative for MERS CoV by RT-PCR from the Netherlands were tested (n=38). In total, antibody reactivity was found in 8.7% of persons exposed to camels, ranging from 6 to 11 % for persons working at the slaughterhouse and on the farms, respectively. Detailed case histories did not find any evidence for severe respiratory

illness. None of the construction workers, people only in contact with sheep, or persons from the Netherlands tested positive.

Data suggests that there is opportunity for contamination of meat during the slaughter process, as 13% of lymph node samples tested positive for viral RNA, although mostly low levels of RNA were detected. At this moment it is not known if the presence of virus RNA in lymph nodes implies that animal meat can contain infectious virus.

In a survey of virus shedding of milking camels, testing of milk showed evidence of viral RNA in more than half of samples from animals shedding virus. As the milk was collected according to local customs, contamination of milk during the process cannot be excluded. All milk samples tested positive for MERS CoV antibodies.

No evidence was found for virus shedding in urine from animals for which virus was detected in nasal or naso-pharyngeal samples.

In addition, persons working with animals were tested for presence of antibodies to MERS CoV, as these indicate past infection. In total, 8.7% of persons with close camel contact had evidence of antibodies, compared to 0% of persons without animal or only sheep contact in Qatar and Europe. None of these persons reported severe illness.

Conclusion: The combined results show that there is frequent opportunity for exposure to MERS CoV, particularly for persons handling live camels. Detection of viral RNA does not equate a direct human health risk, as it is not known if infectious virus is present in animal secretions, on the carcasses or in the milk. However, based on these findings, strict enforcement of general hygiene as well as proper handling of animal products (cooking) is recommended.

Further studies are ongoing to assess whether people are at risk for MERS CoV from consumption of meat or milk. However, the data suggests more widespread mild or subclinical infection of humans.