Authors' reply: Middle East respiratory syndrome coronavirus (MERS-CoV) in dromedary camels: are dromedary camels a reservoir for MERS-CoV?

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To the Editor:

We thank Karagöz et al. for their letter [1] in response to our paper [2]. The letter is a good opportunity to provide additional information on Middle East respiratory syndrome coronavirus (MERS-CoV) infection in dromedary camels and their potential role in the transmission of MERS-CoV to humans.

In fact, we mentioned in our paper [2] in detail that the cycle threshold (Ct) values in nasal and conjunctival swabs of the five MERS-CoV reverse transcription-quantitative polymerase chain reaction (RT-qPCR) positive Omani camels ranged from as low as 15.74 to 36.29, indicating a high viral load in the former. Our results were confirmed in a recent report by Raj et al. [3], who demonstrated an even higher viral load (Ct values of 11.3 and 12.9) in a nasal swab of an eight-month-old camel from Qatar, sampled in February 2014. High loads of MERS-CoV nucleic acid in nasal swabs of dromedary camels from Saudi Arabia were also reported by Alagaili et al. [4].

Karagöz et al. [1] pointed out that we investigated specimens from the upper and not the lower respiratory tract, because MERS-CoV load has been reported to be less in upper respiratory tract samples than in lower respiratory tract samples. Although this is indeed true for human patients [5], who frequently develop during the course of a MERS-CoV infection, severe lower respiratory tract disease including pneumonia [6], infection in camels has been reported to be either asymptomatic [7] or associated with only mild respiratory signs with nasal discharge [8,9]. Consequently, the much easier – and nonetheless highly success-oriented – way of sampling is taking nasal swabs, and so far, all studies investigating MERS-CoV in the respiratory tract of camels have been carried out on nasal swabs and not on lower respiratory tract specimens [2-4,7-10]. To further understand many aspects of MERS-CoV infection in camels, including pathogenesis,

organ tropism, clinical symptoms, viral loads, and viral shedding, more studies are needed, both in the field and in controlled conditions.

The question of whether droplet or aerosol transmission of the MERS-CoV may occur is currently highly debated [5], mainly for human-to-human but also for camel-to-human transmission. Whether camels excrete and thereby may transmit MERS-CoV only in the form of droplets or also as aerosol can only be addressed in an experimental setting. Delineating the mode of respiratory transmission was not the goal of our study, and it is actually impossible in an epidemiological study to determine this; consequently, it cannot be considered a limitation of the study.

Despite a surge of reported human MERS-CoV infections during April and May 2014, which can be partly attributed to two healthcare-associated clusters and the detection of asymptomatic and mild cases through enhanced surveillance activities, it should be clearly noted that there is currently no risk of a human MERS-CoV pandemic, since the basic reproductive rate of the virus (R_0) is definitely below 1 and probably below 0.5 [11], which excludes sustained human-to-human transmission.

So far there is no report showing that infected camels secrete MERS-CoV in milk. In our opinion, there is no current need to apply regulatory measures on camel milk imports; however, the local population in certain regions should be convinced to abstain from drinking raw camel milk, not necessarily because of MERS-CoV but due to the risk of contracting brucellosis, Q-fever and other known zoonoses transmitted by dromedary camels [12]. We also think that camel meat does not really pose a risk for the consumer if standard hygienic procedures such as washing hands carefully after handling raw camel meat are applied; however, people

slaughtering camels should be advised to wear protective gear, mask and glasses.

MERS-CoV infection in camels is widespread in the Arabian Peninsula, e.g., [13] and Africa [14]; consequently, trade restrictions would not be effective. In order to limit possible MERS-CoV transmission from camels to humans, a MERS-CoV vaccine for camels should be developed and applied to young camels after the levels of maternally derived antibodies decrease. No one has been suggesting culling of camels because of MERS since there is no reason at all for such an approach.

We do apologise that we were unable to report data on age, clinical status, geographical area of sampling, and travel history of the MERS-CoV nucleic acid positive camels, as these data were not provided to us.

Human infections resulting from (probably very close direct) contact with acutely infected camels have been shown [8], and such cases may be the source of limited human-to-human transmissions. However, the vast majority of MERS-CoV transmissions seem to occur within families [15], in the community [16] and in health-care facilities [15], which especially raise a serious concern. In addition, in a growing number of infected people, the source of infection remains unclear.

We are only at the beginning of our understanding of MERS, and we fully agree that there are still many open questions, including the epidemiological role of camels and the MERS-CoV transmission routes. These unknown areas need to be addressed in joint efforts by the national medical and veterinary authorities of the affected countries, research institutions, and internationally coordinated by the World Health Organization (WHO), the Food and Agriculture Organization of the United Nations (FAO), and the World Organisation for Animal Health (OIE).

Conflict of interest

None declared.

Authors' contributions

NN wrote the manuscript; JK read and revised the manuscript.

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