

# Middle East respiratory syndrome coronavirus and human-camel relationships in Qatar

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## Abstract

This article investigates camel raising as a possible cause of transmission of the Middle East Respiratory Syndrome coronavirus (MERS-CoV) on the Arabian Peninsula. Drawing on collective research among camel workers in Qatar, it shows the difficulties of asking questions about camel raising in the context of a potential zoonosis, given the secretive nature of herding practices and the values attached to camels in Arab societies. It suggests that the concentration of camels in farms and central markets after the ban of camel grazing as well as the revival of the tradition of drinking camel milk have increased the risks of the transmission of MERS-CoV from camels to humans. The recent valorisation of camels, in the context of the transformation of Qatar from a pastoral economy to a global trade centre, may appear to be an obstacle in the surveillance of MERS-CoV, since camel owners are

prone to denying that their animals are infected, but it can be converted into an asset if public health becomes a key element of national pride alongside camel raising.

## Keywords

MERS-CoV, Qatar, Camel raising, herding secrets, camel races

In 2012, a novel coronavirus was identified, causing severe respiratory disease with a high fatality rate of 35 per cent. Initially reported in Saudi Arabia, it was called the Middle East respiratory syndrome coronavirus (MERS-CoV). Since its first identification, the World Health Organization (WHO) has been notified of more than two thousand laboratory-confirmed cases of infection with MERS-CoV, including more than seven hundred related deaths, all linked to residence in, or travel to, countries in the Arabian Peninsula.<sup>1</sup> Around 85 per cent of the reported cases were found in Saudi Arabia. Qatar, a neighbouring country, has reported nineteen cases. Several cases have been reported outside the Middle East (fifteen infections and eight deaths in Europe), but most of these infections appear to have been acquired in the Middle East and exported outside the region. The outbreak in the Republic of Korea (186 infections and thirty-six deaths in 2015) is the largest observed to date outside of the Middle East. Nothing indicates sustained human-to-human transmission, as all cases are linked to close contact with a patient or with an animal.

Dromedary camels are thought to play a central role in the epidemiology of MERS-CoV as widespread evidence for antibodies and virus shedding<sup>2</sup> was found in camels from the Arabian Peninsula. It is hypothesized that camels play the role of an intermediary host between bats – considered to be the animal reservoir<sup>3</sup> of coronaviruses – and humans, although MERS-CoV has not so far been found in bats. The discovery of highly similar viruses in people and camels on the same premises provided further evidence of involvement, although the direction of transmission could not be concluded from these studies (Haagmans et al. 2014; Memish et al. 2014). This finding, however, is not limited to

<sup>1</sup> <http://www.who.int/emergencies/mers-cov/en/>.

<sup>2</sup> Excretion of virus by any route from the infected host. Important routes include the respiratory tract, genital tract, and intestinal tract. Route and duration of excretion vary according to the pathogenesis of the infection or disease.

<sup>3</sup> A reservoir is any person, animal, arthropod, plant, soil, or substance (or combination of these) in which an infectious agent normally lives and multiplies, on which it depends primarily for survival, and where it reproduces itself in such manner that it can be transmitted to a susceptible host.

the region, and widespread seropositivity<sup>4</sup> was observed in various African countries where dromedary camels are of cultural and economic importance (Reusken et al. 2013). In these countries, camels are used for transportation, racing, milk, and meat, which involve several paths of transmission of zoonotic pathogens. Goats, cattle, and sheep have also been tested, but no evidence of their involvement in disease transmission was found (Reusken et al. 2013; Hemida et al. 2013). It remains unclear why MERS-CoV may have jumped from camels to humans in Saudi Arabia and not in other Middle Eastern or African countries.

This article, which results from a collaborative inquiry by anthropologists, public health officials, and camel herders into the animal origins of MERS-CoV, reflects on the possibilities and limits of ethnographic research on camel breeding in Qatar. How is it possible to investigate the perception of zoonotic risks by camel breeders through ethnographic methods, and how does it complement epidemiological studies? Why is Qatar an interesting ethnographic site for studying the global economy of camel importation, centred on Saudi Arabia? What can be learnt from an observation of camel races in Qatar, given their economic and cultural significance?

## Qatar as a ‘sentinel post’ for global epidemics of MERS-CoV

Qatar is a small peninsula, surrounded on three sides by the waters of the Arabian Gulf. Its only land connection is to Saudi Arabia to the south. In the eighteenth century, its inhabitants generated income mainly from pearl diving, fishing, trade, and sea transport. In addition, they owned camels, sheep, and goats, which were herded by Bedouins in the winter months. For most of the twentieth century, Qatar was under British rule, as a protectorate. In 1960, the government launched a settlement programme, urging the remaining pastoral population to exchange their tents for concrete houses. This process of urbanization was encouraged by the development of the oil industry under British control.

In 1971, Sheikh Ahmad bin Ali declared Qatar’s independence from Britain and its withdrawal from the Federation of Arab Emirates. The discovery of natural gas in the north of the territory in 1983 increased the wealth of the country, as it is estimated that Qatar contains 14 per cent of all natural gas reserves in the world (Fromherz 2012). Profits generated by oil and gas export helped the government develop a cultural policy to promote knowledge, including creating an international broadcast chain (Al-Jazeera), permitting foreign universities (Georgetown, Northwestern, University College London, HEC Paris) to

<sup>4</sup> Indicates a positive reaction to a serological blood test, especially one testing for the presence of antibodies. In this case, that means that many dromedaries in Africa have blood serum that tests positive for MERS-CoV.

establish branches in Qatar, and building museums (the Museum of Islamic Art opened in 2008, and the National Museum of Qatar is under construction).

The oil and gas exports also led to the importation of a massive labour force. The oil companies first hired expatriates on a large scale, mainly Egyptian, Jordanian, Palestinian, Omani, and Saudi, who came to work not only for the oil industry but also in construction and agriculture. After 1971, Asian migrants from Nepal, Sri Lanka, Bangladesh, the Philippines, China, and Indonesia found work in new fields such as transport and other services. The population increased dramatically from 120,000 people in 1971 to 500,000 in 1995 to 2.6 million in 2016. Eighty per cent of the population are migrant workers.

The State of Qatar is described as ‘deeply dependent on these transnational flows of labour in order to attain [its] ambitious national plans for development and infrastructural expansion’ (Gardner, Pessoa, and Harkness 2014, 10). Entry into and work in Qatar require a local sponsor through a sponsorship system called *kafala*, by which the Qatari elite governs and regulates migration. Every Qatari family is said to have several cars. Gleaming cars on the highways and the skyscrapers rising above the capital city of Doha are the most striking signs of the rapid development of the country.

Geographer Mike Davis (2006a, 53) has compared Doha to other cities sprawling in the Arabian desert, such as Dubai or Bahrain, describing them as ‘phantasmagoric but generic Lego blocks’. Davis (2006a, 53) notes that ‘in its exponential quest to conquer the architectural record-books, Dubai has only one real rival: China. . . . Starting from feudalism and peasant Maoism, respectively, both have arrived at the stage of hyper-capitalism through what Trotsky called the “dialectic of uneven and combined development”’. Davis explains that the attractiveness of the Gulf States is also linked to their position in the global ‘geography of fear’, as places where security is guaranteed by the strong public policy of authoritarian states but also where dangerous forces of illegal money and terrorism circulate. However, Davis fails to notice the new role these states play in the economy of global health and the surveillance of emerging infectious diseases, a topic which he covered in a book that contributed to the global mobilisation on bird flu (Davis 2006b).

Malik Peiris, a virologist based at Hong Kong University, who discovered in April 2003 the coronavirus causing severe acute respiratory syndrome (SARS), has noted the analogies between MERS-CoV in the Arabian Peninsula and SARS-CoV in China. While bats could be the reservoir for both coronaviruses – viruses that are usually benign among humans but that can turn deadly when they cross species barriers – dromedary camels could be the intermediary host for MERS-CoV as civet cats were the intermediary host for SARS-CoV. The emergence of MERS-CoV in the expanding camel industry has raised the same fears as the emergence of influenza viruses in the growing poultry and pig industries of South China,

and the same need for surveillance to prevent the spread of new diseases through a hub of communication and transportation. 'It is important', Peiris notes with his coauthors, 'to understand the ecology and epidemiology of MERS so that zoonotic disease can be prevented and epidemic or pandemic threats mitigated' (Hemida et al. 2015, 2).

In the MERS-CoV global health crisis, Qatar has played a role similar to that of Hong Kong in the global mobilisations against SARS and pandemic flu, that is, as a 'sentinel post'<sup>5</sup> for emerging infectious diseases (Keck 2013). Because of the vulnerabilities revealed by MERS-CoV in the transformations of the camel industry of the Arabian Peninsula, the government of Qatar took the emergence of MERS-CoV as an opportunity to become a leading actor in global health and adopt a 'one health' approach to combat emerging infections. In January 2016, Doha welcomed the International Conference in Emergency Medicine and Public Health, aimed at fostering preparedness capacity in the public health systems of the Arabian Peninsula.

## Ethnographic method, veterinary ontologies, and herding secrets

The research that is the basis for this article builds on the collaboration of Elmoubasher Farag, the supervisor for disease control at the Emergency Preparedness Department of the Supreme Council of Health;<sup>6</sup> Marion Koopmans, virologist at the Royal Institute of Public Health in the Netherlands (RIVM); and Sarah Cabalion, researcher at the Laboratory for Social Anthropology in Paris through the European 'Antigone' project (Anticipating the Global Onset of New Epidemics). Their discussions highlighted the need for a study of the role of human behaviour in the transmission of MERS-CoV, beyond what has previously been revealed by epidemiological studies, namely that about 60 per cent of camels in the Doha slaughterhouses tested positive for MERS-CoV, 14 per cent tested positive at the race course, and more than 50 per cent of camel workers ignored the disease (Reusken et al. 2013; Farag et al. 2015; Farag et al. 2016).

In November and December 2014 and in April 2016, under the supervision of Elmoubasher Farag and Frédéric Keck, and with funding from the Supreme Council of Health and the Antigone project, Omer Abdelhadi, a Sudanese researcher with veterinary training in the

<sup>5</sup> The term 'sentinel' comes from the military world, and refers to a soldier who goes to the front in order to see whether an enemy is advancing. A sentinel post sends early warning signals of a threat that affects the rest of the world.

<sup>6</sup> The Supreme Council of Health oversees and regulates the health sector. It was established in 2009. Now called 'Ministry of Public Health', it has more than five hundred employees.

control of camel meat, worked with anthropologist Sarah Cabalion, who had previously studied camel breeding in Niger, to analyse camel workers' perceptions of zoonotic risks in Qatar. The collaboration between a Sudanese man and a French woman worked well in focus group discussions in Central Market and in Shahaniya, where a majority of brokers and camel workers are Sudanese. Some said they were 'happy to see a French anthropologist with a Sudanese researcher', and that they 'would answer all questions'. It was more difficult to practice participant observation and structured interviews in the Qatari Bedouin camps and in men's meeting houses (*majlis*) for reasons of language and gender.

Most of the interviews and discussions were unrecorded and anonymized for different reasons. First of all, camel workers didn't want to share information that could displease the owners. Secondly, veterinarians had access to confidential data, especially in private clinics and drug department stores and at the Shahaniya Veterinary Center. Finally, raising camels involves knowledge that is kept secret, especially when it concerns racing camels: each owner interviewed had his own methods for choosing, feeding, training, and washing his camels in the best way, similar to horse racers in France: 'Each has his tricks and keeps them jealously. The trotting culture is a culture of secrets' (Digard 2001).

As we conducted interviews with public health officials, we had to distance ourselves from the association between public health and the search for a virus. Had we worn masks, it would have been regarded as an insult, and the owner would not have let us enter the barn and speak with the workers. Veterinarians were wary of our investigations. One of them told us: 'How could a vet detect coronavirus if camels don't have lesions or particular signs of infection? We don't see, we don't know'. For them, the dromedary camel was only an 'accidental host' or 'secondary host', and birds or bats should be blamed for the transmission of MERS-CoV. They also told us that we should 'talk about real diseases' such as brucellosis (which has an important impact on humans and camels but is not an emerging infectious disease as it is rather slow and endemic), scabiasis (a skin disease endemic in Saudi Arabia), or tuberculosis (re-emerging in the Arabian Peninsula). As in other cases where they work on zoonoses, veterinarians and physicians had different ontologies of viruses crossing species barriers: while physicians see pathogens when they have crossed the species barrier and perceive their risk in maximal terms, veterinarians look at all the pathogens that are affecting animals (Keck 2008, 36).

Some veterinarians argued that no research should be done on camels because they suspected such research might have hidden intentions against them. A veterinarian named Abdullah al Ziyara told us: 'This is money business. They want to create an environment to sell vaccines on fear. They make new viruses to produce new money. We [veterinarians] are scientists; we do not believe in media; it is easy to scare people with media!' He said that the public refused to see camels as the source of infection, quoting the newspaper *Peninsula*: 'It is

difficult for us to accept that our camels carry this fatal virus. Camels are part of our history and heritage. We enjoy eating their tasty meat and drinking their healthy milk. . . . The latest data coming from the World Health Organization (WHO) says that some birds might be behind the spread of the virus. This means that we need to search for these birds in order to prove to the world that our camels are innocent' (interview, December 2014). When Saudi Arabia began prevention efforts, veterinarians posted videos on YouTube in which humans kissed their camels. By contrast, public health officers pointed to the economic and political position of Qatar to justify the surveillance of MERS-CoV in camels, and tried to convince owners and veterinarians that they should collaborate to save their 'national heritage': camel raising.

## The transformations of the camel industry

The goal of this research was not to reveal whether camel workers were exposed to MERS-CoV but to document how the transformation of the camel industry increases the risks of transmission. As owners and workers were proud to talk about their camels, we could observe the living conditions they had built for them. According to Paul Sillitoe (2010, 3), who has studied with Qatari colleagues the Al Reem Biosphere Reserve after working in Papua New Guinea, camels in Qatar are now 'symbols of social status and Arab identity rather than sources of livelihood'. They are featured honourably in the Quran and in the Qatari domestication system, considered a noble species on the same level as horses and falcons. Sillitoe and his colleagues (2010, 12) explain that 'although some camel owners and their families . . . and migrant workers at stock-camps consume some camel milk and meat, many now keep camels not primarily for food but as status symbols, for demonstrating social standing and wealth'. One owner said, 'We can't live without camels; the camel is like the sun, it is second next to humans, and it is more than money'. Before independence, camels were used for carrying as well as for riding, but these uses are rare today. Another owner said that the Bedouin have traded in their camels as beasts of burden in favour of the half-ton truck: the ship of the desert is now a Toyota, Datsun, Nissan, or General Motors pick-up (Chatty 2013).

Consequently, camels serve today as 'investments of income deriving from the country's vast hydrocarbon reserves' (Sillitoe, Alshawi, and Al-Amir Hassan 2010, 13). Rather than as coworkers in a Bedouin pastoral economy, they now appear as subjects of empathy in a global economy of finance and trade. A similar transformation is described in the United Arab Emirates: 'The Emirati economy and its larger global context have affected the camel in two different ways. While oil wealth initially led to the marginalization of the camel, it later empowered Emiratis, represented by their sheikhly ruling elite, to come to the rescue of the

camel by shifting its role to a new national cultural domain of camel racing' (Khalaf 2010, 100).

The symbolic analysis of camel status should thus be linked to the material transformation of the camel industry, which has produced the fear of zoonotic spread. Camels are imported from different countries: the majority from Sudan and the Arabian Peninsula for racing or for milk and meat production, and some from Australia for meat production. There are around ninety thousand camels in Qatar, particularly in and around the Central Market of Doha, and around thirty thousand camels are raised for racing, mostly in the farms of Shahaniya in the suburbs of Doha. While the Arabian Peninsula has only 4 per cent of the world's camels (77 per cent of the twenty-eight million dromedary camels are in Africa, particularly Somalia, Sudan, Kenya, and Ethiopia), Qatar and the United Arab Emirates have the highest density of camels by land and by human population (Breulmann et al. 2007).

Until recently, 'livestock owners were free to pasture their stock in any region where adequate pasture occurred regardless of tribal affiliation' (Sillitoe, Alshawi, and Al-Amir Hassan 2010, 3). According to Sillitoe and colleagues (2010, 20), local people assert that 'they have herded stock in the region for generations without undue destruction of the vegetation'. However, in 2011, the Ministry of Environment in Qatar decided that free grazing would no longer be allowed, so as to prevent desertification. Consequently, as Sillitoe and colleagues (2010, 10) report, 'stock movements are minimal compared to previously. Today, herders are constrained not only by national borders and a system of government-imposed permits but also by internal borders and highways'. This decision, paradoxically, also provoked the movement of camels between borders, as many pastoralists went to graze their animals in Saudi Arabia. It is estimated that one hundred and fifty thousand Qatari camels are raised in Saudi Arabia, and some of them were expelled in June 2017 by the government of Saudi Arabia as a result of the official embargo on Qatar (Harwood 2017).

With the switch from a nomadic to a sedentary lifestyle, and the recent ban on grazing, animals are now herded in Qatar in much smaller areas, in farms, pens, or barns (*ezba*). The Ministry of the Environment has implemented a system of permits to regulate stock herding camps and hunting activity. It is necessary to obtain a permit to establish a camp and to register animals kept there. While only Qataris can apply for a license to establish such camps, those living in these camps and herding the stock are overwhelmingly (if not exclusively) non-Qataris, mainly Sudanese, Bengalis, and Nepalese (Sillitoe, Alshawi, and Al-Amir Hassan 2010, 8). There are different classes of licenses and some are awarded to nonresidents to establish temporary camps with licensed livestock. Some people do not have licenses and illegally occupy the land with their animals. Other licenses are awarded to recreational camps that imitate Bedouin lifestyle, without animals. The government control



of animals through licensing is reminiscent of the sponsorship system that governs and regulates migration.

Most Qataris own camels, as well as falcons, sheep, goats, horses, dogs, and pigeons (but only a few have all these animals together). Falcons, like horses and camels, can change hands for large sums. There are many breeds of camels: some varieties and some lineages are bred for racing, others for the quality of the meat and milk they produce, and still others for their beauty. Omani camels are the most expensive: they represent the main line for racing camels, and can be bred with Sudanese camels, who have the reputation of being the best runners. The Mudjahim type, which is good for milk, is one of the varieties called 'Khalidji camels', which means 'camels that come from the peninsula'.

Racing camels are raised in Shahaniya, thirty kilometres northwest of Doha. It houses around seven hundred barns, roughly four hundred square metres each, with almost exclusively racing camels. Beyond the tracks, a 'camel city' has sprung, where thousands of men and camels live all year round. Their numbers increase considerably prior to a big event, when owners, trainers, and camels from other Gulf States move in for a few weeks. While trainers and workers reside in Shahaniya, the owners live in Doha, but they come see their camels every day. After work, businessmen gather in their *majlis*,<sup>7</sup> or guest areas, and spend the evening before going back home. Qataris may have a *majlis* close to their house in Doha and another in Shahaniya, close to their barn.

'Barn' is the term used for a large complex that encompasses many smaller, individually owned compounds. All barns house camels that are used for breeding and also provide training for racing camels. Most barns contain a small house that includes a living room, a kitchen, and a bathroom. Coming to the barn to visit their animals during the nights and weekends allows businessmen and city dwellers to take a break from the exhausting life of the city. The living space for the workers is in a different section of the barn, near the animals' pens. Around ten camels per barn are served most of the time by two workers or more. The barn is enclosed by a several-metre-high concrete wall so that the animals are not connected to neighbouring animals. Every barn separates young camels from adult camels, especially in the period when calves are still nursing.

Camels can be bought in two main markets. Central Market, inside Doha, sells camels of different varieties, including racing camels. This market is close to the slaughterhouses,

<sup>7</sup> Visits with unrelated people occur outside the house in *majlis*, which may be as simple as a Bedouin tent or a solid construction as big as the house where the family lives.

which, as signalled by Farag and colleagues (2015, 332), should lead to further research. A comparison of the organization of the meat markets between Egypt and Qatar could provide insight in the observed differences. The camels that are put together for a holding period of weeks prior to slaughter in Doha have a wide variety of origins with varying initial immune statuses, which might provide a platform for extensive virus circulation. These include camels from Australia and camels from areas in the Horn of Africa and the Gulf region with known differences in immune status. The Shahaniya market specializes in racing camels, and is located close to the racetracks. But it seems that many transactions are made between owners and buyers in the barns, without ever going to market.

Camel owners and workers eat camel meat and drink camel milk. Camel products such as milk or urine are considered by most of the owners and workers to be ‘cure/medicine’ because the consumption of these products is linked to an idealized nomadic past in the desert. While milk has been suspected to cause transmission of MERS-CoV to humans (Gossner et al. 2016), camel owners attribute a change in the way milk tastes to the transformation of the camel economy and not to the presence of a virus. They say milk now tastes ‘chemical’ because camels do not graze freely anymore. One camel owner told us: ‘Half of our camels graze in Saudi Arabia, because open grazing is legal there. There are no infections there. Camels are in excellent condition. Their bones become strong. The mothers have no problem for delivery. Closed grazing is not good. It causes infections, because camels infect each other’ (M. al Dossari, Qatari, Shahaniya, May 2016).

To understand this idealized relation to camels and its impact on the camel economy, we need to explore the prestige attached to camel races.



Figure 1. A Sudanese worker feeding camels in Central Market (Doha, November 2014). Source: Sarah Cabalion

## The prestige of camel racing, an attractor for humans and viruses

Khalaf (1999, 87) writes that, in the past, ‘races which were performed on festive social occasions and celebrated by the local community included religious feasts, celebrating rainfall, weddings, circumcision, and perhaps the occasional visit of a prominent tribal sheikh’. Camel races were also recreational activities. This former entertainment has now evolved into a fiercely competitive and expensive sport. Modern racetracks have been built, and some breeds cost more than the most luxurious cars, with prices reaching as high as 1 million Qatari riyals (240,000 euros) per camel. Khalaf (1999, 85) describes the excitement that surrounds the prizes and the honour that accrues with winning:

The sight of 100 or more fine European and Japanese cars – BMW, Mercedes, Lexus, Toyota Land Cruiser, Nissan Patrol Super Safaris, etc. – shining under the sun is a tantalizing view, enticing the desires of Bedu camel breeders and trainers. For them winning a car is not capturing an expensive prize but the prospective value of their camel multiplies several times. ‘She won a car’ has become one of the yardsticks through which the superior quality of a racing camel can be confirmed. The *al-namous* (social honor and prestige) obtained in the process is obviously the symbolic crowning that goes with the car, which both shaikh and tribesman celebrate with joy and excitement.



Figure 2. Racing camels with robot jockeys before the start of the competition (Al Shahaniya tracks, December 2014). Source: Sarah Cabalion

Every year, several camel races are held in Qatar and other Gulf countries between September and April. Participants compete for valuable prizes. The most valuable prize is the Golden Sword, which is awarded at the end of the racing season at the Al-Shahaniya track. Local tournaments are held every week from October to January. This ‘cultural revival

phenomenon' (Khalaf 1999, 86) did not start in Qatar but in the United Arab Emirates in the early 1980s, where organizational methods and rules in horse racing were adopted or modified to suit camel racing.

Because grazing is prohibited, animals depend on a ration of imported feed (oatmeal or barley mixed with water). Racing camels' diet may also include sorghum, wheat bran, camel milk, cow milk, dates, honey, and eggs. They receive the most nutritional feed from outside Doha.

All racing camels have microchips implanted in their neck. They are registered with the Camel Racing Committee and assigned a number; registration gives owners access to low-cost feeds and free veterinary services. Even vaccination is free of charge, as the government wants Qataris to keep racing camels and encourages people to raise them. The valuable prizes offered during the different kinds of competitions are also there to encourage camel breeding in general. Camel owners can freely send female camels to the Emir's stables to mate with his bulls. Because of the competitions, and because of the historical links between Saudi Arabia, Qatar, and the other countries on the peninsula, racing camels travel frequently within the region. Some camels go to Saudi Arabia 'on holidays', to live a 'real camel life' for a few days or weeks, before going back to the zero-grazing system in Qatar. Their owners travel, as well, from *majlis* to *majlis*, to visit friends and relatives, for business, and for hunting; smaller numbers of camel workers travel to care for camels while on the road. Owners also travel with their camels or their falcons to take part in international races and beauty contests. In winter, during the competition season, camels and guests from outside Qatar are also hosted in Shahaniya.



Figure 3. Camel race in Al-Shahaniya. The owners are following the race with their cars (December 2014). Source: Sarah Cabalion

The frequency of cases of MERS-CoV is higher among men than women: 64 per cent of cases were among men (WHO 2015). Different reasons can explain this gender disparity. First of all, women have less contact with camels than men. Women do not go to the *majlis*, to Shahaniya, or to the races and festivals, and they never go to Central Market or the slaughterhouses. But they do drink the fresh milk coming from the barns and they eat camel meat. In addition, they sometimes spend weekends or holidays outside Doha, in temporary camps, sometimes with animals. Secondly, men and women live mostly separate lives, which may decrease women's chances of being exposed to the virus. Khazan (2013) points to research that suggests this may have 'somehow prevented women from coming into contact with infected men. Describing a Riyadh household where four men fell ill with the virus but none of their female care-takers did, researchers previously noted that the men interacted with other members of the society far more than their spouses and daughters did'. Unfortunately, it was not possible to meet with women during our own investigation.

The Council of Ministers issued a decree in 2004 that prohibited the use of child jockeys because of safety risks, and now camels are ridden by robot jockeys. This measure shows that social distances have been maximized in Shahaniya. A place where racing was a 'total social fact' (Mauss 2016), involving money, food, men, women, and children, has become a kind of virtual space where owners and camels interact over some distance. Owners drive alongside their camels in their big cars, using their phones to talk to them through the robot, which urges them to go faster. This kind of artificial attachment at a distance through communication is the ideal image of the new Qatari citizen, a stark contrast with the daily relations between camel and camel workers, characterized by exchanges of substances such as meat, milk, and urine.

## Conclusion

This article is the first ethnographic description of camel raising in Qatar, setting the stage for further investigations. We mostly looked at the barn camels at the Shahaniya race course during the initial steps of the research, because the high valorisation of the camels in this spectacular space meant that researchers' eyes were welcome. The recent valorisation of camels, in the context of the transformation of Qatar from a pastoral economy to a global trade centre, may appear as an obstacle to the surveillance of MERS-CoV, as camel owners are prone to denying that their animals are infected. However, if public health becomes a key element of national pride, alongside camel raising, this obstacle may be overcome. Such was the first result of the collaboration between public health and anthropology in the attempt to move beyond epidemiological studies of illness cases and to better understand both behaviours and values.

This early investigation of human-camel relations in Qatar should be complemented by interviews with migrant workers working in slaughterhouses, as they are particularly exposed to MERS-CoV. It was difficult for us to accomplish during our investigation due to the licence system that controls the economy of migrant workers. Investigations of the breeding system in East Africa, where most calves are raised, are also needed, since the period of weaning has been observed as a peak moment in the shedding of MERS-CoV viruses (Hemida et al. 2013, 6). The import of migrant workers and the breeding of young calves in East Africa, added to the concentration of camels from the Arab Peninsula in the small territory of Qatar, are certainly key factors of the transmission of MERS-CoV between camels and humans.

Comparative analysis should also be made to other areas where camels are highly valued. The attachments between humans and camels may be due to ethological characteristics of camels, such as restraint and memory, that have been noticed by other groups in very

different environments, such as Aborigines in the central Australian desert who say: ‘They’ve got a good memory – that’s why we tell people not to talk rough to camels’ (Vaarzon-Morel 2008, 20). In a society like Qatar that has transformed so rapidly, camels appear as witnesses of the past, which may cause difficulty in admitting the emergence of viruses that reveal the acceleration of the economy in which humans and animals have become increasingly entangled.

## Acknowledgements

This anthropological investigation has been developed with the support of the Laboratory of Social Anthropology (Paris), the European ‘Antigone’ project (FP7, Anticipating the Global Onset of Novel Epidemics), and the Supreme Council of Health, in Doha, Qatar.

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