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Antibody detection against Akabane (AKA) and Bluetongue (BT) viruses in Algerian dromedary camels

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Abstract: In this study, blood samples collected from dromedary camels in the Algerian provinces of Laghouat and Ghardaia, which were kept in the same pastures and in the same herds with sheep and goats, were examined to detect antibodies to the Bluetongue (BT) and Akabane (AKA) viruses using enzyme linked immunosorbent assay and serum neutralization tests, respectively. Overall, 16 (14.4%) and 2 (1.8%) of 111 tested camel serum samples were seropositive for the BT virus (BTV) and the AKA virus (AKAV), respectively. The present study determined that BTV infection was prevalent in camels in Algeria, and antibodies to the AKAV were also detected for the first time in Algerian camels.

Key words: Akabane virus, Algeria, Bluetongue virus, camel, seroprevalence

The Akabane (AKA) and Bluetongue (BT) viruses are nonzoonotic and mosquito-borne viruses carried by livestock and wild animals. They cause significant economic impacts as a result of the reproductive disorders they produce, such as early births, abortions, stillbirths, and malformations, especially in ruminants (cattle, sheep, and goats). AKAV belongs to the genus *Orthobunyavirus* in the family *Peribunyaviridae* as classified by the International Committee on Taxonomy of Viruses [1]. AKAV infection is widely reported throughout the world at present, including Australia, Southeast Asia, East Asia, and the Middle East [2–8], although AKAV was first detected in Japan, where it is called enzootic bovine arthrogryposis hydranencephaly. Moreover, antibodies to AKAV have been detected in many host species, such as cattle, horses, donkeys, sheep, goats, pigs, camels, and buffalo [9].

BTV belongs to the genus *Orbivirus* in the family *Reoviridae* [10,11]. In cattle and goats, BTV infection is seen mostly without clinical symptoms; however, the disease may cause severe clinical signs in sheep and deer that are characterized by hemorrhagic fever and death [12,13]. BTV occurs more widely in a band between latitudes of 40°N and 35°S worldwide [11], including sub-Saharan and Mediterranean countries [10]; therefore, hematophagous insects have a wide distribution in Algeria based upon their settlement-suitable climatic zones.

To the best of our knowledge, the epidemiological data for AKAV infection in Algeria have not been reported until now, and only one report exists regarding the presence of BTV in ruminants and camels [14]. The objective of the present study was therefore to provide information about the prevalence of AKAV infection in clinically healthy dromedary camels in Algeria as well as the prevalence of BTV infection, and also to guide future epidemiological studies in these animal groups.

A total of 111 sera obtained from clinically healthy dromedary camels (*Camelus dromedarius*) were randomly sampled from March 2016 to June 2017 for this survey. The camels were unregistered animals in private ownership from the provinces of Laghouat and Ghardaia in Algeria (Figure). The age of the sampled animals varied from 6 months to 20 years. These camels were bred for milk production and kept in the same pasture and in the same herds with sheep and goats. Furthermore, there were no vaccinations for viral infections examined in camels and other ruminants. All serum samples were kept at –20 °C prior to testing.

A commercial diagnostic ELISA kit (IDEXX Bluetongue Competitive ELISA; Pourquier Laboratory, Montpellier, France) was used for the detection of BT virus specific antibodies.

The serum neutralization test is the gold standard test for AKAV infection. For AKAV specific antibodies,

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Figure. Map of Algeria showing the sampling area.

the reference AKAV strain, at a titer of $10^{5.5}$, the 50% tissue culture infective dose ($TCID_{50}$)/mL, propagated in Madin–Darby bovine kidney cell culture, was used for the serum neutralization test. Serial twofold dilutions (from 1:2 to 1:128) of the camel sera prepared with Dulbecco's minimum essential medium in 96-well cell culture microplates were carried out for AKA specific virus-neutralizing antibodies [15]. Antibody titers of 1:4 or above were recorded as positive.

In the current study, all tested animals had a low prevalence of anti-AKAV (1.8%), while antibodies to BTV were detected in 14.4% of dromedary camels (Table). No animals were positive in terms of AKAV specific antibodies in the province of Ghardaia, while AKAV specific antibodies were detected in 2.6% of camels in the Laghouat province. Similarly, Koç and Erol [16] found no seropositivity to AKAV in camels in some provinces in the Aegean region of Turkey as well as in cattle, sheep, and goats. However, the seroprevalence of AKAV in camels has been reported to be up to 70% worldwide [9,17]. This prevalence may indicate that AKAV could not be detected in our animals due to the low sampling number in the province of Ghardaia.

Table. Distribution of the BTV and AKAV antibodies in dromedary camels in Algeria.

Province	Ab to BTV n (%)	Ab to AKAV n (%)	Ab to AKAV and BTV n (%)
Laghouat (n: 77)	7 (9.1)	2 (2.6)	2 (2.6)
Ghardaia (n: 34)	9 (26.5)	-	-
Total (n: 111)	16 (14.4)	2 (1.8)	2 (1.8)

In the present study, the BTV seropositivity rates were higher in the province of Ghardaia (26.5%) compared with the Laghouat province (9.1%). The seroprevalence of BTV in camels has been determined to range from 0% to 73% in several countries, such as Morocco, Chad, Niger, Saudi Arabia, Sudan, and Spain (Canary Islands) [18–22]. The highest BTV prevalence in dromedary camels on the African continent was at the rate of 76.7% in Ethiopia [17]. The first seroprevalence of BTV ever reported in Algerian dromedary camels was 21% [14]. In our study, we found a prevalence of BTV infection in Algerian dromedary camels similar to the rates described previously [14].

Moreover, Madani et al. [14] and Batten et al. [10] argued that camels might play a role of potential carriers of BTV infection. For this reason, camels may likely contribute to virus persistence in sampling areas and be a primary source of infection in virus naive animals.

In conclusion, the findings of this study indicated a low prevalence of AKAV and a moderate circulation of BTV infection in Algerian dromedary camels. Camels may therefore have an important role in the epidemiological assessments of these infections since the vector-climate and reservoir factors are the most important criteria in the epidemiology of these infections due to their transmission by mosquitoes [11]. Nevertheless, further studies will be needed to determine the reservoir role of camels for other ruminants as well as the epizootiology of these infections in livestock that come in close contact with seropositive camels in Algeria.

Conflict of interest

None of the authors has any financial or personal relationship that could inappropriately influence or bias the content of the paper.

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