Detection of bovine viral diarrhea virus antibodies in camels (Camelus dromedarius) in Maiduguri, Nigeria

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Abstract
This study was carried out to determine the seroprevalence of bovine viral diarrhea virus (BVDV) antibodies in camels presented for slaughter at the Maiduguri abattoir using a BVDV specific indirect enzyme-linked-immunosorbent assay (ELISA). Ninety (90) serum samples collected from adult male and female camels were tested for BVDV antibodies. From the samples tested, 28 (31.1%) were positive for BVDV. The sex distribution of the positive samples showed 7 (33.3%) males and 21 (30.4%) females were positive for BVDV antibodies. The results showed no statistically significant (p<0.05) difference in the sex prevalence of camels observed in the study. This finding demonstrates the presence of BVDV antibodies in camels in Maiduguri. Further studies will be required to elucidate the epidemiology of BVDV infection in camels and other livestock species in the study area.

Keywords: Antibodies, Bovine viral diarrhea virus, Camels, Nigeria, Seroprevalence

Introduction
The growing human population in the world has brought into focus the issue of food security amongst others; thus the need to explore alternatives to meat, milk and other products (Ahmad et al., 2010). Camels have been domesticated for meat, milk and transport over 4,000 years ago (Muhammad & Akpan, 2008; Bamaiyi & Kalu, 2011; Gadahi et al., 2013). The Nigerian camel population was reported to be slightly over 87,000 heads which are found mostly in the northern parts of the country (Bamaiyi & Kalu, 2011). Although considered a less conventional source of meat compared to cattle, sheep and goats (Kurtu, 2004), it can be a better option for animal protein compared to cattle as it has a large body mass and good dressing percentage (Mukasa-Mugerwa, 1981). Camels are adversely affected by lack of water, poor feed, heat stress and diseases (Bamaiyi & Kalu, 2011; Mshelia et al., 2013) leading to decrease in productivity. Studies have shown that camels are susceptible to common diseases affecting other animal species such as brucellosis and bluetongue (Yousif et al., 2003; Amstel & Kennedy, 2010; Wernery, 2012; Gadahi et al., 2013).

Bovine viral diarrhea virus (BVDV), a member of the genus Pestivirus is characterized by a wide spectrum of clinical manifestations from mild infections to severe clinical signs resulting in respiratory, reproductive or immunosuppressive diseases (Duong et al., 2008; Kampa et al., 2009). The virus is maintained in animal population by persistently infected animals that become infected in-utero prior to development of immunocompetence and thus shed BVDV for life (Passler et al., 2009). Bovine viral diarrhea virus infection is not exclusively a disease of cattle, but affects sheep (Paton et al., 1995), rabbits (Frolich & Streich, 1998), camels (Belknap et al., 2000) and goats (Passler et al., 2014). It has been reported that BVDV can produce cases of diarrhoea, ill thrift, reproductive loses as well as respiratory disease in camelds (Kapil et al., 2009). The virus has recently been described as an emerging disease in camels (Wernery, 2012) but the distribution globally is yet to be determined. A
recent report (Mshelia et al., 2014) from this study area has shown that camels are commonly found grazing together with cattle and other ruminant species in Nigeria, which could lead to cross infections with BVDV amongst these species. In view of the above, this study was designed to determine the seroprevalence of BVDV antibodies in camels slaughtered at the Maiduguri abattoir in Nigeria.

**Materials and methods**

**Study area**
The study was carried out in Maiduguri, Nigeria which lies between longitude 10°48′N and latitude 11°20′E. The city is cosmopolitan and is situated at 354 m above sea level. The months of March and April are usually the hottest months, while November to January are the cold dry periods. The city receives annual rainfall from June to September (Mayomi & Mohammed, 2014).

**Animals and sample collection**
Slaughter animals brought into Maiduguri from locations within northern Borno state and even trade animals from neighbouring Niger and Chad Republics were used for this study. Adult animals (<4 years) were selected for sampling. Their ages were estimated according to the methods described by Bello et al. (2012). Between June and August, 2013, blood samples from ninety (90) dromedary camels were collected at the point of slaughter and transferred into plain vacutainer tubes. The samples were then placed on ice pack and transported to the Animal Virus Research Laboratory, Department of Veterinary Microbiology and Parasitology, University of Maiduguri, Nigeria where serum was separated by centrifuging at 3 000 x g (4000 rpm) for 15 minutes and stored in identifiable vials at -20°C until tested.

**Serological test**
Sera were tested for antibodies specific for BVDV using an indirect Enzyme Linked Immunosorbent Assay (ELISA) Kit (Bio-X Diagnostics, Belgium). The test was performed according to the instruction of the manufacturer. Both positive and negative control sera were included in the assay. The results were read by a microplate reader (Emax precision Micro plate reader, California, USA), where the optical density (OD) of the positive and negative sera and those of all the samples were measured at 450 nm wavelength. The cut-off point for positive and negative tests were OD values < 2.216 and >3.391 respectively.

**Data analysis**
Data generated from the study were expressed as simple percentages and presented in a table. The Fischer’s Exact test was used to compare prevalences between male and female animals. P-value was considered significant at 0.05.

**Results and Discussion**
The result shows that BVDV antibodies were detected in 28 (31.1%) of the 90 camel serum samples tested. The sex distribution of the positive samples showed 7 (25%) males and 21 (75%) females (Table 1), but there was no statistically significant (P>0.05) difference in detection rates between male and female camels tested. The rate of detection of BVDV antibodies in camels in the present study is higher than the 1.3% previously reported by Baba et al. (1996) who used agar gel immunodiffusion technique in the same study area. This sharp rise may be due to increased spread of infection amongst this species or due to differences in the assay techniques used. The antibodies detected in this study may likely be due to natural exposure of camel to BVDV as vaccination of animals against bovine viral diarrhea virus is not practiced in Nigeria. Besides Baba et al. (1996), there seems to be no other reports available on the sero-prevalence of BVDV in camels in Nigeria to the best of our knowledge. The sero-prevalence pattern observed in the present study can be compared to the findings obtained elsewhere. For example, seroprevalence rates ranging from 1.6 to 23% have been reported in Oman (Hedger et al., 1980), USA (Doyle &

<table>
<thead>
<tr>
<th>Sex</th>
<th>Number of Samples tested</th>
<th>Detection Rates</th>
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<tbody>
<tr>
<td></td>
<td></td>
<td>Positive n (%)</td>
<td>Negative n (%)</td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>21</td>
<td>7 (33.3)</td>
<td>14 (66.7)</td>
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<tr>
<td>Female</td>
<td>69</td>
<td>21 (30.4)</td>
<td>48 (60.6)</td>
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<tr>
<td>Total</td>
<td>90</td>
<td>28 (31.1)</td>
<td>62 (68.9)</td>
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</tbody>
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**Table 1: Prevalence of BVDV antibodies in camels in Maiduguri, Nigeria**
Heuschele, 1983), Sudan (Bornstein & Musa, 1987), Saudi Arabia (Al-Afaleq et al., 2006) and the UAE (Wernery et al., 2008); higher sero-prevalence rates (>52%) have also been reported among camels in Egypt (Zaghana, 1998) and Sudan (Intisar et al., 2010). The prevalence of BVDV in camels observed in the present study could arise as a result of cross infection from other animal species as they are found grazing together freely in rangelands in the northern frontiers of Nigeria (Mshelia et al., 2014). To validate this claim, a study should be focused on the detection and molecular characterization of BVDV from camels and other animals to compare their genotypes and to determine their phylogeny.

In conclusion, this study has revealed a prevalence of BVDV (31.1%) antibodies among camels presented for slaughter at the Maiduguri abattoir. Since there is no vaccination against the virus in this region, the present finding indicates that camels might be exposed to natural BVDV infection, thus the epidemiology of this virus in camel population needs to be elucidated. A larger sample size will be required to determine the true seroprevalence in this animal species. Furthermore, studies should also be carried out to isolate and genetically characterize the field strains of BVDV in other animals and to determine the disease burden caused by this virus in Nigeria.

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References


