



The concern of Foot and Mouth Disease (FMD) in Arabian dromedary camels in the eastern province of Saudi Arabia

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Abstract

FMD in Saudi Arabia is considered one of the enzootic animal diseases that cause severe economic losses with outbreaks reported in cattle and sheep. The potential role of *Camelus dromedaries* in the epidemiology of FMD is unclear. In the current study, a total of 180 apparently healthy dromedary camels (*Camelus dromedaries*) were randomly sampled and sera were screened for the presence of antibodies produced against 3ABC non-structural proteins (NSP) for FMDV using a commercially available ELISA kit. Nineteen out of the 180 sera samples tested positive with an overall prevalence 10.55%. The obtained results appear that dromedaries might be a susceptible species to FMD infection similar to cattle, sheep and goats in the eastern province of Saudi Arabia.

Key words: *Camel; ELISA; NSP; FMD, Saudi Arabia*

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Introduction

Foot-and-mouth disease (FMD) is caused by an RNA aphthovirus of the family picornaviridae that causes a highly contagious vesicular disease of cattle and other cloven-hoofed animals (Brito et al. 2015). There are seven immunological serotypes of FMD that exist (A, O, C, SAT 1, 2, 3 and Asia1) and over 60 subtypes of the virus circulating around the world (Wernery and Kinne 2012). There is no cross protection between serotypes and sometimes protection covered by vaccines even of the same serotype could be limited (Jamal and Belsham 2013). The disease

is endemic in some parts of Europe, Africa, Middle East and Asia. Places like North America, Australia, New Zealand and most countries in Western Europe reported to be free from the disease and have stringent regulations to prevent the introduction of the virus (Wernery and Kinne, 2012 and OIE 2015).

Although mortality due to FMD is very low and mostly restricted to young animals, drastic decrease in productivity and working capacity of the animals were reported causing great losses to the livestock industry. One of the important mechanisms of FMD spread is by droplet infection

is a rapid and extensive spread (Mikkelsen, et al. 2003).

In Saudi Arabia, FMD is considered one of the enzootic animal diseases and causes severe economic losses (Hafez et al. 1994 and Aidros, 2002). Serotypes A, O, C, Asia1 and SAT2 were reported in Saudi Arabia (Woodbury et al. 1994 and Samuel et al. 1997). During the period 2005-2009, large numbers of FMD types O and A outbreaks were detected (Yousef et al. 2012). The field isolates during FMDV outbreaks isolated from different regions in Saudi Arabia were closely related to O¹manisa strain of FMDV serotype O. In 2005, serotype SAT2 invaded Saudi Arabia and caused major problems (Abdel Baky et al. 2005). Later, the disease was reported in sheep imported to the country during Hajj season (Ali et al. 2011).

FMD virus is a small non-enveloped virus that has a genome of 8.5 kbp which encodes structural and non-structural proteins (NSPs) (Yousef et al., 2011). The viral capsids compose of four structural proteins, VP1, VP2, VP3 and VP4 (Fry et al., 2005). The structural protein produces antibodies to FMDV in vaccinated animals, whereas infected animals produce antibodies to both the structural and non-structural proteins (Yousef et al., 2011). Assays to demonstrate antibodies against non-structural proteins have the potential to differentiate infected animals from vaccinated animals (DIVA).

The potential role of camels in the epidemiology of FMD is unclear. Several investigations suggest that dromedaries are

less susceptible to FMD virus presenting no risk in further transmission of the disease to

susceptible animals (Wernery and Kaaden, 2004 and Alexandersen, et al. 2008). On the other hand many reports have described the isolation of FMDV from camels with or without clinical signs and they suggested that dromedaries are susceptible to natural FMD infection (Kumar, et al. 1983 and Yousef et al. 2012). With regards to the limited information concerning FMDV in camels in Saudi Arabia, this work aimed to evaluate the role of camels in the epidemiology of FMD in Saudi Arabia and to analyze the natural exposure of camels (*Camelus dromedaries*) to FMDV by detecting antibodies against NSP.

Materials and Methods

Blood samples:

A total of 180 blood samples (Table 1) were collected from camels that were admitted to the veterinary teaching hospital of the College of veterinary medicine and animal resources of King Faisal University-Saudi Arabia, in the period from January 2014 to March 2015. These camels were apparently healthy of any clinical signs of FMD and were selected randomly based on the availability of sample collection. Whole blood was collected in collection tubes and allowed to separate at 5 °C over night. Sera were harvested and stored at -20 °C until tested by prioCHECK® FMDV NS commercial ELISA kit (Prionics Lelystad B.V, Netherlands) for detection of antibodies against non-structural proteins (NSP) of FMDV. The assay was performed and results were expressed according to the

manufacturer's protocol. Animals were classified into 3 groups based on their age

and we considered collecting equal number of samples in each group for comparison purpose (Table 1).

Estimation of prevalence (P):

Prevalence (P) was estimated according the following formula:

$$P = \frac{\text{No. of individual having a disease at a particular point in time}}{\text{No. of individual in the population at risk at that point in time}}$$

Results

The overall prevalence was estimated to be 10.55% in which 19 out of the 180 animals tested positive. The highest age prevalence was 25%, detected in group 2 (6-12 years) when compared to 6.7% in group 3 (13 years and above). On the other hand, all animals in group 1 (1-6 years) tested negative. For sex prevalence, antibodies were detected in 11.5% of tested males and 10.1% in females (Table 1).

Table (1): Positive FMD-NSP antibodies among *Camelus dromedaries*

	Age / years	Nr. of samples	Sex	Nr. of positive	prevalence
Gr. 1	1 – 5	60	F=33 M=27	0	0
Gr. 2	6 – 12	60	F=37 M=23	15 (F=9, M= 6)	25%
Gr. 3	13 and above	60	F=49 M=11	4 (F=3, M=1)	6.7%
Total		180	F=119 M=61	19 (F=12, M=7)	10.55%

F= Female

M= Male

Discussion

FMD is a highly contagious viral disease of all domestic and wild cloven hoofed animals and is considered as one of the

most important transboundary animal diseases in the Middle East and Gulf regions (Brito et al. 2015). In Saudi Arabia, FMD is considered one of the enzootic animal diseases that cause severe economic losses with outbreaks reported in cattle and sheep. The potential role of camels (*Camelus dromedaries*) in the

epidemiology of FMD is unclear, there are divergent opinions whether the Camelidae family is susceptible to FMD or not, or it may serve as a reservoir host of the virus.

In the current study, the overall results showed 19 out of 180 (10.55 %) camels to be positive for antibodies against FMD-NSP (Table 1). This appears that dromedaries might be a susceptible species to FMD infection similar to cattle, sheep and goats.

Camels move frequently across the desert for grazing and trade purposes. Since camels are not vaccinated against FMD in Saudi Arabia, it could play an important role during FMD outbreaks; where they mix freely with infected susceptible animals like cattle, sheep or goats with no or less control measures instituted to prevent the disease transmission in-between and across species.

Because of the limited information on the role of *Camelus dromedaries* in the epidemiology of FMD, few documented evidence exists on its epidemiology. The results obtained in the current study contradict other reports that tested camel sera in Africa and the United Arab Emirates for evidence of FMD with negative results (Wernery and Kaaden 2004). On the other hand, dromedaries developed antibodies to FMDV in earlier studies indicating susceptibility of dromedaries to natural and experimental FMD infection (Moussa et al. 1987).

From the results obtained in this study and from data of previous reports, it is clear that dromedaries can contract the FMDV by contacts with FMD infected animals, whether they pose risk of transmitting the disease to

susceptible animals or are they carriers or dead-end host is an open speculation and needs further investigation. In addition, detecting serotypes that circulates within this region in positive sera is essential and warrants further studies.

Lessons learned from past FMD outbreaks point out the need for a strategy that includes coordinated local and regional efforts for FMDV control and surveillance. To date, there is a lack of information about the virus subtypes, and many characteristics of FMD infection in the country have not been extensively studied. Therefore, local information on the detection, identification and distribution of FMD in Saudi Arabia are required as a baseline to design suitable control measures to overcome any unexpected disaster. Specific local characteristics related to host, environment and virus that condition FMD occurrence should be carefully considered and incorporated to adapt appropriate strategies into local plans (Brito et al. 2015).

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الملخص العربي

الحمى القلاعية هو مرض فيروسي شديد العدوى يصيب كل الحيوانات مشفوقة الظلف المستأنسة والبرية. ويعتبر مرض الحمى القلاعية من الأمراض الحيوانية العابرة للحدود الأكثر أهمية في منطقة الشرق الأوسط والخليج وتحدث العدوى غالباً في الماشية. يوجد هذا المرض في سبع أنواع مصلية ووراثية، تتفرع الي عدد كبير من أنواع فرعية داخل كل نوع مصلي وتتسبب في خسائر كبيرة لصناعة الثروة الحيوانية. في المملكة العربية السعودية، يعتبر مرض الحمى القلاعية من الأمراض الحيوانية المتوطنة والتي تسبب خسائر اقتصادية حادة في الماشية والأغنام. حتى الآن، هناك نقص شديد في المعلومات حول الأنواع الفرعية للفيروس وخصائص العدوى بمرض الحمى القلاعية التي لم تدرس على نطاق واسع. ولذا يتطلب الأمر تحديد أنواع الفيروس وتوزيع مرض الحمى القلاعية في المملكة العربية السعودية كأساس لتصميم تدابير الرقابة المناسبة للتغلب على الكوارث غير المتوقعة عن حدوث المرض. هناك آراء متباينة فيما إذا كانت الإبل معرضة للمرض أم لا، أو أنها قد تكون بمثابة خازن للفيروس. في الدراسة الحالية، تم أخذ عينات بشكل عشوائي من 180 جمل وحيد السنام سليم ظاهرياً. وتم فحص الأمصال لوجود الأجسام المضادة المنتجة ضد البروتينات ABC3 غير الهيكلية (NSP) باستخدام اختبار الإليزا ELISA المتاح تجارياً. أسفرت النتائج عن إكتشاف تسعة عشر عينة مصل إيجابية من إجمالي 180 عينة مصل تم اختبارها بمعامل إنتشار مصلي إجمالي قدره 10.55%. وتفسر النتائج المتحصل عليها أن الإبل في المنطقة الشرقية بالمملكة العربية السعودية قد تكون عرضة للإصابة بمرض الحمى القلاعية مثل الأبقار والأغنام والماعز ولها دور في إنتشار الإصابة بهذا المرض.