Observations on Foot and Mouth Disease in Vaccinated and Unvaccinated Wildlife in the United Arab Emirates

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Summary

Our poster compares and summarises the features of two outbreaks of foot-and-mouth disease (FMD) in one unvaccinated collection and a second vaccinated collection of wild ungulates in the United Arab Emirates (UAE) and highlights the importance of vaccination protocols to protect wildlife in a region where infectious viral diseases, including FMD, are endemic.

Introduction

Foot-and-mouth disease (FMD) is a highly contagious, but usually nonlethal disease of ruminants, characterized by vesiculation of the oral mucosa and of the skin of the feet (Thompson et al, 2001). The virus is endemic in domestic livestock populations in the Middle East (serotype O and A) (Knowles et al 2005; 2009). There are few reports of FMD in wildlife in the region, although FMD was reported in gazelles in Israel in 2007 (Promed, 2009) and Shimshony et al (1986) described a FMD outbreak in mountain gazelles that caused severe mortality.

Objectives

Our poster summarises two outbreaks of FMD in one unvaccinated collection and a second vaccinated collection of wild ungulates and highlights the importance of vaccination protocols to protect wildlife in a region where infectious viral diseases, including FMD, are endemic.

Fig 1. Gazelle with FMD showing unilateral lameness.

Fig 2. Gazelle with FMD walking on tip-toe.

Site 1 (unvaccinated)

Site 1 (unvaccinated) was a collection of dorcas gazelles (~100) (*Gazella dorcas*) and sika deer (~25) (*Cervus nippon*) living in a large walled garden within Dubai. A dairy farm was located within the grounds. The week before the investigation began many gazelles had died. On 29/12/2008 it was noted that the majority of deer and gazelles were lame (Figs1-4). Clinical signs in the gazelle included unilateral 'carrying leg' lameness in just one limb (Fig 1), walking on tip-toe with arched backs (Figs 2, 3), or, some animals were immobile (Fig 4) and when approached they were easily caught and examined. Many young gazelles died. Although most of the deer were observed to be lame, none died. Four immobile gazelle were euthanased and submitted to the CVRL. Approximately 50% of the gazelle died over a 6 week period. Tongue erosions were observed (Fig 5), but foot lesions were not observed. Organ samples were assayed in VERO cells to determine the presence of infectious FMDV. FMD virus type O was isolated from tongue lesions and organs.

Site 2 (vaccinated)

Site 2 was a private collection outside Dubai comprising blackbuck (~80) (*Antelope cervicapra*), sand gazelle (~20) (*Gazella subgutturosa marica*), Arabian oryx (~45) (*Oryx leucoryx*), mountain gazelle (~8) (*Gazella gazella*), impala (~48) (*Aepyceros melampus*) and Speke's gazelle (~36) (*Gazella spekei*). Most ungulates had been vaccinated annually against FMD since 2006. The Arabian oryx, mountain gazelle and Speke's gazelle and a group of 10 sand gazelle were kept in fenced enclosures and every adult animal in these groups had been vaccinated within the previous 3 months. The vaccine used was Aftovax (Mérial, Lyon, France), a commercial standard trivalent aluminium hydroxide adjuvanted aqueous vaccine prepared from strains of FMDV type O1- Manisa, A22 Iraq, and Asia 1 Shamir grown in BHK21 clone 13 cells. The blackbuck, impala and the remaining sand gazelle population lived within the 350 hectares of the walled grounds of the collection. Although many of these animals were captured and vaccinated annually by herding them into a raceway system (O'Donovan and Bailey 2006), it was not possible to catch all of them. We estimate that 75 % of these animals were vaccinated 10-12 months previously.

On 29/01/2009 a post parturient female blackbuck was found depressed and unable to stand next to a dead calf that she had delivered. The female was euthanased and submitted to CVRL. Lesions observed in the female included tongue erosions, focal ulceration of the lip and white stripes on the myocardium (Fig 6). FMD virus type O was isolated from tissues. During February, FMD was confirmed in one stillborn oryx calf, one juvenile blackbuck, and 2 sand gazelle calves. In May, FMD was confirmed in a week old mountain gazelle calf. Other than the first euthanased female blackbuck, FMD has not been confirmed in other dead adult animals at site 2 from the first case until the current time (July 2009).

Figs 3-6. 3. Severely debilitated gazelle with FMD with arched back and difficulty walking. 4. Moribund gazelle with FMD. 5. Mouth lesions in gazelle with FMD (©CVRL, Dubai). 6. Typical tiger heart lesions in black buck with FMD (©CVRL, Dubai).

Virus Isolation

Viral isolates from both outbreaks were sent to the World Reference Laboratory at the Institute for Animal Health (UK). The 0 virus was closely related to FMD strains from India (Ind-2001) and Iran (Irn-2001).

Source of infection

The source of infection was not confirmed for either outbreak. At site 1, the infection may have originated from recently imported livestock or from cow dung compost, both originating from adjacent countries where FMD is known to be endemic. Cattle at site 1 tested positive to the field strain of FMD using serology, virus isolation on VERO-cells and PCR. Cattle serum samples were tested by solid phase blocking ELISA (SPBE) for antibodies against FMDV types A (Iraq) and O (Manisa) using the (Ceditest ® FMDV-NS, Cedi-Diagnostics, Netherlands). At site 2, the authors were informed by local veterinarians that a sheep farm adjacent to the collection had FMD immediately prior to the outbreak in the wildlife.

Conclusions

These outbreaks demonstrate how FMD has the potential to wreak havoc upon a susceptible population of unvaccinated exotic ungulates managed in captivity. Few wildlife collections in the Middle East routinely vaccinate their animals against infectious diseases. An important reason is that large numbers of semi-free living exotic ungulates such as gazelles and oryx are challenging to catch and safely handle. Handling systems for exotic ungulates are becoming more commonly used (Tamer, Fauna Research, USA) and make the vaccination of large groups of ungulates possible (Fig 7). Since 2006 an annual vaccination programme was initiated for all ungulates at Site 2.

Further work on vaccination required

With the exception of a recent study by Kilgalon et al (2008) in Arabian oryx, the nature and extent of the immunological response to any FMD vaccine, either high or standard potency has not been established in exotic ungulates (Schaftenaar, 2001, Ryan et al 2004). Kilgalon et al (2008) concluded that a single dose of FMD vaccine may not elicit a sufficient antibody response in Arabian oryx to confer lasting protection and recommended as a standard prophylactic regimen, follow up doses as in domestic livestock. However, from a practical perspective, capturing exotic hoofstock for booster injections one month after primary vaccination, or even biannually is practically impossible in most collections. Our observations indicate that, although most animals at site 2 were vaccinated once a year, they were afforded good protection when exposed to the same FMD strain that caused high mortality in unvaccinated gazelle at site 1. Clearly, further research is required in this area.

Fig 7. Impala in a tamer used to vaccinate large numbers of exotic hoofstock at site 2.

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