An eruptive moderate form of camelpox infection in dromedary camels (*Camelus dromedarius*) in Saudi Arabia

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Submitted for publication: 5 June 1999
Accepted for publication: 6 September 1999

Summary
An eruptive moderate form of camelpox infection is reported in camels aged three to four years from the Al-Ahsa region of Saudi Arabia. The clinical signs were moderate in nature (between the 'mild' and the 'severe' form). The morbidity rate was 100% while the case fatality rate was 0%. Camelpox virus was isolated and identified using electron microscopy and serological analysis.

Keywords

Introduction
Camelpox infection is a disease of camels which is usually manifested as a severe generalised disease. However, a mild form of the disease has also been described (2, 3). The aetiological virus belongs to the genus *Orthopoxvirus* of the family Poxviridae (4). The authors describe an atypical form of camelpox infection which is moderate in nature.

Materials and methods

Disease description
A skin disease was detected in four camels aged 3-4 years which were purchased from the camel market in Al-Ahsa district, in the east of Saudi Arabia. The disease was observed at the beginning of March 1998 and continued until mid-April of the same year. The lesions were initially elevated papules, sparsely distributed over all parts of the body, except the head, with the appearance of insect bites (Fig. 1). The diameter of the papules ranged from 0.5 cm to 1.5 cm. The papule stage lasted 8-11 days, followed by a pustule stage of 4 days which was accompanied or immediately followed by eruptions. The eruptive lesions on the rear of the thighs coalesced into large lesions (Fig. 2). The eruptive pustule phase progressed into a dry scab phase, after 10 days, during which the lesions became dry with a greyish colour, resembling ring-worm infection (Fig. 3). The scabs healed after 2 weeks, leaving greyish dry scars. The mucous membranes of the mouth, eyes or nostrils were not affected.

Nodules were removed for virus isolation. These were placed in sterile containers and immediately transported to the laboratory in a chilled environment.

Virus isolation
The skin biopsy was ground using sterile sand and was made up into a 20% suspension in F-12 medium without serum (pH 7.4). The homogenate was clarified at low centrifugation (1,500 g) for 10 min. To the supernatant, penicillin (10,000 units/ml), streptomycin (100 µg/ml) and mycostatin (50 units/ml) were added. The supernatant was aliquoted into 1-ml volumes, in sterile vials, and stored at -86°C until needed.

The supernatant was inoculated via the chorioallantoic membranes (CAM) of 11-day-old chicken embryos as described by Hitchner (6). A portion of the supernatant was inoculated onto Vero cell culture as described by Munz et al. (8). The cells were examined daily for a cytopathic effect.

Electron microscopy
Skin pieces (2 mm thick) from papule lesions were placed in 4% glutaraldehyde buffered to pH 7.4, in 0.1 M sodium cacodylate. After further rinsing in the buffer (pH 7.4),
samples were post-fixed in 1% osmium tetroxide for 1 h. Samples were then routinely processed by ethanol dehydration and epson embedding. Ultra-thin sections (65 nm thick), were stained with uranyl acetate, followed by lead citrate and then examined under an electron microscope.

Serum neutralisation test

The isolated virus was reacted against known camelpox hyperimmune serum produced against the known camelpox virus C1 (2). The virus was titrated in Vero cell culture and 100 tissue culture infective dose 50 (TCID\textsubscript{50}) was reacted against two-fold dilutions of the reference hyperimmune serum in micro-titre plates. All dilutions, buffers, media, incubations and reading of results were as described by Abu Elzein et al. (1).

Results

Virus isolation

Within 36 h, the inoculated Vero cells began to show rounding. After 72 h, the cell rounding was seen on more than 70% of the cell sheet. This progressed to cover the whole cell sheet in 4 days after which the cells were harvested. A further two passages were performed on Vero cells. The cell homogenate was stored at -86°C until used in the serum neutralisation test (SNT).
The inoculated chicken embryos were opened 5 days post inoculation. White opaque pock lesions ranging from 0.2 mm to 0.8 mm in diameter were observed. Some CAMs showed confluent lesions.

**Virus identification**

The virus infectivity was completely inhibited by the reference hyperimmune serum. Pox virus particles were seen on the electron micrographs from the skin lesions of the affected camels (Fig. 4).

**Discussion**

The close clinical follow-up of the cases described, together with virus isolation and identification, using SNT and electron microscopy, indicated that the condition was due to camelpox infection.

The classical camelpox infection in Saudi Arabia and elsewhere usually commences with numerous papules that cover the entire body of the camel. In the case described, the initial signs of disease were not suggestive of pox infection. This was because the papules were sparsely distributed over the body and the head was clear from papules. Such a picture could easily be confused with insect bites or another non-specific condition. Furthermore, if the condition was observed during early scab formation it could be confused with ring-worm infection (Fig. 3).

The authors advise field veterinarians to isolate camels which show sporadic nodules and to keep the animals under observation for 4 weeks. Veterinarians are also advised to send samples from the nodules for rapid virological investigation. In the experience of the authors, such nodules contain high titre virus to enable visualisation by electron microscopy and virus isolation.

In regions where camelpox is endemic, such as Saudi Arabia (2, 5, 7), clinical camelpox may take deceptive and unfamiliar forms. Studies to examine the virulence of the causative virus in seronegative camels would be of interest.

**Acknowledgements**

The authors would like to thank Mr Al-Khars for technical assistance and Mr M. Ruffaie, Faculty of Medicine, King Faisal University for assistance with electron microscopy.

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**Forme modérée et éruptive de variole chez des dromadaires (Camelus dromedarius) en Arabie saoudite**

**Résumé**

Une forme modérée et éruptive de variole a été signalée chez des dromadaires âgés de trois à quatre ans dans la région d’Al-Ahsa en Arabie saoudite. Les signes cliniques étaient de nature modérée (se situant entre les formes « bénigne » et « grave »). Le taux de morbidité était de 100 % et le taux de mortalité était nul. Le virus de la variole du chameau a été isolé et identifié par microscopie électronique et analyse sérologique.

**Mots-clés**

Forma eruptiva moderada de viruela en dromedarios (*Camelus dromedarius*) en Arabia Saudí

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**Resumen**

En la región de Al-Ahsa de Arabia Saudí se describió una forma eruptiva moderada de infección por la viruela del camello que afectaba a dromedarios de 3-4 años de edad. Los signos clínicos eran de carácter moderado (entre la forma 'leva' y la 'grave'), y aunque la infección presentaba una tasa de morbilidad del 100%, la de mortalidad era del 0%. Para aislar e identificar el virus se recurrió a la microscopía electrónica y el análisis serológico.

**Palabras clave**


**Referencias**


