

PREVALENCE OF VIRUS NEUTRALISING ANTIBODIES TO MALIGNANT CATARRHAL FEVER VIRUS IN ORYX (*Oryx beisa callotis*)

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Abstract: Virus neutralising antibodies to malignant catarrhal fever virus were demonstrated in the sera of 50 oryx (*Oryx beisa callotis*). The mean antibody titre in 42 adult oryx was $10^{1.23}$. Two calves which were 2 weeks old had a mean titre of $10^{1.54}$ but the level of circulating antibody had started to decline in 2 months old calves. The antibody titres continued to decline only to rise steeply in 9 months old calves. Despite the high prevalence of antibodies in oryx no virus was isolated from blood or nasal secretions inoculated into calf thyroid cell cultures or rabbits.

INTRODUCTION

Malignant catarrhal fever (MCF) is a lymphoproliferative and necrotizing disease of cattle caused by a herpesvirus which was isolated from latently infected wildebeest (*Connochaetes taurinus*).⁶ Virus neutralising antibodies to the herpesvirus of MCF were found to be frequently present in three species of the subfamily Alcelaphinae (wildebeest, hartebeest and topi) and one of the subfamily Hippotraginae (oryx).⁹ MCF viruses have also been isolated from wildebeest and hartebeest (*Alcelaphus buselaphus cokei*).⁸ Recently a herpesvirus, antigenically related to the wildebeest-derived MCF virus, has been isolated from topi (*Damaliscus korrigum*).²

We now report the distribution of virus neutralising antibodies to wildebeest-derived MCF virus in two herds of tamed fringe-eared oryx (*Oryx beisa callotis* Ruppell).

MATERIALS AND METHODS

Virus. The cell-free strain (WCII) of MCF virus derived from a wildebeest calf and passaged in calf kidney was used.⁷

Animals. Sera were obtained in July, 1979, from two herds of tamed Oryx on

Galana Ranch, a tract of land of approximately 600,000 ha, bordering Tsavo East National Park on its eastern side. In addition to the oryx, the ranch carries approximately 20,000 beef cattle, lesser numbers of goats, sheep and camels, and a variety of free-living wild ungulates, including oryx, Cokes' hartebeest and topi but no wildebeest. The tamed oryx are maintained as an experiment in domestication. The larger herd, from which 32 animals were bled, are herded out to graze each day and driven into a corral at night. The smaller herd of 18 were grazed in a fenced enclosure. In both herds, a proportion of the animals had been trapped as juveniles of 9-12 months old; some were trapped as long as 8 years from the free-ranging herds on the Ranch. The oryx bled comprised 19 males and 31 females. Of these, 38 were classified as adult, their ages ranging from 2 to 9 years, and 12 were calves and subadults, from a few days to almost 2 years old. Ten of these younger animals, and many of the older animals, had been born in captivity.

Although there was no history of MCF on the ranch, 50 ten-month-old steers of the Boran breed, which had been grazed in the vicinity of the tamed oryx, were bled for MCF serology.

Questions to the manager and herdsman about the health of the oryx revealed that several oryx with ophthalmitis, corneal opacities and blindness had been seen in both the captive and free-ranging herds. The earliest definite record of such eye disease was in November, 1977 and further cases had occurred in January, 1979.

Neutralisation test. The sera were stored at -20 C and heated for 30 min at 56 C immediately before testing. Virus neutralisation was performed in microplates with calf kidney cells as previously described.¹

Cell culture. Calf thyroid (BTh) monolayers were prepared as previously described⁵ except that Minimum Essential Medium[□] was used. Secondary monolayers in test tubes were used for virus isolation from oryx.

Virus isolation. Nasal secretions from 50 oryx were collected on absorbent cotton wool and transported in phosphate buffered saline containing 0.1% bovine albumin and antibiotics. Buffy coat fractions separated from uncoagulated blood and the nasal secretions were inoculated into tubes of secondary calf thyroid monolayers and examined for the development of cytopathic effects (CPE) for 21 days. Pooled buffy coat fractions and nasal secretions were inoculated into 2 pairs of rabbits. The rabbits were examined for the development of disease and virus neutralising antibodies to wildebeest-derived MCF virus. Eight weeks after inoculation the rabbits were intranasally challenged with cell-associated MCF virus infected rabbit lymph node suspension with a titre of $10^{4.2}$ TCID₅₀/ml in BTh cells.

RESULTS

Distribution of neutralising antibody in oryx of various ages.

Neutralising antibodies were demonstrated in all the 50 oryx sera tested. The mean titre for adults and subadults was $10^{1.23}$ (n=41) range $10^{0.75}$ to $10^{1.88}$.

Neutralising antibody was also demonstrated in 9 oryx calves. The younger calves had higher titres of antibody; two calves which were 2 weeks old had a mean neutralising antibody titre of $10^{1.54}$. The level of circulating antibody began to decline in 2 months old calves (Fig. 1). However, by the ninth month the antibody titre showed a steep rise (Fig. 1). Antibodies to MCF virus were demonstrated in one of 50 (2%) bovine steers.

Virus isolation. The calf thyroid cell cultures inoculated with buffy coat fractions and nasal secretions from 50 oryx did not develop CPE. Similarly the rabbits inoculated with these samples remained healthy for 8 weeks. Virus neutralising antibody to MCF virus could not be demonstrated in these rabbits and they succumbed to challenge with MCF virus.

DISCUSSION

Virus neutralising antibodies to MCF virus were demonstrated in the sera of 50 oryx. This perhaps should not be surprising, as antibodies to MCF virus also have been found in all the wildebeest over 7 months old.^{4,9} The high prevalence of antibodies in oryx would suggest that MCF virus infection is very common in these animals. However, Paling *et al.*³ did not find antibody to MCF virus in 14 oryx from the same herds bled and tested in 1977. (These 14 sera were retested by us and confirmed free of antibody to MCFV). Thus it appears that infections with MCF or an MCF-like virus spread through the captive oryx herds sometime between 1977 and the present study, July, 1979. It could

□ Wellcome Reagents Ltd., Beckenham, England.

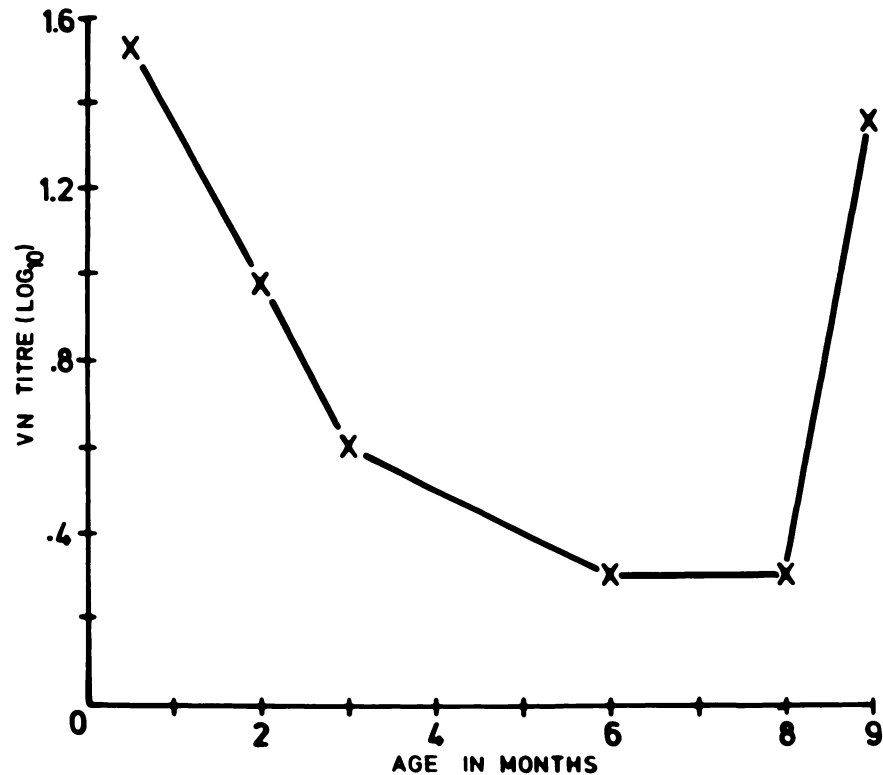


FIGURE 1. Virus neutralising antibodies to the herpesvirus of malignant catarrhal fever in oryx calves. (Mean of two calves except 2, 8 and 9 months when only one calf was available).

possibly have been introduced from free-ranging oryx with trapped animals. Trapped oryx were added to the captive herds in September, 1978 and April 1979. It could not be determined if the cases of eye disease in the oryx observed in November, 1977 and January, 1979 were related to MCF. Ophthalmitis is a lesion consistently present in bovine MCF of wildebeest origin.

Clinical bovine MCF has not been associated with oryx but due to the high prevalence of antibodies to MCFV the ability of oryx to transmit MCFV to cattle should be re-examined.

In young oryx calves the antibodies are probably of maternal origin as is the case

in other ungulates.^{4,9} The antibody titre declined as the calves aged but started to rise again in nine month old animals. This rise in antibody titre is indicative of active infection with an MCF-like virus in oryx and attempts at virus isolation should be concentrated in calves which are about 9 months old. Such a virus could be used for the immunisation of cattle against MCFV infection for the virus carried by oryx did not infect cattle as evidenced by low incidence of antibodies in cattle. Attempts to isolate virus from the blood and nasal secretions from the 50 oryx in calf thyroid cell cultures and rabbits were unsuccessful. The failure to recover virus is probably

because the majority of the sampled oryx were adults in which active virus infection was past but the use of more sensitive techniques for virus isolation such as cocultivation of oryx tissues might yield virus.

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LITERATURE CITED

1. MUSHI, E.Z. and W. PLOWRIGHT. 1979. A microtitre technique for the assay of malignant catarrhal fever virus and neutralising antibodies. *Res. Vet. Sci.* 27: 230-232.
2. ———, P.B. ROSSITER, D.M. JESSETT and L. KARSTAD. 1981. Isolation and characterisation of a herpesvirus from topi (*Damaliscus korrigum*). *J. comp. Path.* 91: 63-68.
3. PALING, R.W., D.M. JESSETT and B.R. HEALTH. 1979. The occurrence of infectious diseases in mixed farming of wild herbivores and domestic herbivores including camels, in Kenya. I. Viral disease: a serologic survey with special reference to foot-and-mouth disease. *J. Wildl. Dis.* 15: 351-358.
4. PLOWRIGHT, W. 1967. Malignant catarrhal fever in East Africa: III. Neutralising antibody in free living wildebeest. *Res. Vet. Sci.* 8: 129-136.
5. ——— and R.D. FERRIS. 1961. The propagation of bovine thyroid monolayers for use in virological investigations. *Res. Vet. Sci.* 2: 149-152.
6. ———, ——— and G.R. SCOTT. 1960. Blue wildebeest and the aetiological agent of malignant catarrhal fever. *Nature.* 188: 1167-1169.
7. ———, R.F. MACADAM and J.A. ARMSTRONG. 1965. Growth and characterisation of the virus of bovine malignant catarrhal fever in East Africa. *J. gen. Microbiol.* 39: 253-266.
8. REID, H.W. and L.W. ROWE. 1973. The attenuation of a herpes virus (Malignant catarrhal fever virus) isolated from hartebeest (*Alcelaphus buselaphus cokei*, Gunther). *Res. Vet. Sci.* 15: 144-146.
9. ———, W. PLOWRIGHT and L.W. ROWE. 1975. Neutralising antibody to herpesviruses derived from wildebeest and hartebeest in wild animals in East Africa. *Res. Vet. Sci.* 18: 269-273.

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