Parapoxvirus infection of the red squirrel (Sciurus vulgaris)

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THE population decline of the British red squirrel (Sciurus vulgaris) since the beginning of this century has been associated with outbreaks of unidentified epidemic disease (Middleton 1930, Edwards 1962, Shorten 1964). It has been suggested that there is sufficient similarity in descriptions of the outbreaks during different years to indicate a common causative agent, possibly of a viral nature, endemic in the species (Vizoso 1968). Myxovirus-like particles have been isolated from both healthy and diseased animals but their involvement in the aetiology of the disease has not been confirmed (Vizoso and others 1964, Vizoso 1970).

In Norfolk and Suffolk it has been widely known for at least 15 years by gamekeepers and naturalists that many red squirrels appear to die as the result of an infection that clinically resembles myxomatosis of rabbits (Orceletogus cuniculatum). Keymer (1974) first saw the disease in squirrels in Norfolk in 1971. On that occasion a paramyxovirus RS6 virus was isolated from the lungs by Dr A. D. Vizoso. As there was some doubt concerning the pathogenic significance of this isolation further diseased red squirrels were examined (Keymer 1976). Between 1972 and 1979 unsuccessful attempts were made to isolate viruses from 17 red squirrels. Various organs were examined, including the eyelids on six occasions when these were sufficiently fresh or uncontaminated. Standard cell culture techniques were used and also inoculation of embryonated eggs and of suckling and adult mice (G. Bidwell, unpublished).

Reported here is the finding, by direct electron microscopy, of parapoxvirus-type particles in eyelid lesions from a red squirrel. The particles, which were present in large numbers, were morphologically similar to the parapoxvirus that causes contagious pustular dermatitis (orf) in sheep. However, they were slightly more brick-shaped and their surface detail was sufficiently different for them to be easily differentiated (Fig 1). Attempts to isolate the virus in cell cultures have been unsuccessful.

The affected animal was from a small community of red squirrels that had lived in Blickling Park, Norfolk, and which had appeared healthy until the winter of 1979. It was found dead in November 1980. It had been seen alive three days previously when it was obviously ill, apparently deaf and blind in one eye. Approximately two weeks earlier this same squirrel, which could be identified by the dark colouration of its tail, had been observed fighting with a grey squirrel (S carolinensis) (D. Neale. personal communication). Grey squirrels have been present in small numbers in this park for about 10 years and have always appeared healthy. One was found dead 10 weeks after the red squirrel but it showed no external lesions and no virus particle could be detected in the eyelids. Death was due to yersinia infection.

On postmortem examination of the red squirrel the edges of both eyelids of the right eye showed reddening of the skin, which was covered by a thin layer of dried serous exudate. The lesions of the left eye were of a more chronic nature and similar to those observed in previous specimens. The eyelids were swollen, pale and devoid of hairs for a distance of about 3 to 5 mm around the eye. Histological examination confirmed the presence of a relatively severe bilateral blepharitis.

Leporipoxviruses have been associated with dermal fibroma of eastern grey squirrels (S carolinensis) in North America (Killham and others 1953). A leporipoxvirus with surface structure 'somewhat reminiscent' of parapoxvirus has been associated with skin lesions from a western grey squirrel (S griseum) in California (Regnery 1975). The present report is believed to be the first description of poxvirus infection in squirrels in Britain. In the authors' opinion this infection may be a contributory cause of the decline of the red squirrel in East Anglia.

References
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FIG 1: (a) Parapoxvirus-type particle in a preparation of eyelid lesion from a red squirrel (×170,200) (b) Contiguous pustular dermatitis virus particle in a preparation of mouth lesion from a sheep (×170,200)