

Mousepox In The Netherlands^{1,2}

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Summary | Two independent outbreaks of ectromelia in mice occurred in The Netherlands. In both cases, the causative virus was isolated and identified as ectromelia virus on the basis of serology, demonstration of antigen by indirect immunofluorescence, negative contrast electron microscopy, morphology of lesions on chorioallantoic membranes of embryonated chicken eggs, and cytopathogenicity for mouse cells. Inoculation of the virus into the dermis of rabbits demonstrated a low virulence for this species.

Key Words | Ectromelia virus — Virus disease — *Mus* species

Several outbreaks of mousepox, occurring in the period from November 1979 to November 1980, have been reported from the USA, suggesting that ectromelia virus may be endemic in that country (1). Although the virus is generally considered to be endemic in Europe, outbreaks of ectromelia in The Netherlands have not been recognized or reported during the last decade. However, at the end of 1979 and at the beginning of 1980, two apparently independent outbreaks of mousepox have been identified.

Case Histories

The first outbreak occurred in a small, private, conventionally reared mouse breeding colony in the northern part of The Netherlands, where mice of unidentified origin were bred commercially. Within a short period of time, most of the animals in this colony became affected by a highly contagious disease with a mortality of about 50%. No age or sex predisposition was observed. Surviving animals were killed 3 weeks after the outbreak started. Clinical symptoms and histopathological lesions were suggestive of mousepox. Apart from a poor general condition of most of the affected animals, some showed swollen faces and foot pads. Postmortem examination showed splenomegaly and edema of the lungs as the most consistent changes. Histologic examination of the organs revealed focal areas of necrosis in lungs, spleen, liver, and kidneys. Lung edema, interstitial pneumonia, and a meningoencephalitis with perivascular lymphocyte infiltration in the brain also were present. Lung and brain lesions, although not generally reported in natural mousepox infections, have been described before (2).

The second outbreak was recognized in a conventionally reared mouse colony of a large research institute in the center of the country, where mice of more than 40 different strains were bred. Most of these were congenic or mutant strains of the C57BL, DBA, A, and Balb/C strains coming from various sources. In this case, clinical signs were less pronounced, mortality rates were relatively low, and the course of the disease tended to be more chronic. No apparent predisposition of one or more of the different mouse strains was observed. Suspicion arose when swollen foot pads were found in a small number of the animals. An indirect immunofluorescence test carried out with a selected number of sera from these mice on vaccinia virus infected BHK cells showed that most of these animals were seropositive.

Virus was isolated from liver, lung, and brain suspensions of affected mice in both outbreaks. Two days after inoculation of primary mouse embryo monolayer cell cultures with these suspensions, the first cytopathic changes were found: syncytium formation and cytoplasmic inclusions preceded complete detachment of cells (Figure 1, Table 1). The effect was serially passaged three times in mouse embryo cells with 1:10 diluted culture media.

Negative contrast electron microscopic techniques carried out on pellets of infected and sham infected water disrupted mouse embryo cells demonstrated vaccinia virus-like virus particles in the infected cultures (Figure 2, Table 1). Similar cultures used in an indirect immunofluorescence test with a human pre- and post-vaccinia vaccination serum showed a clear immunofluorescence with the latter (Figure 3). With the same test, focal immunofluorescence could be demonstrated in ethanol-fixed sections of livers and kidneys from affected animals (Table 1). In order to demonstrate that both poxvirus isolates were indeed ectromelia virus, they were further passaged on the chorioallantoic membranes of 11-day-old embryonated chicken eggs, and in a rabbit kidney

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Table 1

Criteria for identification of two Dutch virus isolates as ectromelia virus

Test	Results
Serology: indirect immunofluorescence (with vaccinia virus infected cells)	Positive
Viral antigen demonstration: indirect immunofluorescence (monolayers and organ sections)	Positive
Negative contrast electron microscopy with mouse embryo cells	Vaccinia virus-like particles
Cytopathic changes in mouse embryo cells	Syncytia, cytoplasmic inclusions, detachment
Cytopathic changes in RK ₁₃ cells	Toxic effect
Lesions on chorioallantoic membrane	Small white pox within 4 days
Pathogenicity for mice	High mortality
Pathogenicity for rabbits	Localized pox

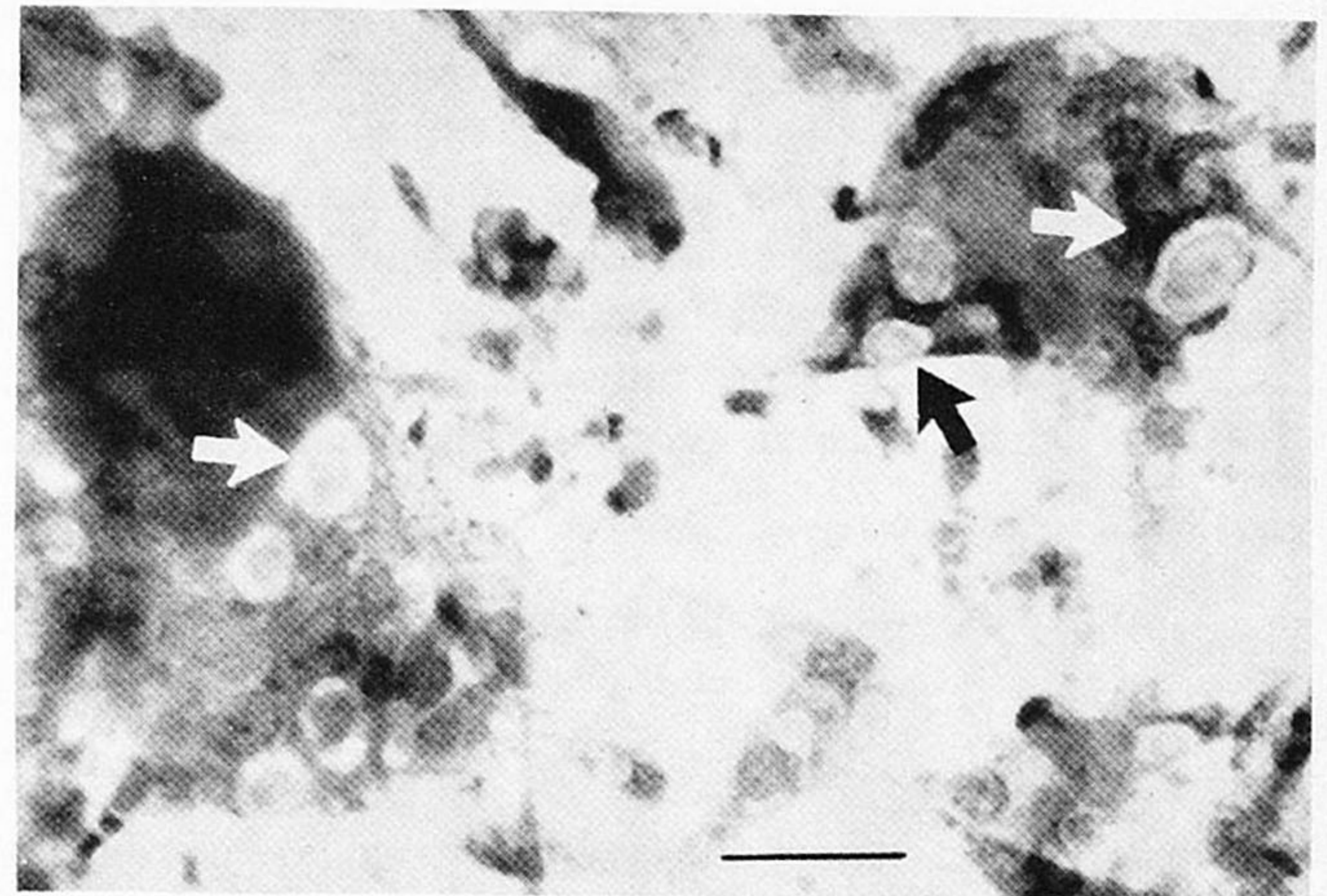


Figure 1
Primary mouse embryo culture, 4 days after inoculation with 20% liver suspension from affected mouse. Note syncytia and cytoplasmic inclusions (arrows). Hematoxylin and eosin stain. Line = 50 μm.

Figure 2
Negative contrast (phosphotungstic acid) electron micrograph of virus particles from water disrupted mouse embryo cells infected with isolate of second outbreak. Line = 300 nm.

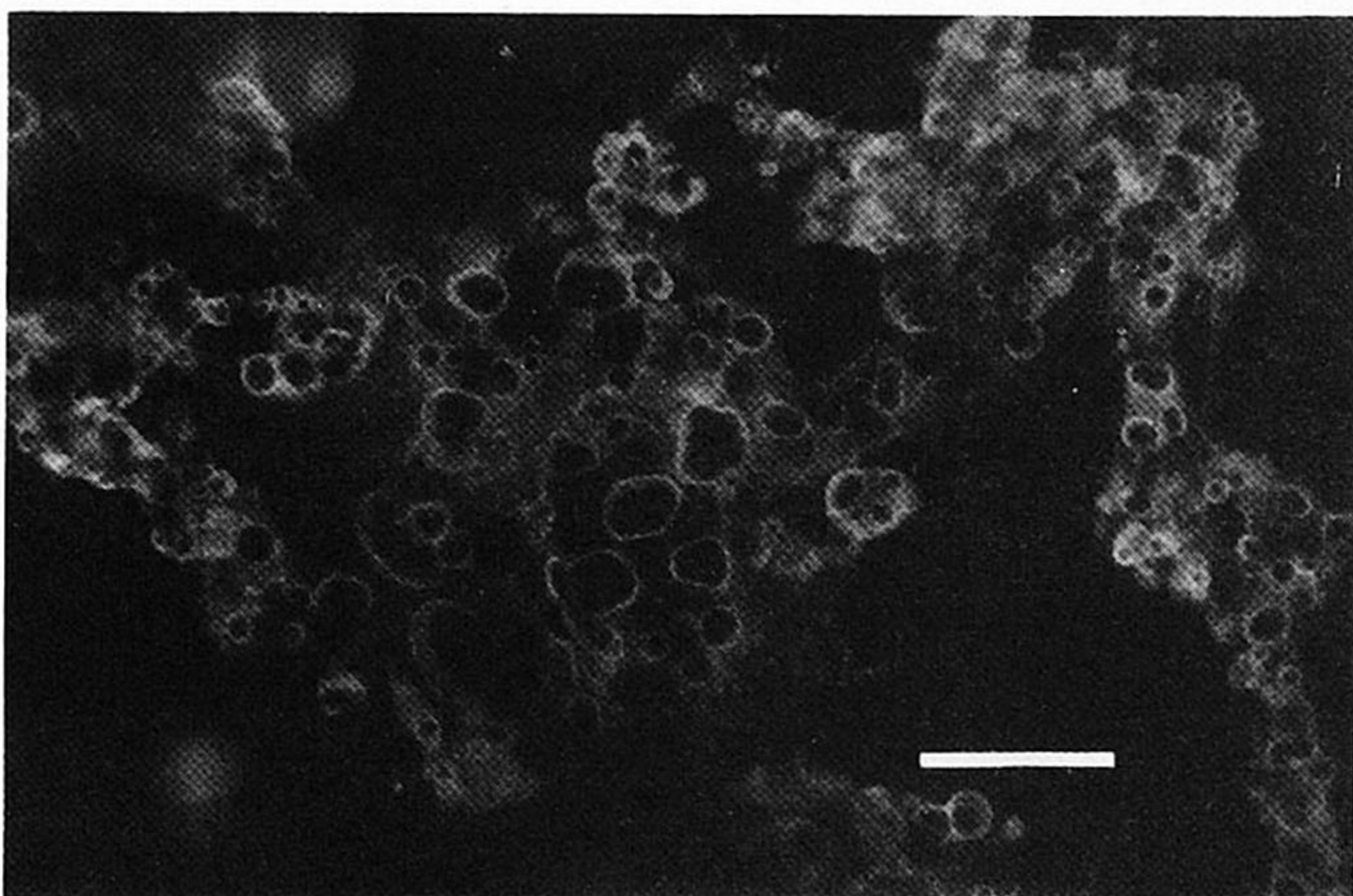
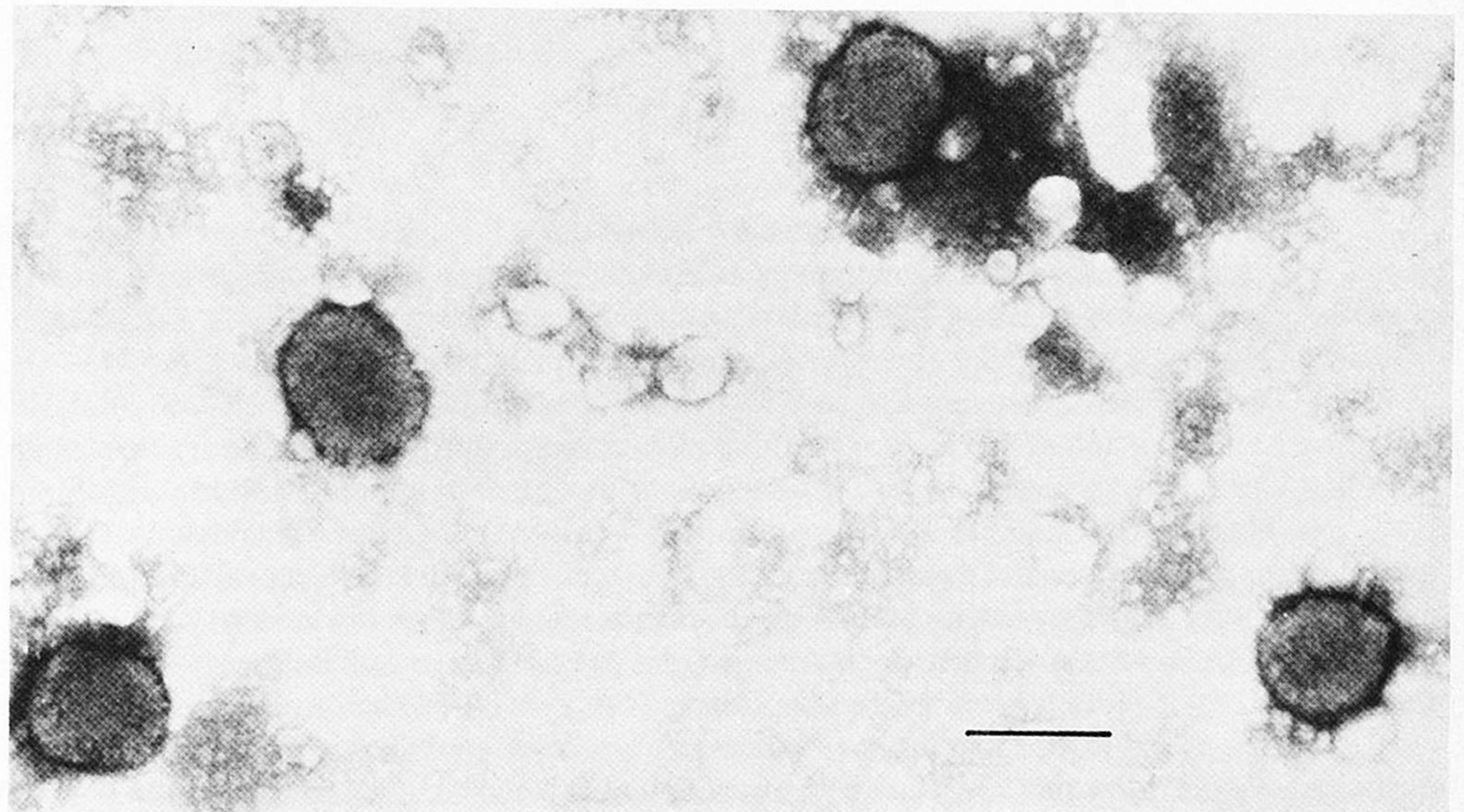


Figure 3
Indirect immunofluorescence on infected mouse embryo cells using human anti-vaccinia serum. Line = 50 μm.

cell line (RK₁₃). Both isolates also were inoculated intracutaneously into the foot pads of six 8-week-old male N:NIH mice, and the second isolate intracutaneously into two weanling rabbits. All these animals were bred at the Rijksinstituut voor de Volksgezondheid in colonies which are free of most pathogens. For each inoculation, 10⁴ to 10⁵ tissue culture infectious doses (TCID₅₀) were used. The results of these additional identification studies are summarized in Table 1. White pox developed within 4 days on the chorioallantoic membrane. Apart from initial toxic effects, no cytopathic changes could be demonstrated in RK₁₃ cell passages. All mice showed edematous swellings at the inoculated pads and died within 6 days. Apart from small and localized cutaneous lesions at the site of infection, the rabbits did not show clinical signs. On the basis of these criteria, it was concluded that both virus isolates were ectromelia virus (3,4).

The consequences of these two apparently unrelated mousepox outbreaks, the source of which was not determined, are not limited to the affected colonies. The potential threat of spreading the virus from these foci to rodent colonies of other institutes is serious. Such spreading may not only result from direct or indirect contact between animals, but also may occur by exchanging body fluids, organ, or cellular materials from infected animals.

References

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Noninfectious Diseases of Reptiles

Reptiles subjected to suboptimal temperatures may become lethargic and anorectic, and the humoral immune response may become depressed. Elevated environmental temperatures can cause local burns which may lead to death. Incandescent lights should be above and outside of reptile cages.

Many reptilian species do well at a relative humidity of 50–60%. Low relative humidity can result in abnormal shedding and retention of the spectacles in snakes. Excess humidity commonly causes epidermal blisters in water snakes, garter snakes, and king snakes and may promote the growth of opportunistic organisms.

Nutritional problems are common in captive reptiles. Nutritional secondary hyperparathyroidism and osteodystrophy result from improper calcium: phosphorus ratios or vitamin D₃ deficiency. Hypovitaminosis A frequently occurs in young aquatic turtles fed skeletal muscle meats and poor quality vegetables. This condition results in swollen palpebrae and anorexia. Steatitis resulting from hypovitaminosis E occurs in crocodilians fed fish (such as mackerel, mullet, and smelt) which are high in unsaturated fatty acids. This disease also occurs in snakes fed obese laboratory rats.

Uric acid is the principle nitrogenous waste of snakes, and renal damage may result in extrarenal uric acid deposition (visceral gout). The use of gentamicin sulfate is justified in reptiles to prevent fatal secondary infections from gram negative organisms, but its use may cause kidney damage and subsequent visceral gout. This risk may be reduced if food intake is restricted during gentamicin therapy to decrease circulating uric acid levels.

Jacobson ER. Diseases of reptiles. Part I. Noninfectious diseases. *The Compendium on Continuing Education for the Practicing Veterinarian* 1981; 3:122–26. Abstracted by Connie Cantrell.