

Electron microscopic analysis of Fatal Cowpox Virus Infection in Captive Banded Mongooses (*Mungos mungo*)

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Cowpox virus, a member of the genus *Orthopoxvirus* of the family *Poxviridae*, is endemic in parts of Europe and Western Asia [3, 6, 22]. Natural infections have been documented in a broad range of species, for example, domestic cats [2, 9, 11, 22, 23], cattle [20], horses [8, 20], dogs [7, 10, 20], white laboratory rats [14, 16, 17], brown rats (*Rattus norvegicus*) [13, 18, 24], man [9, 13, 20, 24] and various captive exotic mammals [9, 13, 14, 15, 18, 19] in particular several wild species of the family Felidae [1, 14]. Wild rodents are generally accepted to be the host reservoir of Cowpox virus, whereas cattle, domestic cats and humans are regarded to be accidental hosts [2, 5, 18]. Serological surveys and the detection of Cowpox-specific DNA by polymerase chain reaction (PCR) suggested bank voles (*Clethrionomys glareolus*), wood mice (*Apodemus sylvaticus*) and field voles (*Microtus agrestis*) to constitute the host reservoir in Great Britain [5, 6, 12]. Cowpox virus is a rare zoonosis [4, 18]. Nowadays, the most common source of human infection are domestic cats [4], probably infected by rodents [2, 4, 21].

Present study reports electron microscopic findings in an outbreak of fatal generalized cowpox virus infection among captive banded mongooses (*Mungos mungo*, suborder *Feliformia*). In summer 2008 all animals of a colony of banded mongooses in a zoological park in Germany showed a rapid course of disease. The whole population was eradicated within 11 days. Postmortem examination was performed on 4 animals. At necropsy, all animals showed extensive necrotizing inflammation of retropharyngeal lymph nodes and multiple necrotic foci in liver and spleen. Typical poxviral skin lesions were found in all mongooses and 3 animals had ulcerations of the mucous membranes of oral cavity. Using electron microscopy of negatively stained samples *Orthopoxvirus* was identified as etiologic agent. Electron microscopic examination of ultrathin sections of liver and skin revealed as well orthopox-specific virus factory with crescent-shaped structure and immature virus particles in hepatocytes, Kupffer cells and keratinocytes (Figure 1). In the subcutaneous connective tissue extracellular mature viral particles were detected and viral particles in different stages of maturation were also found in the fibroblasts.

The virus was further characterized by polymerase chain reaction and sequence analysis and identified as cowpox virus.

1. D. Baxby et al., J. Hyg. (London) **89** (1982) p365.
2. M. Bennett et al., Vet. Rec. **118** (1986) p387.
3. S. Burthe et al., J. Anim. Ecol. **77** (2008) p110.
4. J.L. Burton, Lancet **343** (1994) p67.
5. J. Chantrey et al., Epidemiol. Infect. **122** (1999) p455.

6. A.C. Crouch et al., *Epidemiol. Infect.* **115** (1995) p185.
7. C.P. Czerny et al., *Zentralbl. Veterinärmed. B.* **38** (1991) p421.
8. C. Ellenberger et al., *J. Comp. Pathol.* **132** (2005) p101.
9. S. Essbauer et al., *Revue Med. Vet.* **153** (2002) p635.
10. S. Essbauer et al., *Zoonoses Public Health* **54** (2007) p118.
11. R.M. Gaskell et al. *Vet. Rec.* **112** (1983) p164.
12. S.M. Hazel et al., *Epidemiol. Infect.* **124** (2000) p551.
13. A. Kurth et al., *Emerg. Infect. Dis.* **14** (2008) p670.
14. S.S. Marennikova et al., *J. Infect. Dis.* **135** (1977) p358.
15. S.S. Marennikova et al., *Acta Virol.* **28** (1984) p437.
16. S.S. Marennikova et al., *Lab. Anim.* **12** (1978) p33.
17. H. Campe et al., *Emerg. Infect. Dis.* **15** (2009) p777.
18. B.E. Martina et al., *Emerg. Infect. Dis.* **12** (2006) p1005.
19. K. Matz-Rensing et al., 2006. *Vet. Pathol.* **43** (2006) p212.
20. H. Meyer et al., *Arch. Virol.* **144** (1999) p491.
21. M. Pfeffer et al., *Vet. Rec.* **150** (2002) p50.
22. C. Schulze et al., *Zoonoses Public Health* **54** (2007) p37.
23. L.R. Thomsett et al., *Vet. Rec.* **103** (1978) p567.
24. T.F. Wolfs et al., *Emerg. Infect. Dis.* **8** (2002) p1495.

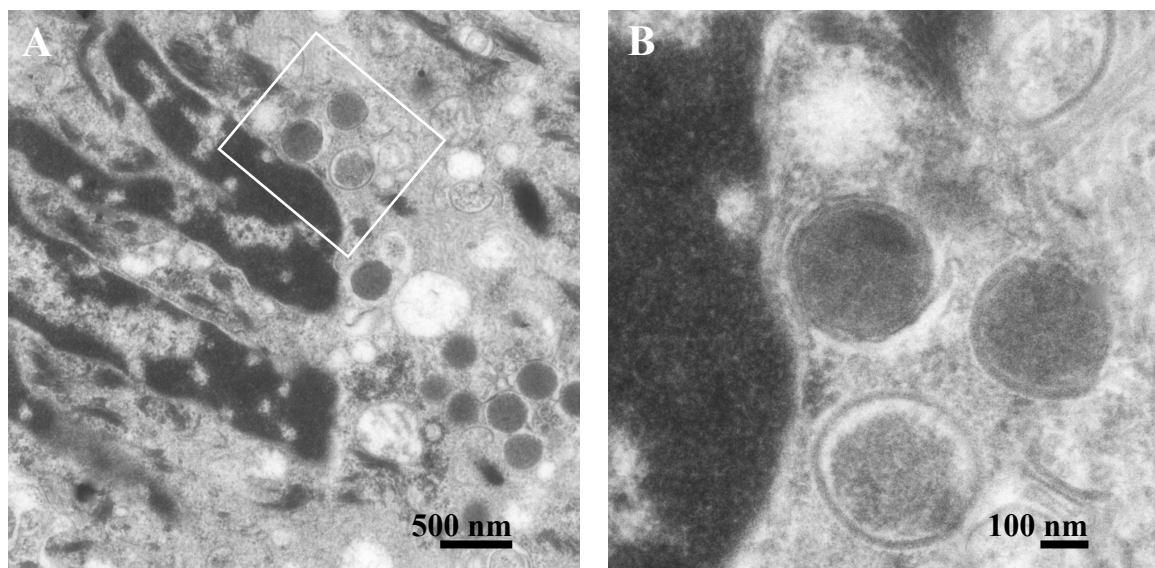


Figure 1. Electron microscopic analysis of skin autopsy. The virus factories with crescent-shaped structures and viral particles in different stages of maturation were detected in keratinocytes (A and B).