



## INFECTIOUS DISEASE

## Atypical Cowpox Virus Infection in a Series of Cats

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## Summary

Within 4 weeks, five cats with skin lesions affecting the hindlimbs and mainly consisting of oedema, hyperaemia and plaque-like alterations were presented to the same veterinary clinic. The cats were suffering from lameness, trauma, renal insufficiency or complicated tail amputation. Although the lesions seemed unusual for a poxvirus infection, microscopical examination of biopsy samples or specimens taken during necropsy examination revealed ballooning degeneration of keratinocytes with eosinophilic, cytoplasmic inclusion bodies indicative of an orthopoxvirus infection. Cowpox virus infection was verified using immunohistochemistry and virus isolation. Molecular analysis revealed identical haemagglutinin gene sequences in four cases and spatiotemporal circumstances in some cases pointed to hospital-acquired transmission. Unusual manifestations of feline cowpox may have an unexpected risk for human infection.

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Cowpox virus belongs to the genus *Orthopoxvirus* and is an endemic pathogen in Europe and Northern and Central Asia, with a zoonotic potential for man resulting in localized skin lesions or non-fatal or fatal systemic disease (Scarff and Clough, 1990; Pfeiff *et al.*, 1991; Bennett and Baxby, 1996; Chantrey *et al.*, 1999; Essbauer *et al.*, 2010; Hemmer *et al.*, 2010). Natural infections are seen in cattle, cats, dogs, rodents, non-human primates and various zoo animals (Mätz-Rensing *et al.*, 2006; Kurth *et al.*, 2008; Essbauer *et al.*, 2010; Von Bomhard *et al.*, 2011; Jäger *et al.*, 2016). About 50% of human cowpox infections are caused by stray cats that had been infected by hunting rodents (Lawn, 2010; Herder *et al.*, 2011; Appl *et al.*, 2013). The highest seasonal incidence of

feline cowpox is from late summer to autumn, corresponding to the peak size of rodent populations, especially of bank voles (*Clethrionomys glareolus*) or wood mice (*Apodemus sylvaticus*), which are regarded as reservoir hosts (Bennett and Baxby, 1996; Chantrey *et al.*, 1999; Appl *et al.*, 2013; Hnilica and Patterson, 2016). Typically, lesions in infected cats are located on the head, neck or forelimbs and consist of erythematous macules and papules extending into nodules of up to 1 cm over a period of 3–5 days (Hnilica and Patterson, 2016; Mauldin and Peters-Kennedy, 2016). These nodules tend to ulcerate, forming central necrosis, craters and crusts. During the first week of viraemia, secondary bacterial infection or systemic illness may be observed (Hnilica and Patterson, 2016; Mauldin and Peters-Kennedy, 2016). Additionally, individual cases develop fatal necrotizing pneumonia during the viraemic period,

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without typical skin lesions (Godfrey *et al.*, 2004; Schöniger *et al.*, 2007; Mauldin and Peters-Kennedy, 2016). Fatal outcomes due to concurrent immunosuppression caused by feline leukaemia virus, feline immunodeficiency virus (FIV) or feline panleukopenia virus are described (Bennett *et al.*, 1986; Schaudien *et al.*, 2007). Most cats infected with cowpox recover completely (Schöniger *et al.*, 2007; Appl *et al.*, 2013; Mauldin and Peters-Kennedy, 2016).

In this report, five cats originating from the Greater Hannover area, infected with cowpox virus and presented to the same veterinary clinic over a 4-week period in 2015, are described in order to draw attention to both an unusual clinical presentation and an atypical morphological manifestation.

A 7-year-old, neutered male European shorthair cat (case 1) with access to the outside was presented in late August with pain in the left hindlimb that had been present for the previous 5 days. Clinically, there was normal general behaviour despite an elevated body temperature (40.0°C). Multiple nodular skin lesions with crusts (<0.8 cm) were present on the head (lower lid, ear and mandible), right forelimb and trunk. The left hindlimb was diffusely and severely swollen and painful with mild exudation. Despite antibiotic treatment and wound dressing, no recovery was achieved and lesions progressed within 3 days to dermal necrosis on the dorsal part of the paw of the left hindlimb. Therefore, surgical debridement was performed 2 weeks after initial presentation (Fig. 1). The follow-up showed almost complete healing of the skin lesions within 3 weeks and after 4 months the cat was able to go outside again.

A 1-year-old, neutered male, European shorthair cat (case 2) with access to the outside was referred to the same clinic 1 day after case 1 with a history of a car accident. The cat had severe abrasions on the left hindpaw and a severely swollen right forepaw with lameness. Wound debridement and amputation of the fifth toe of the left hindpaw were performed. Within 9 days after surgery, even with antibiotic treatment, severe necrosis of the left hindlimb developed and a complete amputation was performed. Twelve days after initial presentation the cat had developed multiple cutaneous red nodules (~0.5–1 cm) extending from the forelimbs to the trunk with central necrosis. Multiple macules were observed on the left flank and right hindlimb, which also showed diffuse, moderate, subcutaneous oedema. Due to its poor general condition and inappetence the cat was humanely destroyed 22 days after initial presentation.

A 6-year-old, neutered male European shorthair cat (case 3) had been hospitalized in the same



Fig. 1. Cutaneous poxvirus infection, case 1. Dorsoplantar lesion of the left hindpaw showing focal extensive ulceration with diffuse, moderate oedema and diffuse mild hyperaemia.

clinic twice, in July and late August, due to chronic renal insufficiency, anaemia and thrombocytopenia. The cat was seropositive for FIV. In mid-September, the cat had developed severe swelling of the right hindlimb with lameness and poor general condition. Multifocal to coalescing areas of alopecia with mild hyperaemia were present on the right hindlimb, extending from the hip to the paws. Additionally, multifocal serocellular crusts and moderate, diffuse subcutaneous oedema were present at this location. The cat died spontaneously 1 day after hospitalization.

A 5-year-old, neutered male European shorthair cat (case 4) with access to the outside had a tail amputation in early September after unknown trauma. Several days post surgery the cat developed poor general condition and diffuse, severe swelling with lameness affecting the left hindlimb that had started 5 days post surgery, followed by similar changes in the right hindlimb 12 days after surgery. This cat was also referred to the same clinic in mid-September and displayed diffuse, severe dermal hyperaemia of the left hindlimb and a brown, raised, dermal plaque (~1 cm) proximal to the foot pad (Fig. 2). Subsequently, the cat developed fever with deterioration of health status and was humanely destroyed.

A 4-month-old, male cat (case 5) was presented in late September to the same clinic with a 2-day history

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