### Cowpox Virus

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<th>Animal Group(s) Affected</th>
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<td>Rodent reservoir with large affected host range including: Felidae, Bovidae, Elephantidae, Equidae, Canidae, Mustelidae, Ailuridae, Herpestidae, Suidae, Camelidae, Tapiridae, Rhinocerotidae (black and white), Myrmecophagidae, Soricidae, Cercopithecidae, Callitrichidae, Humans</td>
<td>Most likely direct contact with infected animal or scabs. Poxviruses are fairly resistant to environmental inactivation.</td>
<td>From mild skin lesions to severe skin, oral/oesophageal and respiratory lesions. Skin lesions may be absent in the pulmonary form. Lymphadenopathy and conjunctivitis may occur.</td>
<td>From mild to fatal although human fatalities are rare. Severity may depend on virus strain as well as species infected and individual immune status.</td>
<td>Generally self-limiting. Supportive care in more severe cases with antibiotics for secondary infections. Systemic or topical antiviral therapy with cidofovir may be beneficial.</td>
<td>Isolation of infected animals. Protective equipment including latex gloves and face shield to prevent cutaneous and mucous membrane exposure. Rodent control in endemic areas. Vaccinia virus vaccines available for zoo animals in some countries.</td>
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**Fact Sheet compiled by:** James M. Rasmussen  
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**Fact Sheet Reviewed by:** Robert B. Moeller, Jr.; Leslie Woods

**Susceptible animal groups:** Rodents (voles, mice, rats, gerbils, ground squirrels, beaver, cavy), felids (domestic cat, cheetah, lynx, African lion, spotted leopard, ocelot, jaguar, puma, jaguarundi, Asian leopard cats), cattle, canids (dog, red fox, arctic fox), marten, red panda, wild boar, okapi, llama, horse, Malayan tapir, black rhinoceros, white rhinoceros, Asian elephant, African elephant, anteater, Barbary macaque, common marmoset, and human.

**Causative organism:** Double-stranded DNA enveloped virus in the family Poxviridae, subfamily Chordopoxvirinae, genus Orthopoxvirus which includes smallpox (Variola virus), monkeypox, buffalopox (vaccinia virus), ectromelia, camelpox, horsepox, raccoonpox, skunkpox, volepox, and Uasin Gishu disease. Multiple strains of cowpox exist.

**Zoonotic potential:** Yes. Smallpox vaccination confers protection against cowpox as well. Cats are the most common source of human infection. Less common sources include cattle, pet rats and an Asian elephant.

**Distribution:** Endemic in various rodent reservoir hosts in Great Britain, Scandinavia, European mainland and adjacent western Asiatic countries.

**Incubation period:** 3-10 days.
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**Clinical signs:** Skin lesions usually progress through characteristic macule, papule, vesicle, and pustule phase before becoming scabbed. Generally mild self-limiting cutaneous pox lesions in humans and most animal species, but can become generalized and/or cause necrotizing pneumonia in certain species or immunocompromised individuals. Strain, route and dose of virus causing infection may influence course of disease.

**Humans:** Generally localized lesions on hands, face, arms or other points of contact with infected animal. Infection may cause lymphadenopathy. Lesions typically resolve in 3–4 weeks without secondary bacterial infections which can extend the process by several weeks. Systemic infections and fatalities may occur in immunocompromised individuals. Previous vaccinia vaccination for smallpox should confer at least partial immunity.

**Animals:** Mild localized pox lesions to generalized lesions with ulcerations, including the conjunctiva, oral cavity and esophagus. Oral lesions may cause anorexia. An uncommon disease in cattle, but lesions most typical on udder and teats of cows and mouths of suckling calves. Infection may cause pyrexia and lymphadenopathy. Pulmonary disease is rare in most species, but is more common in felid species. Pulmonary involvement has also been seen in giant anteaters.

**Postmortem, gross, or histologic findings:** Epitheliotropic virus. The lesions undergo the classical poxvirus cascade of macules, papules and later collapse of the lesion from the center giving the lesion a targetoid appearance. The lesions then scab over and are slow to heal. Histologically, affected epithelial cells demonstrate ballooning degeneration and may have eosinophilic homogenous intracytoplasmic inclusions, 3 – 7 micron in diameter. The affected cells often swell and rupture leaving spaces filled with neutrophils and debris (pustules). These lesions with intraepithelial intracytoplasmic inclusions have also been identified in the pulmonary tract and oral cavity. In an outbreak in captive banded mongooses inclusions were also present in hepatocytes, enterocytes as well as in cells with histiocytic and fibroblastic morphology.

**Diagnosis:** Histopathology shows characteristic large homogenous eosinophilic cytoplasmic inclusion bodies in epithelial cells undergoing ballooning degeneration. Electron microscopy of fresh or frozen lesion material will typically demonstrate morphologically distinct orthopoxvirus (approximately 220nm x 280nm, brick-shaped virions with tubular surface projections). Cell culture. PCR and DNA sequence analysis. Serologic testing is available to determine if exposure occurred.

**Material required for laboratory analysis:** Biopsies of lesions- fresh/frozen and formalin fixed.

**Relevant diagnostic laboratories:** Laboratories capable of performing electron microscopy of biopsy samples can identify to the level of Orthopox virus. Sequencing of viral DNA is required for more specific identification.

**Treatment:** Lesions are generally self-limiting, but in some severe cases supportive care and antibiotics for secondary infections are indicated. Systemic treatment with the antiviral drug cidofovir has been used with some success in the treatment of some pox virus infections. A topical cream preparation of cidofovir is now available as well. In severe, unresponsive cases euthanasia should be considered before secondary complications cause significant morbidity.

**Prevention and control:** Control of rodents to the extent possible in endemic areas. Vaccination of susceptible zoo animals with modified vaccinia virus Ankara (MVA) is authorized in some European countries.

**Suggested disinfectant for housing facilities:** Removal and incineration or burial of organic material. Sunlight, heat and humidity leads to more rapid inactivation of virus, but virus may persist for months or longer if frozen or present in cool, dry locations. Fairly resistant to disinfectants, but phenolics, quaternary ammonium compounds and iodophors can be effective disinfectants with proper concentration and contact time. Organic debris will decrease disinfectant efficacy. Steam sterilization and dry heat may also be utilized for disinfection.

**Notification:** Required as it is a foreign animal disease outside of Europe and Asia.

**Measures required under the Animal Disease Surveillance Plan:** Currently none

**Measures required for introducing animals to infected animal:** Maintain infected animals in a quarantine
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situation until lesions have healed and scabs have been lost. If feasible may want to bathe infected animal in order to remove all virus from fur. In endemic areas may want to vaccinate susceptible species. Recovered animals should have immunity to the virus. Infected brown rats indicated animals which survived the infection could continue shedding virus in feces and urine for more than a month.

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<th>Conditions for restoring disease-free status after an outbreak:</th>
<th>Wait for all scabs to be lost from an infected animal. Remove bedding and biological material and incinerate or dispose of with other appropriate method. Disinfect environment with phenolic or quaternary ammonia disinfectants to the extent possible.</th>
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