Poxviruses and native Australian wildlife

**Fact sheet**

**Introductory statement**

Poxviruses represent a large group of viruses which, in Australia, have been primarily found in macropods with occasional cases reported in possums, echidnas and crocodiles. It seems likely that all mammals and reptiles are susceptible to infection. Infection rates appear to be low and disease is usually relatively mild.

**Aetiology**

Pox in native Australian wildlife is caused by viruses of the family *Poxviridae*, subfamily *Chordopoxvirinae*. There are seven genera of mammalian poxviruses. Apart from an outbreak in common ringtail possums (*Pseudocheirus peregrinus*), that was caused by an *Orthopoxvirus*, the Australian poxviruses have not been characterised (Vogelnest et al 2012). The genome of crocodile poxvirus infecting Nile crocodiles (*Crocodylus niloticus*) was identified and found to belong to a new genus of *Chordopoxvirinae* (Afonso et al 2006). It seems likely that the poxviruses infecting Australian crocodiles will be similar, if not identical.

Poxviruses are large, 200 to 400 nm long, brick shaped, double stranded enveloped DNA viruses. The core is dumbbell-shaped (Robinson and Kerr 2001).

**Natural hosts**

It seems likely that all mammal and reptile species are susceptible to poxvirus infection.

**World distribution**

Worldwide.

**Occurrences in Australia**

Australian native species reported in the literature with poxvirus infection include the red kangaroo (*Macropus rufus*), eastern grey kangaroo (*Macropus giganteus*), western grey kangaroo (*Macropus fuliginosus*), common wallaroo (*Macropus robustus*), tammar wallaby (*Macropus eugenii*), agile wallaby

There are also anecdotal reports of poxvirus infections in a Tasmanian pademelon (Thylogale billardierii), southern bent-wing bat (Miniopterus schreibersii bassanii) and bottlenose dolphin (Tursiops sp.) (eWHIS).

Epidemiology

Poxviruses are extremely resistant, being able to survive in the environment for months to years. Infections usually occur in juveniles. In crocodiles they may be associated with stressors such as relocation, handling and inappropriate water temperature (Ladds 2009b).

Transmission is likely via arthropod vectors or close contact. However, poxviruses are unable to penetrate intact skin and need to gain entry through wounds.

Macropod poxviruses are believed to be species specific. Speare (1988) cites an example of a captive macropod colony where only the eastern grey kangaroos were affected. Newly introduced eastern grey kangaroos developed the disease, while other species did not.

Clinical signs

Lesions in macropods may be solitary or multiple and vary in size from a few millimetres up to 5 cm. While they can be found anywhere on the body previous reports describe lesions on the tail of quokkas and western grey kangaroos, (Papadimitriou and Ashman 1979, Presidente 1978), the forearm, dorsum and lips of red kangaroos (Arundel et al 1979, Presidente 1978, Bagnall and Wilson 1974), and the hind leg of an eastern grey kangaroo and western grey kangaroo (Rothwell et al 1984, McKenzie et al 1979). Grossly lesions can appear as an umbilicated firm papule containing creamy exudates of keratinised debris and purulent material or, more commonly, an irregular wart-type mass with a hyperkeratotic surface that becomes darker and hairless as it enlarges. There is no associated pruritus and lesions regress spontaneously over about three months, leaving a pigmented or non-pigmented hairless scar (Ladds 2009a, Reece and Hartley 1994, Speare 1988, Bagnall and Wilson 1974).

In possums lesions were raised, erythematous and ulcerated. They occurred on the tail, feet and tongue, and regressed over two months (Vogelnest et al 2012, Ladds 2009a).

Affected echidnas developed a severe proliferative dermatitis (Whittington 1988).

In crocodiles lesions can occur on all parts of the body, but especially the belly. They may be up to five millimetres in diameter, proliferative, raised, discrete or may present as erosions (Ladds 2009b, Buenviaje et al 1992).

Diagnosis

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**Pathology**

Histologically the epidermis is markedly thickened due to hyperkeratosis and acanthosis. The more superficial cells are enlarged, often vacuolated and may contain intracytoplasmic eosinophilic inclusion bodies up to 45 µm in diameter in macropods and 10 to 20 µm in diameter in possums. Lesions may be secondarily infected by fungi and bacteria resulting in a variable leucocytic infiltrate. Electron microscopy can be used to demonstrate typical poxvirus particles, which are 175 to 200 x 250 to 300 nm in macropods, 250 nm long in possums and 220 x 110 nm in crocodiles. No inclusion bodies were found in affected echidnas but electron microscopy demonstrated poxvirus particles (Vogelnest et al 2012, Ladds 2009a, Buenviaje et al 1992, Whittington 1988, McKenzie et al 1979, Bagnall and Wilson 1974)

**Differential diagnosis**

Differential diagnoses include diseases that can cause proliferative lesions, such as neoplasia, abscesses or granulomas. Hairless scars need to be differentiated from diseases that cause focal alopecia, such as ringworm.

**Laboratory diagnostic specimens**

Lesions should be excised and submitted, half in formalin for histopathology and half fresh/frozen for viral culture and PCR.

**Laboratory procedures**

Poxvirus of crocodiles needs to be cultured in crocodile embryo cells (Buenviaje et al 1992).

**Treatment**

Treatment is usually not necessary as lesions resolve over several months. Surgical excision can be undertaken if lesions are located near the eyes or mouth; once removed they do not recur. Secondly
infected masses can be treated with topical antimicrobials. Systemic antibiotics and supportive treatment may aid recovery (Vogelnest and Portas 2008).

**Prevention and control**

Control of the disease in wild populations is difficult and should focus on reducing arthropod vectors. Captive animals can be held in screened insect-proof enclosures. Any diseased animals should be isolated and held in separate screened enclosures to prevent the disease spreading. Feeders should be cleaned regularly with a disinfectant such as bleach.

**Surveillance and management**

There is no targeted surveillance program or AUSVETPLAN for poxviruses. Routine Import Risk Analysis processes for Australia consider poxviruses where necessary.

Wildlife disease surveillance in Australia is coordinated by Wildlife Health Australia. The National Wildlife Health Information System (eWHIS) captures information from a variety of sources including Australian government agencies, zoo and wildlife parks, wildlife carers, universities and members of the public. Coordinators in each of Australia’s States and Territories report monthly on significant wildlife cases identified in their jurisdictions. NOTE: access to information contained within the National Wildlife Health Information System dataset is by application. Please contact admin@wildlifehealthaustralia.com.au.

The national wildlife health surveillance system logs cases of poxviruses in native wildlife in the national database.

**Statistics**

There are currently 5 cases of poxvirus infection in the National Wildlife Health Surveillance Database (eWHIS – [www.wildlifehealthaustralia.com.au](http://www.wildlifehealthaustralia.com.au)) extending from 2003 to 2011. Animals listed include a Tasmanian pademelon from Tasmania, a ringtail possum from NSW, a southern bent-wing bat from South Australia, a bottlenose dolphin from Tasmania and an eastern grey kangaroo from Victoria.

**Research**

Poxvirus infection in native Australian wildlife is likely far more common than the figures in the National Wildlife Health Surveillance Database suggest and little is known about the poxviruses that have been reported. The majority of them have not been characterised and there is almost no information on species specificity or transmission. We encourage those with definitive diagnoses of poxvirus infections in Australian native wildlife to submit this information to the national system for consideration for inclusion in the national database (contact admin@wildlifehealthaustralia.com.au).

**Human health implications**

None.
Conclusions

While poxviruses are likely widespread through the Australian fauna relatively few reports of disease have appeared in the literature. Given the available information they do not appear to pose a threat to established populations of free ranging species. However, increasing global temperatures could potentially result in increased vector numbers and longer periods of vector activity possibly resulting in higher incidence and prevalence of poxvirus infections. Ongoing surveillance and awareness of the possible consequences will be necessary to prevent or mitigate any resulting deleterious effects.

References and other information


Acknowledgments

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To provide feedback on this fact sheet

We are interested in hearing from anyone with information on this condition in Australia, including laboratory reports, historical datasets or survey results that could be added to the National Wildlife Health Information System. If you can help, please contact us at admin@wildlifehealthaustralia.com.au.

Wildlife Health Australia would be very grateful for any feedback on this fact sheet. Please provide detailed comments or suggestions to admin@wildlifehealthaustralia.com.au. We would also like to hear from you if you have a particular area of expertise and would like to produce a fact sheet (or sheets) for the network (or update current sheets). A small amount of funding is available to facilitate this.

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