Ranaviruses in wild reptiles in Australia

Fact sheet

Introductory statement

Systemic infection caused by a ranavirus (Wamena virus) has been reported in confiscated green tree pythons, *Morelia viridis*, (Schlegel 1872; Underwood and Stimson 1990) originating from Irian Jaya. This was the first report of the infection in any species of snake, and the first in a reptile in Australia. Studies indicate that ranaviruses have the potential to infect and kill a wide range of poikilotherms (fish, amphibians, reptiles). This information indicates there is a major risk associated with the national and international trade in wildlife and the co-translocation of pathogens.

Aetiology

**Family:** Iridoviridae

**Genus:** Ranavirus

Iridoviruses (Iridovirus, Chloriridovirus, Ranavirus, Lymphocystivirus) are large double stranded cytoplasmic DNA viruses that can occur as enveloped and non-enveloped forms.

Natural hosts

Ranaviruses infect fish, amphibians and reptiles. Unclassified forms have been found in lower vertebrate hosts. Iridovirus has been implicated as a major cause of mortality in amphibians.

World distribution

Systemic ranaviral infection has been documented in reptiles in the USA, Europe, and China.

Occurrences in Australia

Within Australia, ranaviruses have been isolated from fish (epizootic hematopoietic necrosis virus [EHNV]) and from the ornate burrowing frog (*Limnodynastes ornatus*) (Bohle iridovirus [BIV]). Other viruses...
belonging to the family Iridoviridae have also been identified in Australian fish and reptiles. These viruses include lymphocystis viruses from a range of Australian marine fish,\textsuperscript{15,16,17} uncharacterised iridovirus-like viruses in ornamental fish imported into Australia,\textsuperscript{18,19} and an erythrocytic virus infecting a diamond python (\textit{Morelia spilota spilota}) in Australia (Hyatt and McCracken, unpublished observations).


\section*{Epidemiology}

There is little known of the epidemiology of ranaviruses in reptiles compared with amphibians. In amphibians ranaviruses are capable of causing a high incidence of morbidity and mortality in captivity, experimentally and in the wild.\textsuperscript{20}

\section*{Incubation period}

Little accurate information is available on the incubation period of ranaviral infection in reptiles. Toads fed infected crickets display viral particles in the stomach and skeletal muscle 37 days after inoculation.\textsuperscript{21}

\section*{Transmission}

A clinical carrier state with ranaviruses occurs in amphibians. Movement of ranaviruses into an area will most probably be by movement of infected amphibians, fish or reptiles and infected equipment and other inanimate objects that have been contaminated by ranaviruses.\textsuperscript{20} It has also been proposed that a natural source of infection could be from invertebrates.\textsuperscript{9,21}

Generally, ranaviruses have low host specificity.\textsuperscript{23} The virus is highly infectious and capable of surviving for extended periods of time, even in dried material.\textsuperscript{24}

The potentially lethal characteristics of ranaviruses have been demonstrated.\textsuperscript{22,25,26} It has been shown that at least one species of ranavirus can naturally infect animals of different taxonomic classes (fish and amphibian).\textsuperscript{4} The potential of foreign ranaviruses and those intercepted in imported fish and reptiles to cause disease in Australian amphibians is unknown.\textsuperscript{20}

From experimental trials and the epidemiology of ranaviruses overseas, the most likely outcome of a new ranavirus in Australia would be unpredictable local epidemics.\textsuperscript{20} Consequently, the presence of ranaviruses may be highly significant to amphibians that have small populations confined to small geographic areas.\textsuperscript{20}

\section*{Clinical signs}

Oral and cutaneous abscessation, oral ulceration, respiratory distress, anorexia, and lethargy occur in ranaviral infections in reptiles.

Cervical oedema, palpebral oedema, rhinitis, stomatitis, glossitis has been reported in chelonians.\textsuperscript{2}

Lethargy, anorexia and ulceration of the buccal mucosa occurred in pythons.\textsuperscript{1}

\section*{Diagnosis}

Diagnosis is by a combination of history, clinical signs, and diagnostic laboratory techniques including, histopathology, immunohistochemistry, electron microscopy, PCR and DNA hybridisation.\textsuperscript{1,6}
Clinical pathology

Culture of lesions to exclude the diagnosis of primary bacterial or fungal infection is recommended.

Pathology

Gross findings in turtles include cutaneous and mucosal lesions, hyperaemic and oedematous lungs, splenomegaly, and enlarged, yellow livers. Ulceration of the nasal mucosa, necrotising pharyngitis and oedema, and hepatic necrosis was reported in green pythons.

Microscopically, lesions include fibrinoid vasculitis of multiple organs, including, the skin, mucous membranes, liver, and lungs. Inclusion bodies may not be observed. Heterophilic tracheitis and chronic pancreatitis are also reported in turtles. In green pythons thickening of the pulmonary alveolar walls, focal peracute tubular necrosis in the kidney, myocardial infarction and diffuse acute necrosis of the spleen has been noted. Hepatic lipidosis may occur.

Differential diagnoses

- Snakes – Including, but not limited to, ophidian paramyxovirus (OPMV) infection, bacterial or fungal stomatitis
- Chelonians – any infectious or non-infectious cause of oral ulceration, oedema, respiratory signs or sudden death.

Laboratory diagnostic specimens

- Histopathological examination and immunohistochemistry - (liver, lung, heart, kidney, spleen, stomach, intestine), brain, fixed in 10% buffered neutral formalin.
- Samples from oral cavity lesions together with lung, liver, kidney, and intestines for bacterial culture
- Similar specimens collected aseptically for virus isolation and frozen at minus 80° C.

Laboratory procedures

- Histopathology, PCR, electron microscopy, virus isolation.

Treatment

Most cases are diagnosed post mortem. Extrapolating from what is known of ranavirus infection in amphibians, no antiviral agents have been tested against ranaviruses. The chances of obtaining cure of chronically affected or carrier amphibians is very small.

Prevention and control

- Isolation of affected animals. Euthanasia of moribund animals. Implementation of barrier nursing and strict quarantine measures.
- Disinfection of premises can be achieved with the following agents:
  - Chlorhexidine (0.75%), bleach (3.0%) and Virkon S (1.0%) are effective at inactivating ranavirus after one minute exposure time.
  - Glutaraldehyde and artificially generated ultraviolet light are also effective disinfectants.
  - Ethyl alcohol is not an effective disinfectant for ranaviruses.
Ranaviruses are highly virulent to amphibians (and fish and reptiles). Researchers should be conscious of the fact that suitable standards of biocontainment must be adopted to prevent release of laboratory cultures to the wild.20

Surveillance and management

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.

There are currently no formal surveillance programs for ranaviruses in reptiles in Australia.

There is no AUSVETPLAN for ranavirus infection in reptiles. Nevertheless, any cases of ranavirus disease in reptiles should be listed by AWHN wildlife coordinators (www.wildlifehealthaustralia.com.au).

Iridoviruses (Wamena virus and snake erythrocytic virus) are listed in the Generic Import Risk Analysis of Live Snakes – Technical Issues Paper (Department of Agriculture, Fisheries and Forestry) 2003.28 Ranavirus (Wamena virus) and iridovirus (snake erythrocytic virus) are not listed by the OIE.

Statistics

There is no information available on ranavirus infection in reptiles in the National Wildlife Health Surveillance Database (www.wildlifehealthaustralia.com.au).

Research

The risks in transmitting ranaviruses by various activities due to humans interacting with amphibians (handling, etc) need to be quantified to enable best practices to be chosen. Strategies need to be developed to decrease the risk of commercial culture of amphibians on a mass scale polluting the natural environment with ranaviruses.20

Human health implications

Ranaviruses will not infect humans since they will not multiply above 33°C.20

Conclusions

Ranavirus disease in reptiles is an emerging threat overseas. The isolation of the virus from clinically affected pythons illegally smuggled into Australia highlights the risk of introduction of this pathogen into the country by illegal activities and breaches of quarantine, both intended and accidental. (http://www.daff.gov.au/__data/assets/pdf_file/0017/11807/2004-08.pdf)
References and other information


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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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