Sunshine virus in Australian snakes

Fact sheet

Introductory statement

In 2008, an outbreak of neuro-respiratory disease occurred in a collection of Australian pythons in Southeast Queensland, Australia. This was the first report of an infection by this novel paramyxovirus in Australia or worldwide (Hyndman 2012a). The status of Australia’s wild snakes with respect to Sunshine virus is unknown. Assessment of the risk to Australian wild snakes is indicated.

Aetiology

Sunshine virus is a novel paramyxovirus distantly related to the genus Ferlavirus and was named after the origin of the first isolates – the Sunshine Coast of Queensland. Previously all known paramyxoviruses utilising squamate hosts (snakes and lizards) were clustered within the genus Ferlavirus;¹ this new virus has been molecularly characterised and shown to lie outside this and other Paramyxovirus genera (Hyndman 2012b).

Natural hosts

To date carpet (Morelia spilota), green tree (M. viridis), black-headed (Aspidites melanocephalus), woma (Aspidites ramsayi), spotted (Antaresia maculosa), Children’s (Antaresia childreni), olive (Liasis olivaceus) and ball (Python regius) pythons have been diagnosed with Sunshine virus; however this host range is likely to expand as further testing is performed. Analyses have been too limited to make meaningful comments about age or sex-linked predisposition to infection (Hyndman 2012b).

World distribution

Sunshine virus has been detected in Germany in ball pythons (Marschang et al. 2013) but there are no other published reports outside of Australia.

Occurrences in Australia

There are no definitive data that show that Sunshine virus is present in wild Australian snake populations. Sunshine virus has, however, been identified in captive pythons in Queensland, Victoria, South Australia, New South Wales and the Northern Territory. Associated outbreaks of disease have been reported in Queensland, Victoria, South Australia and the Northern Territory (Hyndman 2012a).

Epidemiology

The virus has been detected by PCR in both oral and cloacal swabs so it is likely that transmission may include faecal-oral and aerosols. There is evidence that Sunshine virus can be transmitted vertically. Recent work has shown that shedding of the virus can occur for several months from asymptomatic individuals. Biosecurity arrangements within a collection should be centred around these observations. Serial sampling in quarantine is recommended to help prevent the entry of this virus into a collection. The initial outbreak in Queensland was associated with significant morbidity and some mortality. There is no information available at this stage regarding incubation period.

Clinical signs

Clinical signs appear to be related primarily to the central nervous and respiratory systems. Reported clinical signs:

- Loss or reduction of righting response
- Opisthotonus and torticollis
- Spasticity
- Mouth gaping
- Nasal discharge
- Dermatitis
- Non-specific signs such as anorexia, weight loss

Diagnosis

Diagnostic testing

- PCR testing utilising a combined choanal/cloacal swab, is available through Dr Tim Hyndman, Murdoch University, Perth, Western Australia.
- Gross pathology and histopathology

2 This fact sheet should be a guide only. Individual institutions should make their own judgments regarding quarantine and testing procedures using the latest information. Before testing it is important that plans are in place to deal with the issue of positive animals.
Gross pathological findings are largely unremarkable and usually limited to mild or moderate pulmonary congestion and oedema

- Histopathology – most of the pathology is seen in the hindbrain and the cranial spinal cord. It is vital that the entire brain and cranial spinal cord is submitted for examination. Be extremely careful to prevent artefact (e.g. crush artefact) in this very important but very fragile sample (see Sampling Protocol).

Pathology

Histopathology (Hyndman 2012a)

- Mild to severe spongiosis of the white matter of the hindbrain and, in a minority of cases, the white matter tracts of the midbrain or the parenchyma of the cerebellum.
- Neuronal chromatolysis or necrosis can be evident in the hindbrain.
- Mild to marked gliosis, composed of both astrocytosis and microgliosis, generally accompanied the spongiosis.
- Severely affected areas contained necrotic cell debris and low numbers of Gitter cells, primarily located in the meninges and surrounding parenchymal blood vessels.

Detailed information on the pathology of Sunshine virus infection is available from the Australian Registry of Wildlife Health (www.arwh.org) or Murdoch University (above).

Differential diagnoses

Differential diagnoses include infectious agents and toxins that can cause respiratory or neurological sins, or chronic debilitation.

Laboratory diagnostic specimens for PCR

- Cloacal, oral and combined oral/cloacal swabs
- Fresh samples of brain, lung, liver and kidney
- Archival formalin-fixed paraffin-embedded tissue
  - Sample quality is often badly degraded so negative results carry less weight than positive results

Sampling protocol

- Oral swabs
  - Moisten a cotton-tipped sterile swab with sterile saline. Rub the swab around the mouth paying particular attention to the glottis. If possible, advance the swab down into the trachea before sampling the rest of the mouth.
- Cloacal swabs
  - Moisten a cotton-tipped sterile swab with sterile saline. Advance the swab through the vent and swab the colon and cloaca.
- Combined oral/cloacal swabs
  - Moisten a cotton-tipped sterile swab with sterile saline. Swab as for the oral swab and then, using the same swab, sample as for the cloacal swab.
- All swabs
• Break off the swab-tip into a small sterile container (e.g. plain blood tube) where no more than 5mLs of sterile saline would cover the swab even when the container is inverted. The combined oral-cloacal swab is preferred. Do not use bacterial culture swabs as these will facilitate bacterial growth.

• Fresh tissue samples
  o Small samples (pinhead size) of (in order of preference) brain, kidney, lung and liver can be collected into small sterile containers, and like the swabs, immersed in sterile saline. Pooling these samples is preferred to submitting them individually, unless testing will be performed on individual tissue samples, in which case, tissue samples should be collected into separate containers with sterile instruments being used for each tissue sample.

To sample the brain, hinge the dorsal skull cranially using a fine tipped set of bone cutters; this will reveal the brain; remove and then freeze a pin head-sized part of the brain for molecular testing; fix the brain (while still in the skull) in formalin; submit the fixed brain (while still in the skull) to your pathologist.

Detailed information on laboratory diagnostic specimens required for diagnosis of Sunshine virus infection is available from the Australian Registry of Wildlife Health (www.arwh.org) or Murdoch University (above).

Laboratory procedures

PCR testing, gross pathology and histopathology.

Detailed information on laboratory procedures required for diagnosis of Sunshine virus infection is available from the Australian Registry of Wildlife Health (www.arwh.org) or Murdoch University (above).

Treatment

There is no treatment.

Prevention and control

Until transmission studies have been undertaken, it is difficult to advise on the prevention and control of Sunshine virus infections. Due to the uncertainty of the shedding kinetics of this virus, it is recommended that serial sampling in quarantine be performed to help prevent the entry of this disease into a collection.

There is no information available yet on the resistance of the Sunshine virus to physical and chemical action, however, being an enveloped virus, it is expected that the virus is labile outside of the host.

If Sunshine virus is diagnosed in a collection, the measures taken to control the virus are influenced by the purpose and size of the collection:

• Owners of private collections with only a few snakes are encouraged to “close” their collections by ceasing the movements of animals into and out of their collection. It is essential that hygiene is maintained fastidiously to minimise the spread of the virus between animals within the collection and to

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animals in other collections. Ideally, collections should only be “opened” when the threat of viral spread has ceased. For example, six months since the death of an infected animal and multiple negative test results during this time on the rest of the animals, would provide a level of confidence that the collection was free of the virus.

- Owners of larger collections should balance the value of the individual animal against the value of the entire collection. Euthanasia of infected animals should be seriously considered. All other snakes should be tested for the presence of the virus. The uncertainty of shedding kinetics justifies serial testing and the potential for asymptomatic animals shedding confirms that clinical signs should not be used a surrogate marker for infection. There are no current data to provide evidence-based recommendations on the number of sampling times or the interval(s) between sampling points. An empirical recommendation would be to seek three PCR-negative results from each animal evenly spaced in the six months since the time of the most recent diagnosis or death (whichever comes last). The comments concerning “closing” collections mentioned above, equally apply to these larger collections.

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.

The status of Australia’s wild snakes with respect to Sunshine virus is unknown. However, as an interesting or unusual disease, cases of Sunshine virus diagnosed in wild snakes should be reported as part of Australia’s general wildlife health surveillance system.

Statistics

Limited information is available in the National Wildlife Health Surveillance Database (eWHIS – See www.wildlifehealthaustralia.com.au). We are interested in confirmed reports of Sunshine virus in wild Australian snakes. Please contact admin@wildlifehealthaustralia.com.au or your local WHA Wildlife Coordinator.

Research

Research is needed in order to clarify virtually every aspect of this disease from cause to transmission to diagnosis. PCR testing for Sunshine virus is currently being performed at Murdoch University, Perth.

Human health implications

There are no reports of Sunshine virus in humans.

Conclusions

With increased understanding of virus ecology and evolution, it becomes more feasible to identify probable candidates for future novel disease outbreaks, and to increase surveillance. Paramyxoviruses have a
precedent of jumping hosts and causing significant disease. The impact that the discovery of Sunshine virus may have on animal health, including people, by way of broadening the understanding of the paramyxoviruses is unknown (Hyndman 2012b).

References and other information

Hyndman TH, Shilton CM, Doneley RJT, Nicholls PK (2012a) Sunshine virus in Australian pythons. Veterinary Microbiology. 161:77-87.


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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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