

# Respiratory disease syndrome in shingleback lizards

## Fact sheet

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### Introductory statement

A respiratory disease syndrome has been reported in wild and captive shingleback lizards (*Tiliqua rugosa*) in Western Australia (WA). The syndrome has been colloquially termed “bobtail flu” and is also known as Upper Respiratory Tract Infection (URTI). The cause of the syndrome has not been confirmed, however recent studies implicate a nidovirus as the possible infectious cause.

### Aetiology

A viral aetiology for this syndrome has been suspected for many years, due to its apparent contagious nature and the absence of evidence for a bacterial or fungal aetiology on cytology, culture and histopathological investigation.

A novel nidovirus, family *Coronaviridae*; subfamily *Torovirinae*, has recently been identified by next generation molecular sequencing of samples collected from affected lizards in WA. There is a significant association between the presence of the virus and the presence of the respiratory syndrome (O’Dea et al. 2016). However, causation has not been proven, and it is not known if this virus is an obligate pathogen, or if (as has been commonly demonstrated with respiratory disease in reptiles) it forms one component of a multifactorial disease syndrome (Schumacher 2011; O’Dea et al. 2016).

Nidoviruses have not previously been reported in lizards globally, but have been reported in captive pythons in Europe and North America in association with respiratory disease (Bodewes et al. 2014; Stenglein et al. 2014; Uccellini et al. 2014; Lempp et al. 2015; Marschang and Kolesnik 2017). Phylogenetic analysis of the recently discovered Shingleback nidovirus shows it is most closely related to the Ball python nidovirus, although it is a distinctly separate species.

## Natural hosts

The syndrome has only been reported in shingleback lizards (*Tiliqua rugosa*). Both wild and captive individuals may be affected. Without appropriate surveillance, it is unknown if other species are affected, or act as reservoirs in the wild.

## World distribution

The syndrome has only been reported in Australia. It is not known if the syndrome has been seen in captive shingleback lizards overseas.

## Occurrence in Australia

Shingleback lizards occur in the wild across much of Australia, however the upper respiratory tract syndrome has primarily been reported in shinglebacks in WA, with first reports in the 1990s. It is not certain when the syndrome first emerged, although records in wildlife centres document an increase in admissions with corresponding clinical signs during the 1990s.

There are numerous anecdotal reports (e.g. herpetologist blogs) of the syndrome occurring in captive shinglebacks across Australia (Haight 2004). There are anecdotal reports of the syndrome in wild shinglebacks in South Australia and one published report of wild shingleback lizards with ocular and nasal discharge (Smyth et al. 2014), from a SA location close to the NSW and Victorian borders. There have been no published reports of the syndrome in wild shinglebacks outside of SA and WA.

## Epidemiology

The syndrome has been described in adult and immature individuals of both sexes. Further epidemiological information, including spatiotemporal associations will require ongoing studies that incorporate PCR testing to assign cases based on presence of pathogen rather than clinical signs alone.

The presence of the novel nidovirus in clinically healthy animals may indicate a carrier status.

It is currently hypothesised that disease causation is multifactorial, with stress, nutritional status, reproductive status and secondary infectious agents interacting with the nidovirus to result in disease.

## Clinical signs

Reported clinical signs include loss of body condition, lethargy and depression, inappetence, pale mucous membranes, presence of increased amounts of clear to cloudy mucus in the oral cavity, nasal passages and choana, sneezing, watery and swollen eyes, and bubbling from the eyes and nostrils. Mortality rates may be high without treatment (Haight 2004; O'Dea et al. 2016).

## Diagnosis

Diagnosis of the syndrome is based on the pathognomic pattern of clinical signs, combined with confirmation of viral presence using quantitative real-time PCR. Detection of virus to date has been from oral/tracheal and/or eye swabs (Pers. comm. M O'Dea).

## Pathology

No information is available on clinical pathology. Changes seen at post mortem include poor body condition, thick mucus in upper respiratory tract, sometimes blocking glottis, lungs very inflated, occupying much of body cavity, and remain inflated during post mortem examination. In advanced cases, the liver may be pale (Haight 2004). There is no published information on histopathological changes.

## Differential diagnoses

Other reported causes of respiratory disease in reptiles include viral, bacterial and fungal infections (such as herpesvirus and *mycoplasma* spp.) and non-infectious causes (Schumacher 2011). A full diagnostic work up to exclude other agents of disease should be included in any investigation that involves Shingleback nidovirus.

## Laboratory diagnostic specimens and procedures

A diagnostic service is currently offered for research purposes through Dr Mark O'Dea at Murdoch University. For further details of this service please contact [M.O'Dea@murdoch.edu.au](mailto:M.O'Dea@murdoch.edu.au) and see <http://wildlifehealthaustralia.com.au/Portals/0/Documents/Resources/Shingleback%20nidovirus%20testing%20diagnostic%20service%20Murdoch%20University%20Mar2017.pdf>.

For viral diagnostics, aseptic technique is used to collect swabs of secretions from the oral cavity at the level of the glottis, which are placed into viral transport medium or sterile physiological saline (O'Dea et al. 2016). The medial canthus of the eye can also be swabbed as above.

A full post mortem examination should be undertaken and a range of samples, particularly respiratory tract, collected aseptically for culture and histopathology. Examination should include bacterial culture of aseptically collected lung samples and qRT-PCR of oral and eye swabs.

## Prevention and control

Understanding of the epidemiology of the syndrome to date is consistent with a highly contagious pathogen. An infectious cause, although not confirmed, is considered highly likely due to the significant findings of a novel nidovirus in diseased individuals. Excellent husbandry and appropriate biosecurity management are recommended when housing, handling and treating affected lizards.

## 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](mailto:admin@wildlifehealthaustralia.com.au). Cases of respiratory disease syndrome in shingleback lizards are reported in eWHIS, primarily from WA, but also from wild shinglebacks in SA, and captive shinglebacks in Vic.

## Statistics

Most cases seen in WA are presented for care to Kanyana Wildlife Rehabilitation Centre (<http://www.kanyanawildlife.org.au/>), although other wildlife rehabilitation centres in WA, including Native Animal Rescue (<https://nativeanimalrescue.org.au/>) and Native ARC (<http://www.nativearc.org.au/>) also treat affected individuals.

## Treatment

Supportive treatment is recommended, including warmth, parenteral or oral fluid therapy, and nebulisation with distilled water. Affected lizards have been found to have relatively higher loads of GIT parasites (coccidia, trichomonas and oxyurids) and individuals may require treatment for these conditions (Kanyana, pers. comm. May 2017). A broad-spectrum parenteral antibiotic treatment with enrofloxacin and administration of an antiprotozoal treatment (metronidazole orally) may also be considered, although should be decided on a case-by-case basis. The majority of treated cases are reported to respond well to therapy (O'Dea et al. 2016). It is recommended that euthanasia be considered for individuals with severe or chronic disease, indicated by very poor body condition and a failure to respond to preliminary supportive therapy. Treatment, when undertaken, is recommended for a minimum of six weeks, or until clinical signs have resolved (Haight 2004). Mortality rates without treatment may be high (Haight 2004; O'Dea et al. 2016).

## Research

Further work is recommended in the following areas:

- Confirm the aetiology of the syndrome and its epidemiological factors including transmission pathways, presence of a carrier state and geographic and host range.
- Improved understanding of the epidemiology of the disease, including risk factors and causation.
- The prevalence of Shingleback nidovirus in wild individuals of the *Tiliqua* genus.
- Optimal treatment, including assessment of long term response and fate in the wild following rehabilitation.
- Risk assessment, and if indicated, mitigation measures for other wildlife, human and domestic animal health.
- Description of the disease at a histological level with detailed investigation of confirmed cases by histopathology and immunohistochemistry.

## Human health implications

There are no known human health implications, however an aetiology has not been confirmed, therefore appropriate biosecurity precautions should be adopted when treatment or post mortem investigation of affected animals is undertaken.

## Conclusions

Further work is required to confirm the aetiology of this syndrome and improve understanding of the risk factors contributing to this syndrome in shingleback lizards. Suspect cases should be reported to your state or territory WHA Coordinator.

## References and other information

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## To provide feedback on this fact sheet

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](mailto: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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