

EXOTIC

Batrachochytrium salamandrivorans ("Bsal")

Fact sheet

July 2023

Key points

- *Batrachochytrium salamandrivoran* (*Bsal*) is a species of fungus that can cause fatal disease in salamanders and newts, and may cause disease in frog species.
- Infection with *Bsal* causes skin erosion and mortalities in susceptible species.
- This disease has been detected overseas in both wild and captive populations of salamanders and newts. It has **not** been detected in Australia.
- *Bsal* is considered to have significant risk of negative consequences on wild amphibian populations overseas, with a high likelihood of spread via international trade.
- Infection with *Bsal* is a nationally notifiable disease; you must notify animal health authorities if you suspect an animal has *Bsal* infection (see *Surveillance and management* below).

Aetiology and natural hosts

Batrachochytrium salamandrivoran (*Bsal*) is a chytrid fungus of the genus *Batrachochytrium* and family *Batrachochytriaceae* ^[1].

Bsal predominantly infects salamanders, newts and sirens (amphibians) with over 20 species known to be susceptible ^[2]. Australia does not have any native species of salamander, newt or siren. After experimental infection, *Bsal* is also capable of infecting some frog species ^[3].

One Health implications

Wildlife and the environment: *Bsal* can cause fatal disease in susceptible species, resulting in rapid wild amphibian population declines ^[1]. The impact of *Bsal* on frog species is not well understood, however there may be impacts on Australian frog populations if the pathogen were to enter Australia.

Domestic animals: there is no known risk to domestic animals ^[4].

Humans: there is no evidence of transmission of *Bsal* to humans.

World distribution and occurrences in Australia

Bsal has been detected in wild and captive populations of salamanders and newts in the Netherlands, Belgium, Germany, Spain, United Kingdom, Japan, Thailand, Vietnam and China [2, 5].

This disease is exotic and has **not** been recorded in Australia.

Epidemiology

Bsal grows well in freshwater at an optimal temperature of 15°C. Transmission is believed to occur via sharing spore-infected water or direct contact. *Bsal* spores can persist in fresh water in the environment for three weeks [2].

Bsal was first detected in Europe in 2013 following severe population declines (96%) of wild fire salamanders (*Salamandra salamandra*) in the Netherlands. It is thought that *Bsal* is endemic to Asia, causing asymptomatic infections in native salamanders, and has spread to geographically via the international pet trade. This trade route presents a high risk of *Bsal* incursion into naïve species and new geographic regions, such as North America, which is a hotspot for salamander biodiversity [1, 2].

Australia does not have any native salamander, newt or siren species, however a small population of introduced newt, the smooth newt (*Lissotriton vulgaris*), has established in south-eastern Australia [6]. This species is a declared pest and is susceptible to *Bsal* disease [2, 6].

Clinical signs and pathology

The effect of *Bsal* on its host depends on the ability of the fungus to invade and parasitise the skin, which varies across host species [7]. Some species of salamander, newts, sirens and frogs have no clinical signs associated with *Bsal* infections and may act as silent reservoir hosts for the fungus [2, 8].

However, many species of salamanders and newts are highly susceptible to clinical chytridiomycosis. Clinical signs include ataxia, anorexia, lethargy, discolouration and ulceration of the skin, excessive skin shedding, and high levels of mortality [2]. *Bsal* causes degradation of the epidermis. Impairment of vital skin function in susceptible species results in death [1, 7]. Following experimental infection with *Bsal*, Cuban treefrogs (*Osteopilus septentrionalis*) developed clinical disease including anorexia, skin haemorrhage and erythema, ulceration, excessive skin shedding and loss of righting reflex [9].

Diagnosis

Bsal infection can be confirmed with culture or PCR. PCR is a more sensitive method and is more commonly used. A highly sensitive and specific *Bsal* qPCR has been developed which does not cross-react with *Batrachochytrium dendrobatidis* (*Bd*), the causative agent of chytridiomycosis in frogs. A protocol has been developed for the detection of both *Bd* and *Bsal* at the same time from samples using a duplex real time PCR [1].

The latest information on *Bsal*, including specimen collection procedures, is available from the World Organisation for Animal Health (WOAH) website:

www.woah.org/fileadmin/Home/eng/Health_standards/aahm/current/2.1.02_Bsal.pdf

Treatment, prevention and control

Heat exposure can be used to manage *Bsal* infection in thermotolerant salamander species^[10]. A combination of antibiotics and heat exposure (minimum of 20°C) for over a week has shown to be effective^[1]. *Bsal* is sensitive to disinfectants, including ethanol^[10].

Surveillance and management

Infection with *Bsal* is a nationally notifiable disease (see www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/notifiable). By law you must notify animal health authorities in your jurisdiction if you know or suspect that an animal has a notifiable pest or disease. Refer to advice in your jurisdiction (www.agriculture.gov.au/biosecurity-trade/pests-diseases-weeds/animal/state-notifiable) and on outbreak.gov.au on how to report.

No cases of *Bsal* infection have been reported in Australia.

WOAH detection, reporting and control measures are located at:

www.woah.org/fileadmin/Home/eng/Health_standards/aahc/current/chapitre_batrachochytrium_salamandrivorans.pdf

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. Negative data are also valuable. If you can help, please contact us at admin@wildlifehealthaustralia.com.au.

Wildlife Health Australia administers Australia's general wildlife health surveillance system, in partnership with government and non-government agencies. Wildlife health data is collected into a national database, the electronic Wildlife Health Information System (eWHIS). Information is captured from a variety of sources including government agencies, zoo based wildlife hospitals, sentinel veterinary clinics, universities, wildlife rehabilitators, and a range of other organisations and individuals. Targeted surveillance data is also collected by WHA. See the WHA website for more information: <https://wildlifehealthaustralia.com.au/ProgramsProjects/eWHIS-WildlifeHealthInformationSystem.aspx>

Acknowledgements

We are grateful to the people who contributed to this fact sheet.

Created: July 2023

References

1. WOA (2018) *Batrachochytrium salamandrivorans*. Available from: https://rr-africa.woah.org/wp-content/uploads/2019/09/a_bsal_disease_card.pdf

2. DAWE (2020) Aquatic Animal Diseases Significant to Australia: Identification Field Guide, 5th Edition, Australian Government Department of Agriculture, Water and the Environment. Available from: <https://www.agriculture.gov.au/sites/default/files/documents/field-guide-5th-edition.pdf>
3. Gray MJ, Carter ED et al. (2023) Broad host susceptibility of North American amphibian species to *Batrachochytrium salamandrivorans* suggests high invasion potential and biodiversity risk. *Nature Communications*, **14**(1): 3270
4. Baláž V, Solský M et al. (2018) First survey of the pathogenic fungus *Batrachochytrium salamandrivorans* in wild and captive amphibians in the Czech Republic. *Salamandra*: 87-91
5. Castro Monzon F, Rödel M-O et al. (2022) *Batrachochytrium salamandrivorans*' Amphibian Host Species and Invasion Range. *EcoHealth*, **19**(4): 475-486
6. Tingley R, Weeks AR et al. (2015) European newts establish in Australia, marking the arrival of a new amphibian order. *Biological Invasions*, **17**: 31-37
7. Gray MJ, Lewis JP et al. (2015) *Batrachochytrium salamandrivorans*: the North American response and a call for action. *PLoS pathogens*, **11**(12): e1005251
8. Blaustein AR, Urbina J et al. (2018) Effects of emerging infectious diseases on amphibians: a review of experimental studies. *Diversity*, **10**(3): 81
9. Towe AE, Gray MJ et al. (2021) *Batrachochytrium salamandrivorans* can Devour more than Salamanders. *Journal of wildlife diseases*, **57**(4): 942-948
10. WOA (2021) Chapter 2.1.2. - Infection with *Batrachochytrium salamandrivorans*. Available from: https://www.woah.org/fileadmin/Home/eng/Health_standards/aahm/current/2.1.02_Bsal.pdf

To provide feedback on fact sheets

Wildlife Health Australia welcomes your feedback on fact sheets. Please email admin@wildlifehealthaustralia.com.au. We would also like to hear from you if you have a particular area of expertise and are interested in creating or updating a WHA fact sheet. A small amount of funding is available to facilitate this.

Disclaimer

This fact sheet is managed by Wildlife Health Australia for information purposes only. Information contained in it is drawn from a variety of sources external to Wildlife Health Australia. Although reasonable care was taken in its preparation, Wildlife Health Australia does not guarantee or warrant the accuracy, reliability, completeness or currency of the information or its usefulness in achieving any purpose. It should not be relied on in place of professional veterinary consultation or medical consultation. To the fullest extent permitted by law, Wildlife Health Australia will not be liable for any loss, damage, cost or expense incurred in or arising by reason of any person relying on information in this fact sheet. Persons should accordingly make and rely on their own assessments and enquiries to verify the accuracy of the information provided.



Find out more at www.wildlifehealthaustralia.com.au

Email admin@wildlifehealthaustralia.com.au

Or call +61 2 9960 6333