



# OPHIDIOMYCOSIS

## Snake Fungal Disease

*Timber rattlesnake with ophidiomycosis lesions near the mouth.*

*Photo credit: Melissa Fadden. This fact sheet has been updated on 08/26/2020.*

### CAUSE

Ophidiomycosis, sometimes also referred to as snake fungal disease (SFD), is caused by the fungus *Ophidiomyces ophiodiicola*. This fungus is thought to be an emergent pathogen on the North American landscape and poses a significant threat to snake health and population sustainability.

### SIGNIFICANCE

Ophidiomycosis is an emerging disease that affects wild and captive snakes across North America. The incidence of ophidiomycosis is thought to have increased in some snake populations over the last few years. In some species (i.e., Eastern Massasauga) the mortality rate may be over 90% in the Eastern US.

### SPECIES AFFECTED

Ophidiomycosis can infect wild or captive snakes and is the predominant cause of skin infections in wild snakes. It has been documented in over 15 Genera of wild and captive snake. Species confirmed with diagnosis of ophidiomycosis include: the eastern indigo snake, the northern water snake, the eastern racer, the rat snake, the timber rattlesnake, the massasauga, the pygmy rattlesnake, garter snakes, cottonmouth snakes, the milk snake, queensnake, and eastern fox snake. The fungus causing ophidiomycosis is not known to affect humans.

### DISTRIBUTION

As of August 2020, the fungus *O. ophiodiicola* has been found in at least 38 states, including recent findings in California, Idaho, Oklahoma. It is also present in one U.S. territory (Puerto Rico) and one Canadian Providence (Ontario).



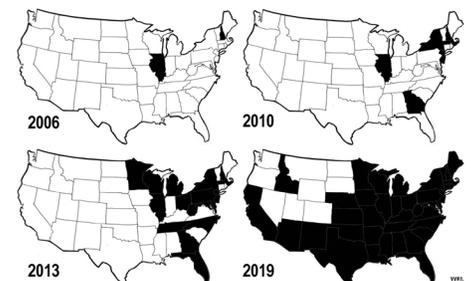
*King snake with Ophidiomycosis lesions.*

*Photo credit: Wildlife Epidemiology Laboratory, University of Illinois*



*Snake with Ophidiomycosis lesion.*

*Photo credit: Matt Allender*



*Map of geographic distribution of Ophidiomyces ophiodiicola in the United States, 2006-2019.*

*(Credit: Matt Allender, Wildlife Epidemiology Laboratory University of Illinois)*

## TRANSMISSION

At this time, it is not well understood how the fungus causing ophidiomycosis is spread. It is likely that the pathogen is shed into the environment by infected snakes and spreads from the environment to other snakes (i.e., snakes that share dens). A recent report indicates *O. ophiodiicola* may be spread via vertical transmission, though host and environmental factors that lead to disease remain largely unknown. For example, it is thought that timber rattlesnake populations are at higher risk of ophidiomycosis in years with higher rainfall.

## CLINICAL SIGNS

Clinical signs of SFD and the severity of disease may vary by species. The most common clinical signs include accelerated ecdysis cycles, flaking and crusting of the scales/epidermis, displaced or discolored scales, granulomas, nodules, swelling or disfiguration of infected tissues. The disease may progress internally (via the eyes, throat and/or lungs) and cause eye infections or pneumonia.

## DIAGNOSIS

Ophidiomycosis is diagnosed by identification of the classic clinical signs in combination with either molecular detection (PCR or qPCR) of the fungus, histopathology, and/or a positive fungal culture. Ophidiomycosis status should be characterized as defined in the case definition (Baker et al., 2019):

- 1 negative (no clinical lesions or qPCR detection of *O. ophiodiicola*)
- 2 *Ophidiomyces* present (qPCR detection in absence of clinical signs)
- 3 possible ophidiomycosis (presence of clinical signs in the absence of qPCR detection)
- 4 apparent ophidiomycosis (clinical signs present and qPCR detection) (Allender et al., 2019).

It must be noted that there may be difficulty in sampling for and detecting (by PCR/ qPCR) *O. ophiodiicola* by skin/epidermal swabs (i.e., low DNA quantity on the skin or the fungi are deep within the epidermis). Therefore, caution should be taken in assigning causation to *O. ophiodiicola* to animals with skin lesions that are qPCR negative in the presence of skin lesions. There are numerous causes of skin lesions in wild snakes (e.g., trauma, another pathogen causing skin lesions, etc). Conversely, the absence of clinical signs of ophidiomycosis is more reliable for eliminating a diagnosis of apparent ophidiomycosis.

## TREATMENT

Treatment with an antifungal, Terbinafine, either by a slow-release, long-lasting implant or nebulization, has been found to reach therapeutic levels in cottonmouth snakes; methods and doses for treatment are thus based on these findings. Other treatment options include thermal and nutritional supportive therapy.

## MANAGEMENT

Ophidiomycosis appears to be negatively impacting several species and populations of snakes across North America. However, its long-term impact remains unknown. It is also very difficult to assess changing snake populations because of the solitary nature of many snakes and importantly, the absence of long-term monitoring data for most species of snakes. Any sightings of snakes with suspected SFD infection should be reported to the Northeast Wildlife Disease Cooperative and/or DTT Herp Disease Alert System for further investigation. Wildlife specialists, veterinarians, and any other individuals who routinely come in contact with wild snakes should keep gear, snake holding containers, and clothes clean and disinfected to prevent spreading the fungus to other snakes. For information on field gear disinfection and biosecurity, please review Gray et al., 2017. This paper provides a fantastic review of disinfectants proven effective against *O. ophiodiicola* (Appendix I, Gray et al., 2017).

## SUGGESTED READING

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