

# *Ophidiomyces ophiodiicola* (causing snake fungal disease) (Infection with)

Aetiology Epidemiology Diagnosis Prevention and Control  
Potential Impacts of Disease Agent Beyond Clinical Illness References

## **AETIOLOGY**

### **Classification of the causative agent**

*Ophidiomyces ophiodiicola* (Oo), formerly *Chrysosporium ophiodiicola*, is the causative agent of snake fungal disease (SFD), an emerging fungal disease of North-American snake species. Oo is an environmental saprobe (feeds on decaying matter in the environment) therefore, many believe SFD is an opportunistic infection. However, risk factors for infection are not well characterised, and experimental inoculations are successful in producing clinical disease.

### **Resistance to physical and chemical action**

Temperature:	Oo is active within a wide temperature range but often ceases to grow above 35°C.
pH:	Oo is able to tolerate a pH range of 5-11.
Chemicals/Disinfectants:	2 minute exposure to 3% bleach or 70% ethanol; chlorhexidine may <u>not</u> be effective.
Survival:	Drought tolerant; able to utilise a wide range of compounds for survival; adaptable to different environments

## **EPIDEMIOLOGY**

### **Hosts**

- Pit vipers and colubrid snakes
  - Milk snake (*Lampropeltis triangulum*)
  - Black rat snake (*Pantherophis obsoletus* ssp.)
  - Garter snake (*Thamnophis* spp.)
  - Timber rattlesnake (*Crotalus horridus*)
  - Eastern massasaugas (*Sistrurus catenatus catenatus*)
  - Cottonmouth snake (*Agkistrodon piscivorus* ssp.)
  - Black racer (eastern racer) snakes (*Coluber constrictor* ssp.)
  - Eastern foxsnake (*Pantherophis vulpinus*)
  - Ring-necked snake (*Diadophis punctatus*)
  - Northern copperhead (*Agkistrodon contortrix*)
  - Northern pinesnake (*Pituophis melanoleucus*)
  - Northern watersnake (*Nerodia sipedon*)
  - Pygmy rattlesnake (*Sistrurus miliarius*)
  - Mudsnake (*Farancia abacura*)
  - Milksnake (*Lampropeltis triangulum*)

### **Transmission**

- Infected snakes shed spores into the environment
- There is little evidence of direct snake-to-snake transmission; snakes must come into contact with infectious spores in the environment

## Sources

- Fungal spores in the environment
- Transmission of spores via soil-contaminated fomites

## Occurrence

Oo was first detected in North America on the Atlantic coast in 2006 and is currently known to infect snakes in the eastern and midwestern United States as well as the Canadian province of Ontario. It is believed to be endemic in these areas. Oo has also been detected in Great Britain and the Czech Republic; the latter suggests that mainland Europe may be another site where the fungus is present. Lesions from affected European snakes are similar to those from affected North American snakes.

Oo may be an opportunistic pathogen and therefore may have variable effects on different species and populations.

## DIAGNOSIS

The typical incubation period for SFD is 30-37 days, however, clinical disease has been detected as early as 4 days post-inoculation in experimental settings. If there are significant skin lesions secondary to infection, the fungus is able to penetrate and invade systemically. SFD has a 40% fatality rate and an approximately 90-day course of disease.

### Clinical diagnosis

Snakes infected with Oo often exhibit abnormal feeding behaviours and bask inappropriately, increasing their risk of predation and hyperthermia. Scale discolouration is seen early in the course of disease, and facial swelling should be investigated for secondary jaw misalignment or narrowing of the nares. Grossly, lesions appear to resolve after a moult, but some hyphae may remain and re-initiate disease. Previously infected scales may appear scarred or misshapen after a moult.

SFD is often misdiagnosed as other members of the *Chrysosporium* anamorph *Nannizziopsis vriesii* (CANV) complex due to their genetic similarities and clinical presentations.

### Lesions

- Scabby or crusty scales
- Scale oedema, discolouration
- Subcutaneous nodules or, if severe, nodules in deeper tissues
- Dermal granulomas on the head, neck, and chin
- Abnormal moulting
  - Increased frequency
  - +/- fluid accumulation between skin layers
  - +/- dysecdysis
- Cloudiness of spectacles not associated with moulting
- Thickening and crusting of the epidermis
- Epithelial ulcers
- Fungal invasion of muscle, bone, viscera
- Foci of necrosis and granulocytic inflammation in the epidermis surrounded by oedema
- Separation of the stratum corneum

### Differential diagnoses

- Other fungal dermatopathies (ex: CANV, *Mucor* spp., *Penicillium* spp., *Candida* spp.)
- Trauma-induced dermatopathy
- Scale mites

## **Laboratory diagnosis**

### **Samples**

*For isolation of agent*

- Skin biopsy
- Scute clip
- Swabs of skin/scales or sheds

*Serological tests*

- Serology is not utilised for the detection of *O. ophiodiicola*.

### **Procedures**

*Identification of the agent*

- Histopathology
  - Must confirm full-thickness lesion in skin
- Fungal culture
- Polymerase chain-reaction (PCR)

*Serological tests*

- Serology is not utilised for the detection of *O. ophiodiicola*

## **PREVENTION AND CONTROL**

### **Sanitary prophylaxis**

- Do not relocate or release snakes into new locations unless confirmed uninfected; this prevents the introduction of Oo to a new environment.
- Disinfect boots, clothing, and equipment before moving between field sites.

### **Medical prophylaxis**

- There is no effective vaccine or treatment for SFD.

## **POTENTIAL IMPACTS OF DISEASE AGENT BEYOND CLINICAL ILLNESS**

### **Risks to public health**

- There is no known direct risk of Oo infection to humans.

### **Risks to agriculture**

- There is no determined risk of Oo infection to the agricultural industry.

## **REFERENCES AND OTHER INFORMATION**

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The OIE will periodically update the OIE Technical Disease Cards. Please send relevant new references and proposed modifications to the OIE Scientific Department ([scientific.dept@oie.int](mailto:scientific.dept@oie.int)). Last updated 2019. Written by Marie Bucko and Samantha Gieger with assistance from the USGS National Wildlife Health Center.