

## LETTER TO THE EDITOR

**Case Report. A disseminated infection due to *Chrysosporium queenslandicum* in a garter snake (*Thamnophis*)**

Eine disseminierte *Chrysosporium queenslandicum*-Infektion bei einer Strumpfbandnatter (*Thamnophis*)

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**Key words.** *Chrysosporium queenslandicum*, garter snake, *Thamnophis*, disseminated infection.

**Schlüsselwörter.** *Chrysosporium queenslandicum*, Strumpfbandnatter, *Thamnophis*, disseminierte Infektion.

**Summary.** A male garter snake (*Thamnophis*) from a private terrarium was spontaneously and simultaneously infected with *Chrysosporium queenslandicum* and *Geotrichum candidum*. The autopsy revealed disseminated mycotic alterations in skin, lungs and liver. *Chrysosporium queenslandicum* grew well at 28 °C, the optimal temperature of the animal. This is the first description of a *Chrysosporium queenslandicum* infection in a garter snake.

**Zusammenfassung.** Eine männliche Strumpfbandnatter aus privater Hand erkrankte spontan und verendete an einer Mischinfektion mit *Chrysosporium queenslandicum* und *Geotrichum candidum*. Die postmortalen Untersuchungen zeigten mykotisch bedingte Alterationen in Haut, Lunge und Leber. Die für das Wachstum des isolierten *Chrysosporium queenslandicum* optimale Temperatur von 28 °C stimmt genau mit dem Wärmebedürfnis der Schlange überein. Es handelt sich um die erste Beschreibung einer *Chrysosporium queenslandicum*-Infektion bei einer Strumpfbandnatter.

**Introduction**

*Chrysosporium* species are ubiquitous moulds occurring commonly in soil, decaying leaves, wood, animal pastures and chicken yards [1–5], related to dermatophytes by their gymnoascoceous perfect states, by their keratophilic ability and by their accessory conidia [6]. Members of the genus rarely cause diseases in humans and animals such as dermatomycosis, onychomycosis, endocarditis, osteomyelitis [7, 8]. We report the first case of disseminated *Chrysosporium queenslandicum* infection concomitant with a *Geotrichum candidum* infection in a garter snake.

*Case history*

A 3-year-old, male garter snake (*Thamnophis*) with a size of 76 cm from a private terrarium owner was presented for autopsy. The animal was borne in the terrarium. Skin lesions were noted *sub finem* around the cloaca. The animal died in spite of the administration of itraconazole.

**Gross morphology:** The carcase was in bad nutritional condition and showed, 15 cm cranial to the cloaca, a 1.3 × 2 cm large, grayish-white cutaneous nodule. Both the hemipeni were markedly swollen and revealed macroscopically necrotic foci. Multiple submiliary to avenaceous whitish nodules were present in lungs and liver (Fig. 1). A muco-purulent mass filled the air sacs. The spleen

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was slightly swollen. Kidneys and heart showed no alterations.

**Histology:** Examination of tissues from lungs, liver and skin revealed mycotic lesions at varying intensities. The liver showed abundant, marked necrosis with invasion into the vessels and thrombosis (Fig. 2). The hyphae, surrounded by a necrotic mass, measured  $2.5 \times 3-80 \mu\text{m}$  and were septated. In the lungs, desquamated alveolar cells and granulocytes filled the acini. Two kinds of hyphae were seen in the lungs: the first were similar to those detected in the liver, and the second showed budding cells, that were compatible with *Geotrichum candidum* (Fig. 3). The severity of the lesions desorganised completely the pulmonary architecture of the snake lungs.

Intraepidermal neutrophilic abscesses and granulomatous structure with few foreign type giant cells were observed.

Kidney, heart and pancreas were free from any mycotic lesions histologically.

**Mycology:** The aetiological agents isolated was identified as *Chrysosporium queenslandicum* Apinis &

Rees. The fungus showed a good growth ( $45-70 \text{ cm}$  diam in 14 days) at  $28^\circ\text{C}$  as white, felty, fluffy to velvety, up to 2–3 mm high and dense colonies. The reverse on Sabouraud glucose agar was pale creamy yellow. A poor growth was noted at  $34^\circ\text{C}$  and at room temperature, but no growth was observed at  $37^\circ\text{C}$ .

The hyphae were hyaline, thin-walled,  $1.5-6.5 \mu\text{m}$  wide and often fragmented. The last feature complicates the microscopic examination both in direct preparation and in slide cultures.

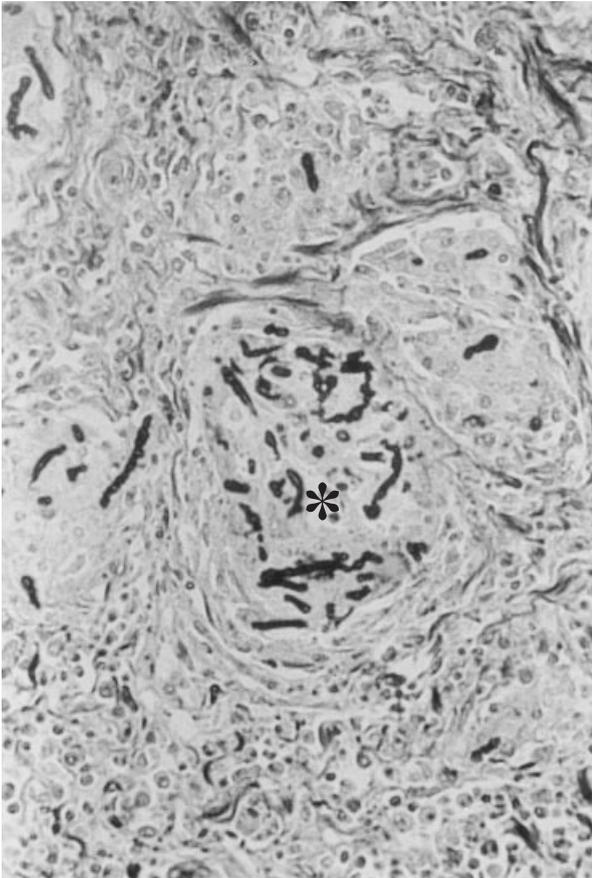
The isolate is deposited in the institute fungus collection (Dr Vissiennon, Leipzig, Germany) as M39 and in the CBS (Baarn, NL) as CBS M253.

## Discussion

Originated from North America, the genus *Thamnophis* comprises more than 22 species of garter snakes. They are viviparous reptiles and kept as hobby animals in terraria. With a length of 20–130 cm, head and neck have almost the



**Figure 1.** Gross pathological finding: (a) grayish-white cutaneous nodule; (b) miliary to avellaneous whitish foci in the lung.



**Figure 2.** Liver: thrombosis (\*) in an invaded hepatic vessel. Note the surrounding necrotic foci (GMS, H & E-counterstained,  $\times 200$ ).

same diameter and the tail tapers toward to it apex. During the day active snakes love humidity and are met in the wilderness near lakes, lagoons and marshy areas [9–11]. The optimal keeping temperatures are 22–28 °C. Night temperatures around 15 °C are recommended. The snakes can reach in capture an age of 11 years [10]. The present case was 3-year-old.

Data about its immunological state were not available. However, the isolation of *Chr. queenslandicum* from air-dust particles, animal folds, various animals and sewage sludge [4, 12–14] on the one hand, and the good fungal growth at 28 °C, the optimal keeping temperature of the animal, on the other hand should favour the infection. Therefore the fungus can be considered as a permanent hazard risk for the snake. It is to be feared, that, *Chr. queenslandicum* becomes an emerging agent in terraria. Measures to reduce the fungal population such as cleaning, less use of woods and natural matters in terraria should be taken for sensitive animals (e.g. old or otherwise weakened snakes).

With its inability of growing at 37 °C, the fungus should be considered as pathogen for poiki-



**Figure 3.** Lung: desquamated alveolar cells with septated branching hyphae (big arrow) and budding yeast-like cells (thin arrow) in the lung. (GMS, H & E-counterstained;  $\times 400$ ).

lothermic animals, but has no medical importance for mammals and birds.

Originally isolated from feathers of domestic fowls, ducks and turkeys in Southern Queensland (Australia) by Apinis & Rees [15], the fungus was found to be involved in diseases in a small mammal by Gugnani and in a nonspecified snake by Ajello [16, 17]. To our knowledge, the present case is the first description of a *Chr. queenslandicum*-infection in a garter snake.

The identification of the fungus can cause some difficulties to the nonskilled mycologist. However, the growth temperatures (22–32 °C with an optimum at 28 °C), the white fluffy to velvety colony with a pale creamy yellow reverse on Sabouraud glucose agar, 1-celled, 3.5–10  $\times$  3–6  $\mu$ m conidia can provide the suspicion on *Chr. queenslandicum*. The final diagnosis can be performed only by a skilled specialist.

Similar to other mycotic infections, the pathologico-anatomical findings are indistinguishable from those of other septicemic infections (e.g. mycobacterial infections, salmonellosis).

The histology differed from the dichotomously branching hyphae encountered in *Aspergillus* infec-

tions [18, 19], but also from alterations due to *Scedosporium prolificans* [20] and was similar to mycotic lesions such as *Ochroconis* and *Fusarium* infections [21, 22].

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