

## An algal infection (protothecosis) in a cat

This case report describes a cat with inflammation caused by an infection with a particular type of algae named *Prototheca*. The evoked clinical disease is called protothecosis.



Fig. 1. Shown is the cat's hairless crusted spot within the skin of the dorsal nasal area (arrowheads).

*Prototheca* species and their occurrence in the environment. *Prototheca* species belong to the green algae (Family *Chlorellaceae*, Genus *Prototheca*). In comparison to other green algae, these are neither green nor visible to the naked eye. This former is due to the loss of a particular cellular organelle (chloroplast). *Prototheca* is a tiny organism measuring 8-21  $\mu\text{m}$  in diameter that consists

of only one cell and replicates by irregular division (called endosporulation). *Prototheca* occurs worldwide in the terrestrial environment, e.g. plants, water and soil. It has also been isolated from the surface of the skin, the respiratory tract and the faeces of healthy men and domestic animals. Thus, an exposure to this organism can happen everywhere, for example at home in the garden, on a farm or at a recreational area.

*Protothecosis: a rare clinical disease.* The good news is: despite the frequent ways of exposure, clinical disease is seldom. In healthy individuals the immune system usually prevents the entry or spread of *Prototheca*. In rare instances, however, clinical disease can develop. It often affects immunocompromised individuals or may also occur if there is a contamination of an open wound with dirt or water containing *Prototheca*. Further, only some *Prototheca* species are capable of evoking disease, these are *Prototheca zopfii* genotype 2, *Prototheca wickerhamii* and *Prototheca blaschkeae*.

Notably, protothecosis of domestic animals and men differ in regard to the most commonly affected organ(s), i.e. in cows it is the mammary gland and in cats and men the skin. In dogs, an initial infection of the bowl is often followed by a spread to other organs.

*This case.* A 14-year-old female domestic shorthair cat had a hairless crusted spot within the skin of the dorsal nasal area and a swelling within the nostril, both measured ca. 0.5 cm in diameter (Fig. 1). Due to the latter, the cat had mild breathing problems.

For a further diagnostic workup and to rule out cancer, biopsies of the altered tissue were taken and submitted for microscopic examination. This revealed marked inflammation and intralesional organisms resembling algae that even showed endosporulation (Fig. 2).

For the definitive diagnosis of an algal infection, however, it is necessary to specifically identify cellular structures that are unique to algae or even certain types of algae such as *Prototheca*. In the present case, this was done using the following diagnostic tests, i.e. immunohistochemistry and molecular methods (PCR and sequencing). These detected *Prototheca* specific proteins and genomic sequences, respectively. Thus, the final diagnosis of protothecosis was reached. The latter method is such a powerful diagnostic tool, that even the respective *Prototheca* species was identified. The cat's skin disease was caused by *Prototheca zopfii* genotype 2. Notably, all previously published cases of protothecosis in cats with an identification of the respective *Prototheca* species were caused by *Prototheca wickerhamii*.

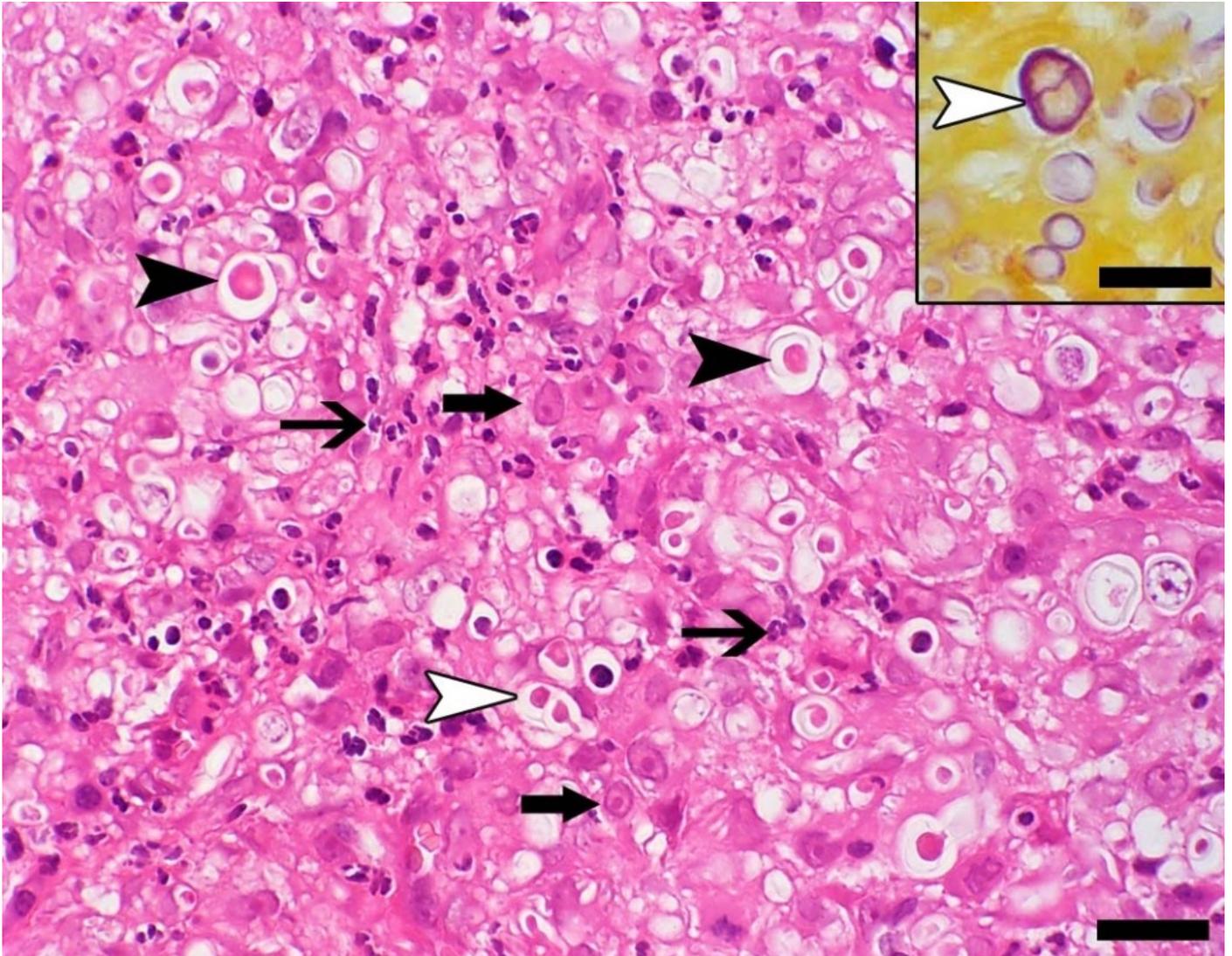


Fig. 2. Depicted are the findings observed during the microscopic examination of the routinely stained biopsy sample (haematoxylin and eosin stain). Tissue inflammation is characterized by the accumulation of mainly two types of inflammatory cells, i.e. neutrophils (thin black arrows) and macrophages (thick black arrows). The affected tissue contains numerous algae (black arrowheads). Their cellular bodies are surrounded by a clear halo representing the capsule. The body of some algae is divided by a septum consistent with endosporulation (white arrowhead). Bar = 20  $\mu\text{m}$ .

The inset shows several algal organisms including one with endosporulation (white arrowhead). These are visualized by the use of the Gridley stain. This specific staining technique selectively labels the algae, but not the surrounding tissue. Bar = 15  $\mu\text{m}$ .

*Importance of the precise identification of the causative agent. A specific treatment can only be*

performed, if the cause evoking the skin lesions is known. Although this is most frequently a bacterial infection, rarely other pathogens are responsible, e.g. *Prototheca* species. The treatment of a bacterial infection, however, will mostly not cure a protothecal infection.

The further identification of the respective *Prototheca* subspecies, in this case *Prototheca zopfii* genotype 2, may give further information about the source of the infection or ways of transmission.

## Publication

[Prototheca zopfii Genotype 2-induced Nasal Dermatitis in a Cat.](#)

Huth N, Wenkel RF, Roschanski N, Rösler U, Plagge L, Schöniger S  
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