Rev Iberoam Micol. (2021);38(3):105–106

Revista Iberoamericana de Micología

www.elsevier.es/reviberoammicol

Mycologic Forum

Hedgehogs, ringworm and zoonosis: They can itch a lot!☆

Erizos, tiñas y zoonosis: pueden llegar a picar mucho

F. Javier Cabañes*

Veterinary Mycology Group, Department of Animal Health, Anatomy, Veterinary School, Universitat Autònoma de Barcelona, Bellaterra, Spain

ARTICLE INFO

Article history:
Received 6 March 2020
Accepted 27 March 2020
Available online 30 May 2020

In recent years, hedgehogs have become increasingly popular as pets around the world. This trend began in the early 1990s in the USA, when some African hedgehog species were imported. A few years ago, an English newspaper reported that there were more than 100,000 hedgehogs kept as pets in the UK. The two most popular pet hedgehog species are the African pygmy hedgehog (*Atelerix albiventris*) and the Egyptian long-eared hedgehog (*Hemiechinus auritus*). Currently in Spain their popularity has declined, as from 2013 they are considered invasive exotic species and their possession, reproduction and sale are banned. On the other hand, the common hedgehog (*Erinaceus europaeus*), the most numerous wildlife species in Europe, is protected and it is illegal to keep it as a pet. However, in the 19th century, coinciding with the Victorian era, this last species was kept in the kitchens of some houses in order to control the presence of cockroaches and other insects. This tradition led the common European hedgehog to colonize territories as far away as New Zealand.

Throughout evolution, some species of dermatophytes have adapted to live in certain animal species. A clear example would be *Trichophyton erinacei*, whose principal natural reservoir are hedgehogs. In fact, dermatophytosis is the most common mycosis in these animals, with *T. erinacei* being almost the only species that is isolated from them. However, there is some confusion in the bibliography about the nomenclature of this species since it has been cited under different names (e.g. *Trichophyton mentagrophytes*, *Arthroderma benhamiae*) depending on the concept of species used at each moment.

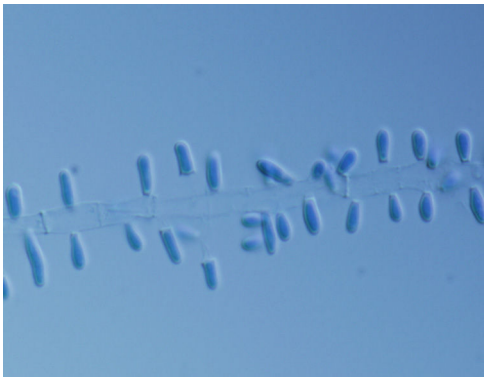

Fig. 1. Micromorphology of *Trichophyton erinacei*. Note the elongated lateral microconidia along the hyphae.

In a recent study carried out in our laboratory,[1] ten strains of dermatophytes isolated from hedgehogs in Spain were characterized, all of them showing the same morphological characteristics compatible with *T. erinacei* (Fig. 1). Identification of these fungi was confirmed by DNA sequencing, with all strains showing the same ITS-5.8S rRNA gene sequences. The similarity between each of these sequences and the one of the *T. erinacei* type strain was 100%.

Due to the adaptation of this dermatophyte to its host, the symptoms produced by *T. erinacei* infection in hedgehogs are usually mild and not very inflammatory. Generally, desquamation, crusting around the face and ears and, in more severe cases, loss of spines are observed (Fig. 2). Treatment with antifungal drugs such as terbinafine is effective. However, in a large number of animals the infection may be inconspicuous or asymptomatic, thus increasing the risk of transmission to those who handle them.

☆ These Mycology Forum articles can be consulted in Spanish on the Animal Mycology section on the website of the Spanish Mycology Association (https://aemicol.com/micologia-animal/).

* Corresponding author.
E-mail address: javier.cabanes@uab.es

https://doi.org/10.1016/j.riam.2020.03.002

Fig. 2. Ringworm caused by *Trichophyton erinacei* in an African pygmy hedgehog. Photo courtesy of Jaume Martorell (UAB).

A small number of mycoses are known to be zoonosis, where direct transmission between animals and humans occurs. Although rare, hedgehogs can transmit ringworm to humans. In Spain the percentage of isolation of this species cited in studies of human dermatophytosis is very low, being less than 0.5%. The first human cases in the world were published in the 60s and 70s of the last century, related to European and African wild hedgehogs, respectively. More recently, this type of zoonosis has been sporadically reported in many countries, but, in these cases, mainly related to contact with pet hedgehogs. Dermatophytosis caused by *T. erinacei* in humans affects usually hands and wrists due to pet handling habits. However, in one of the last published cases caused by this species,[2] the involvement of the scalp of a Korean boy who had a pet hedgehog is described. This child presented a suppurative, highly inflammatory, and rare form of tinea capitis called kerion, which responded well to treatment with terbinafine. As it is common in tinea capitis, infection in humans with a dermatophyte that has an animal reservoir produces more inflammatory lesions than when there is no change in the host.

While *T. erinacei* is easy to identify in the veterinary laboratory when related to hedgehog cases, it is less so in human medicine, unless a contact with a hedgehog is taken in patient's history.

This dermatophyte belongs to the *T. mentagrophytes* species complex, whose members are difficult to distinguish by their morphology. It can be confused mainly with *Trichophyton benhamiae*, a species mainly transmitted by guinea pigs, *Trichophyton interdigitale*, a typically anthropophilic species producing non-inflammatory tinea of the nails and feet, and *T. mentagrophytes* sensu stricto, which causes inflammatory infections transmitted by different animal species. For this reason, and in order to avoid misidentifications, it is important to confirm their identification by DNA sequencing methods.

Conflict of interest

Author has no conflict of interest.

Acknowledgements

Financial support came from Servei Veterinari de Bacteriologia i Micologia of the Universitat Autònoma de Barcelona.

References

1. Abarca ML, Castellá G, Martorell J, Cabañes FJ. *Trichophyton erinacei* in pet hedgehogs in Spain: occurrence and revision of its taxonomic status. Med Mycol. 2017;55:164–72.
2. Jang MS, Park JB, Jang JY, Yang MH, Kim JH, Lee KH, et al. Kerion celsi caused by *Trichophyton erinacei* from a hedgehog treated with terbinafine. J Dermatol. 2017;44:1070–1.