

Considering that animals may represent a potential source of infection for humans through direct contact or shedding in the environment, we would like to suggest to the medical mycology community to pay special attention to the involvement of animals in this topic. In fact, it seems that the human-animal interface may significantly contribute to recurrent infections, which is one of the leading causes of treatment failure.

To conclude, we would like to congratulate Uhrlaß *et al.* for their work.¹ This is a step further towards better understanding the clinical aspects and therapeutic challenges of *N. incurvata*, a pathogen with potential to emerge as a threat to in human, pets and livestock. In our perspective, the findings by Uhrlaß *et al.* turn the spotlight on the importance of this new fungal species, possibly leading to the identification of new cases in other countries. Finally, we hope that our discussion may add relevant information regarding the epidemiological aspects of animals as carriers and disseminators of *Nannizzia* spp.

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Nil.

Conflicts of interest
There are no conflicts of interest.

Authors' Reply

Sir,
We are grateful to Dr. Aline Elisa Santana from Brazil who responded to our article on the occurrence of the rare geophilic dermatophyte *Nannizzia incurvata* in Southeast Asia^{1,2}. *N. incurvata* belongs to the so-called *Nannizzia gypsea* (formerly *Microsporium gypseum*) complex. In addition to *N. gypsea*, one also counts *Nannizzia fulva* (formerly *Microsporium fulvum*) and *N. incurvata* described here. *N. gypsea* is perhaps the most prominent representative within the geophilic dermatophyte species. In a typical way, *N. gypsea* causes infection of the skin on the hands and arms, for example, in gardeners who have direct contact with the earth and the dust. Animals do not play a role in *N. gypsea* dermatophytoses. *N. gypsea* and also *N. incurvata* are *per se* not among the zoophilic dermatophytes. Of course, however,

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it is conceivable that especially in the rural environment at the village, ground living fur animals are surely capable of carrying spores or mycelia of primarily geophilic dermatophytes, thus also of *N. incurvata*. They may then also be indirect carriers for transmission of infections due to *N. incurvata* or *N. gypsea* to humans. However, data on this are not available. The boy we described in Cambodia with tinea capitis favosa and tinea faciei lives in a rural region and is surrounded by various animals in his village and in his parents' house and farm. That is why, such an indirect transmission path from *N. incurvata* from the ground through the fur of animals (dogs, cats and rodents) would be conceivable and theoretically possible. There is no proof of this, however; it is purely speculative.

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One further example of a transmission pathway of a primary geophilic dermatophyte from animals on humans is *N. praecox*, a geophilic dermatophyte present in soil and equine environments (saddles, straw and stables). *N. praecox* is rarely reported as a cause of human tinea, particularly after contact with horses. *N. praecox* can be isolated from horse hair in the absence of clinical lesions^{3,4}.

Interestingly, the colleagues from Brazil focused on the fact that the Translation Elongation Factor 1 α (TEF1 α) gene sequence used in our investigation in Germany, was in theory, erroneously associated with *N. gypsea*¹. This is, indeed, right. We were able to show that by sequencing of the TEF1- α gene, for strain 213959/2017 isolated from the Vietnamese patient, no cluster to compare was available in the National Centre for Biotechnology Information (NCBI, Bethesda, Maryland, USA) database². On the other hand, strain 211859/2017, isolated from patient two, the Cambodian boy, clustered with KM678105.1 from the NCBI database. This sequence, however, was first assigned in the database as *N. gypsea*. Due to the new classification and nomenclature of dermatophytes from 2017, sequence of strain KM678105.1, now, has to be considered as *N. incurvata*⁵.

In addition to the two patients with *N. incurvata* dermatophytoses from Vietnam and Cambodia described in our IJDVL paper, in the meantime, we were able to isolate three other patients suffering from tinea corporis due to *N. incurvata*. These were a 33-year-old female with onychomycosis from Finland, a 29-year-old female with tinea corporis from Iraq and a 19-year-old German patient with tinea corporis after visiting Thailand. Interestingly, there was no background of any contact to animals in these patients. Despite the geophilic origin of the dermatophytosis, a human-to-human transmission of *N. incurvata* seems possible, too. Recently, in Russia, a new case report has been published on *N. incurvata* dermatophytosis in a 42-year-old man. The infection – tinea corporis of the forearm – due to this geophilic fungus occurred in Italy during a vacation on the seaside⁶.

Declaration of patient consent

Patient's consent not required as there are no patients in this study.

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