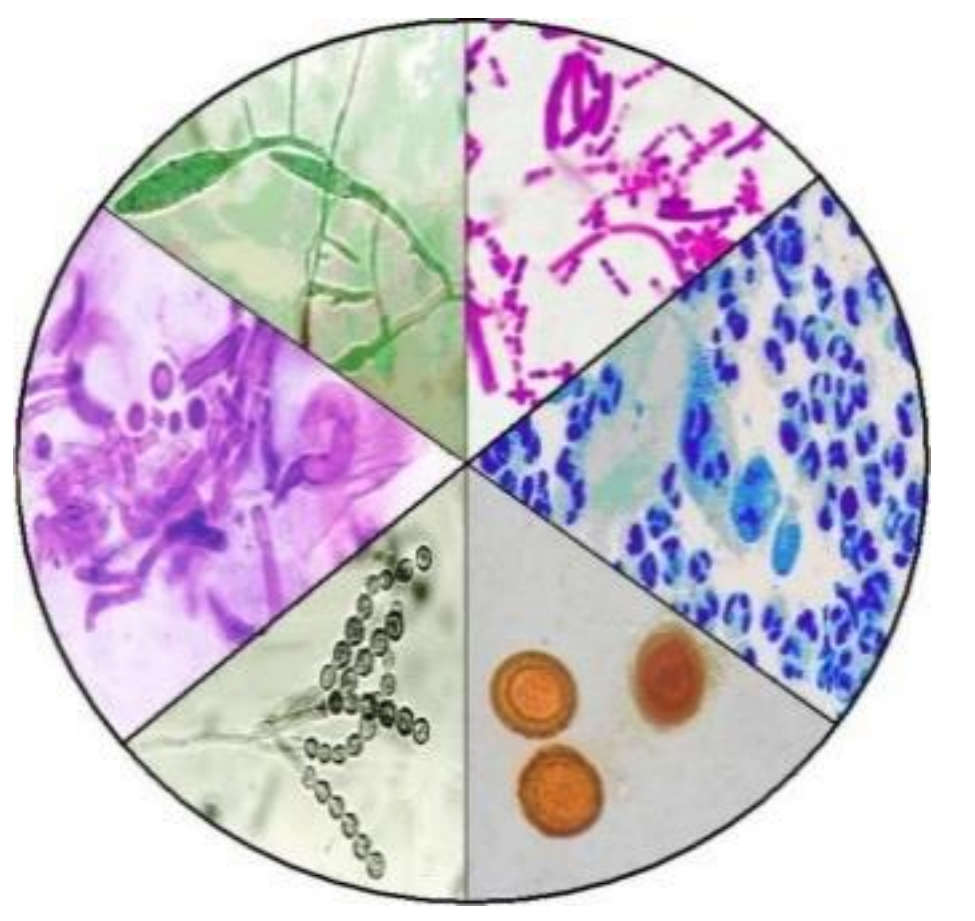


Arthroderma chiloniense - a new geophilic dermatophyte - molecular characterization and occurrence in Germany.



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Introduction

According to the new taxonomy of dermatophytes, all geophilic fungal species are summarized in the genus *Arthroderma* (*A.*). Known species of *Arthroderma* are *A. insingulare*, *A. gertleri*, *A. uncinatum*, *A. thuringiensis*, besides there are new species such as *A. amazonicum*, *A. eboreum*, *A. vespertilii*, and *A. crocatum*.

Methods

A total of 4 strains (Table 1) of a hitherto unknown dermatophyte were isolated from human patient materials from 2011 to 2017. The underlying dermatoses were a hand eczema to exclude a tinea manus, nail discoloration (onychomycosis) and skin scrapings from the lower leg and body. There was a conventional analysis (Table 2) with growth of fungi on the usual fungal nutrients, as well as molecular mycological diagnosis (Figure 1). Sequencing of the gene regions ITS-1 and ITS-2, TEF 1 α , β -tubulin, actin and calmodulin was performed for species identification.

Results Phylogenetic analysis

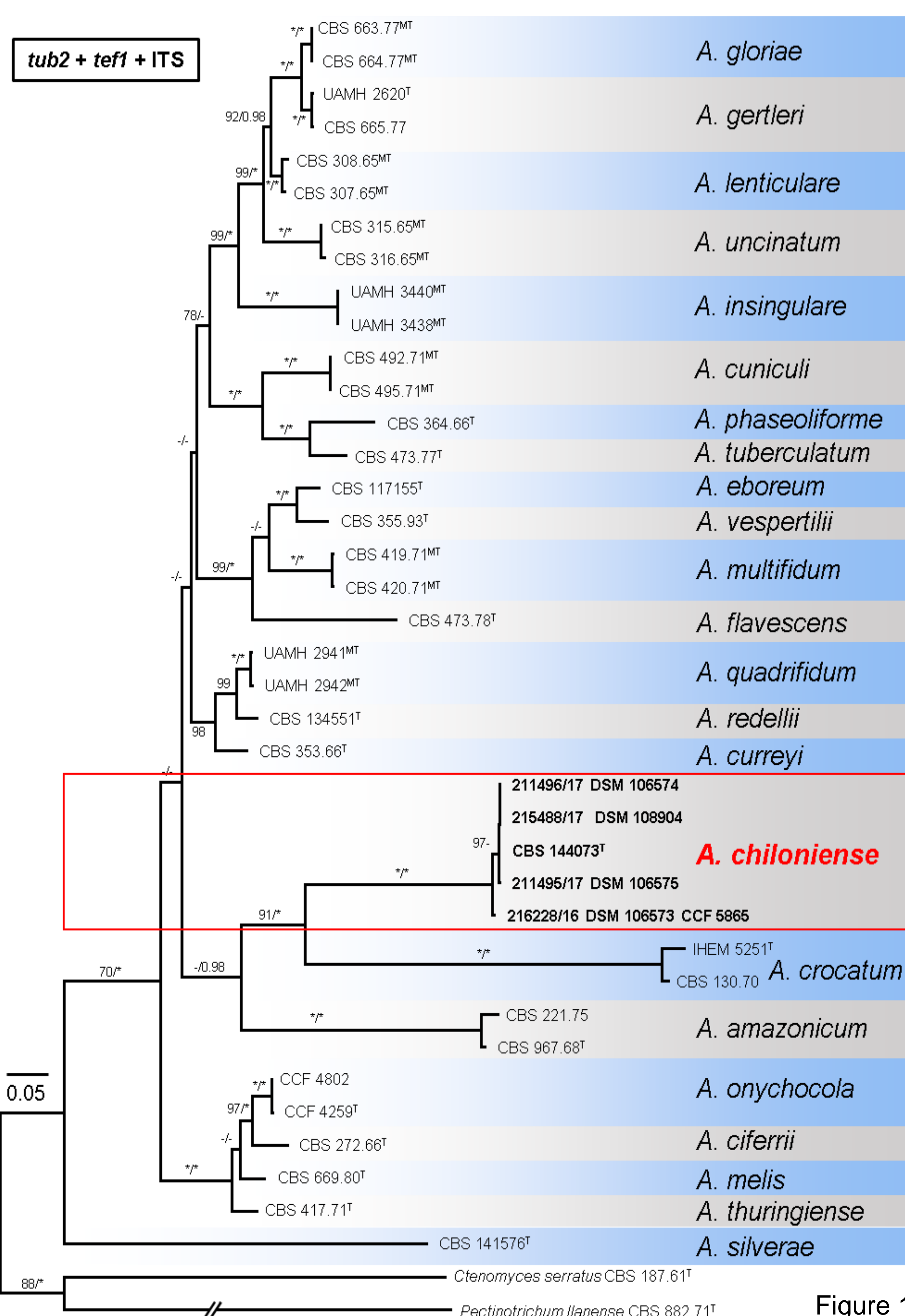


Figure 1

Overview of strains - general description of 4 strains

<i>Arthroderma chiloniense</i>	211495/17	211496/17	216228/16	215488/17
Date of sample	December 2011	September 2014	October 2016	September 2017
Location of sample	Thuringia Germany	Thuringia Germany	Rhineland-Palatinate	Thuringia Germany
Source of strain	ML00712/2011 Bad Langensalza	ML00314/2014 Bad Langensalza	Mölbis	Mölbis
Source of isolation	toenail woman, 62-year-old	skin scales of hand	skin scrapings lower leg, male, 80-year-old	skin scrapings, dermatomycosis male, 58-year-old
Deposit strain	DSM 106575	DSM 106574	DSM 106573 CCF 5865	DSM 108904
GenBank/ENA/DDBJ accession numbers	LR136986 - ITS LR136838 - TUB2 LR136839 - TEF1 α	LR136984 - ITS LR136834 - TUB2 LR136835 - TEF1 α	LR136987 - ITS LR136840 - TUB2 LR136841 - TEF1 α	LR136985 - ITS LR136836 - TUB2 LR136837 - TEF1 α

Table 1: General description of 4 strains

Morphology

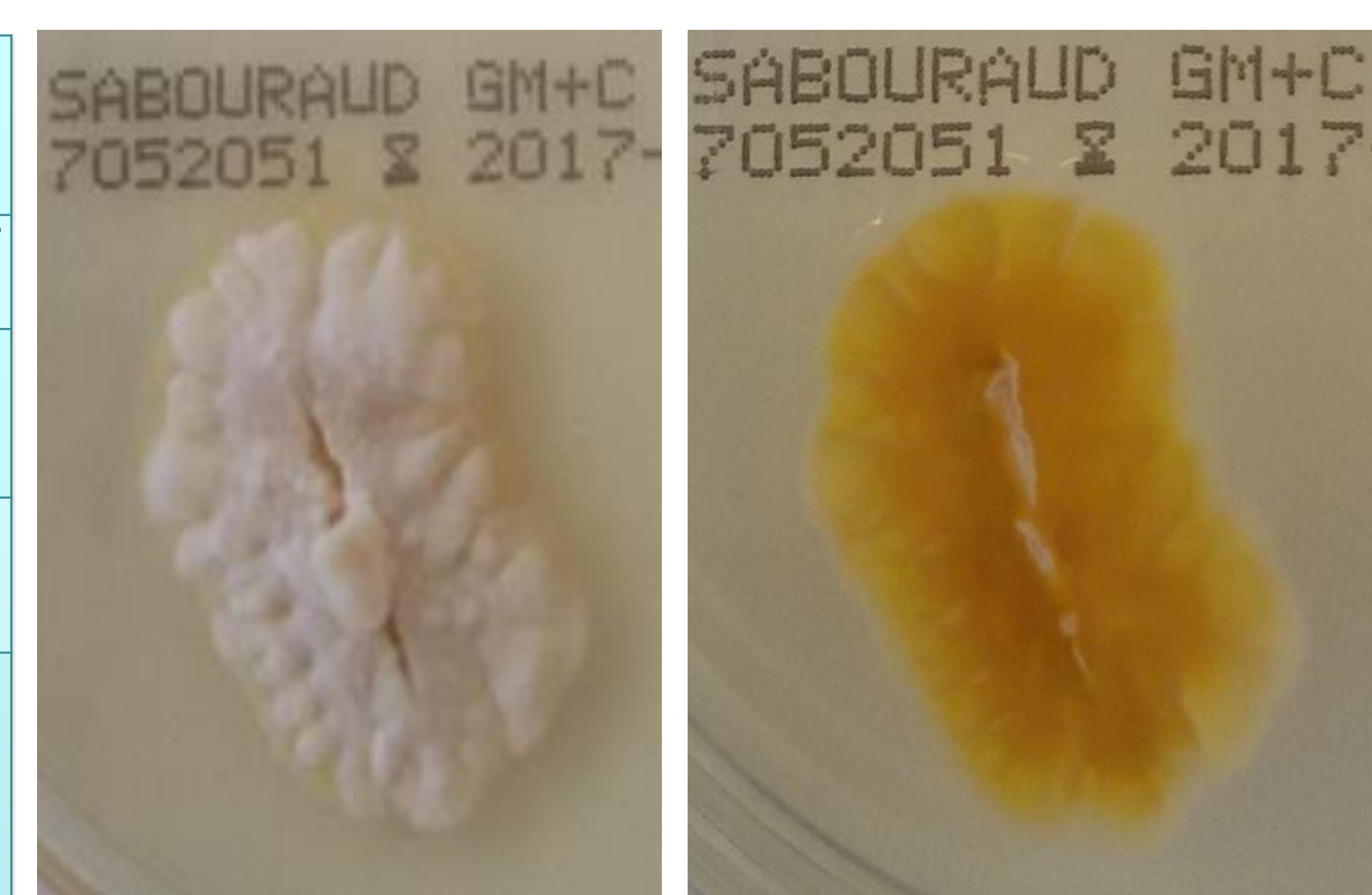
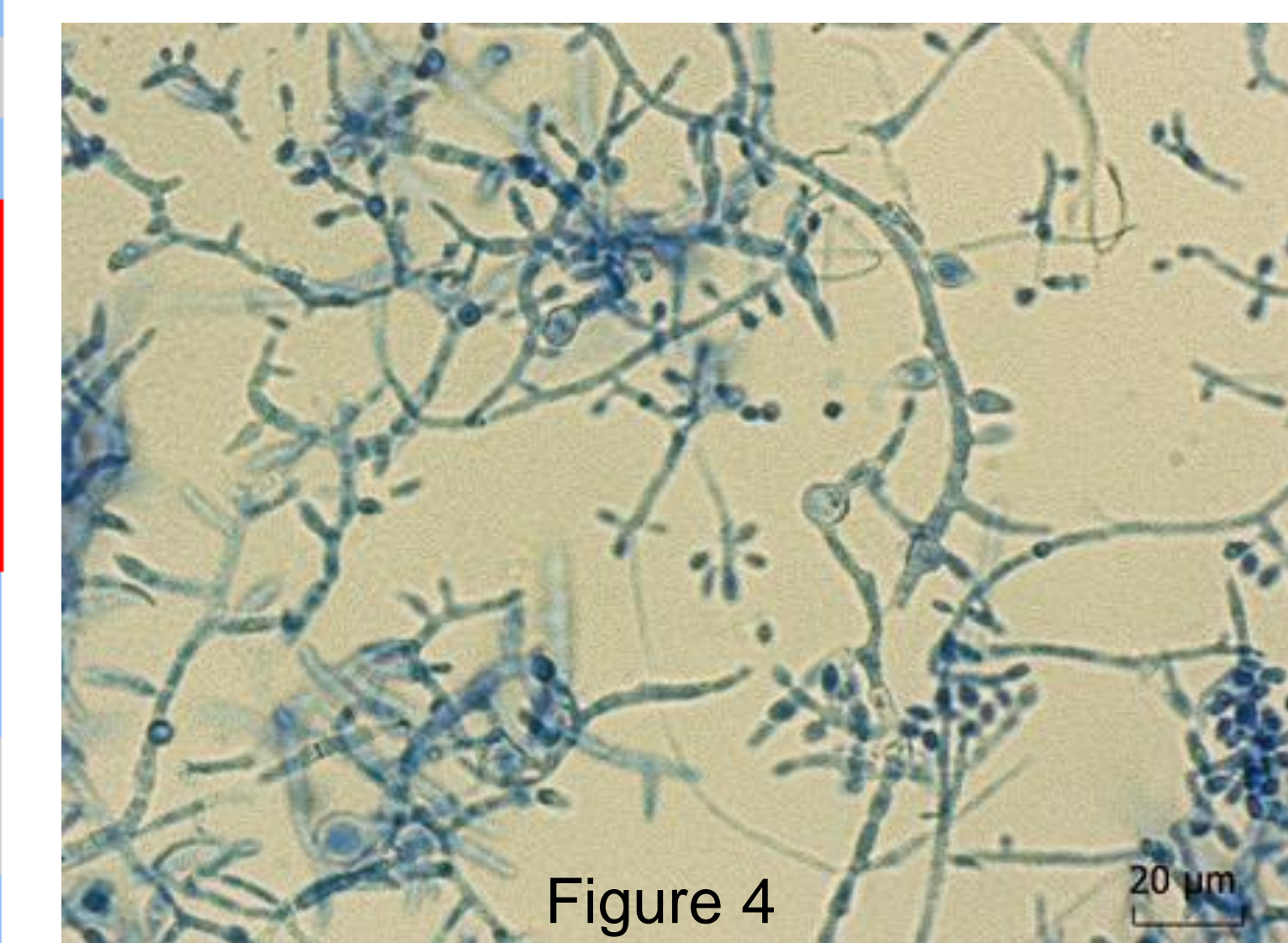


Figure 2 a Figure 2 b

Figure 2: *Arthroderma chiloniense*, strain 216228/17 growth at 28°C, on common mycological culture media, on BD Sabouraud GM+C glucose agar, (a) upper on surface; whitely (b) reverse: yellowish pigmentation



Microscopy

Figure 4: Microconidia (small, elongated, alongside hyphae or in clusters next to conidiophores), many chlamydospores

Figure 4

Figure 1: Phylogenetic placement of *Arthroderma chiloniense* sp. nov. and other species of the *Arthroderma* clade by Vit Hubka- performed using the G-INS-i option implemented in MAFFT v.7 (Kato et al. 2017). Alignments were trimmed, concatenated and then analysed using Maximum Likelihood (ML) and Bayesian Inference (BI) analyses. The final dataset contained 40 taxa and 1886 positions of which 964 were variable and 756 parsimony informative.

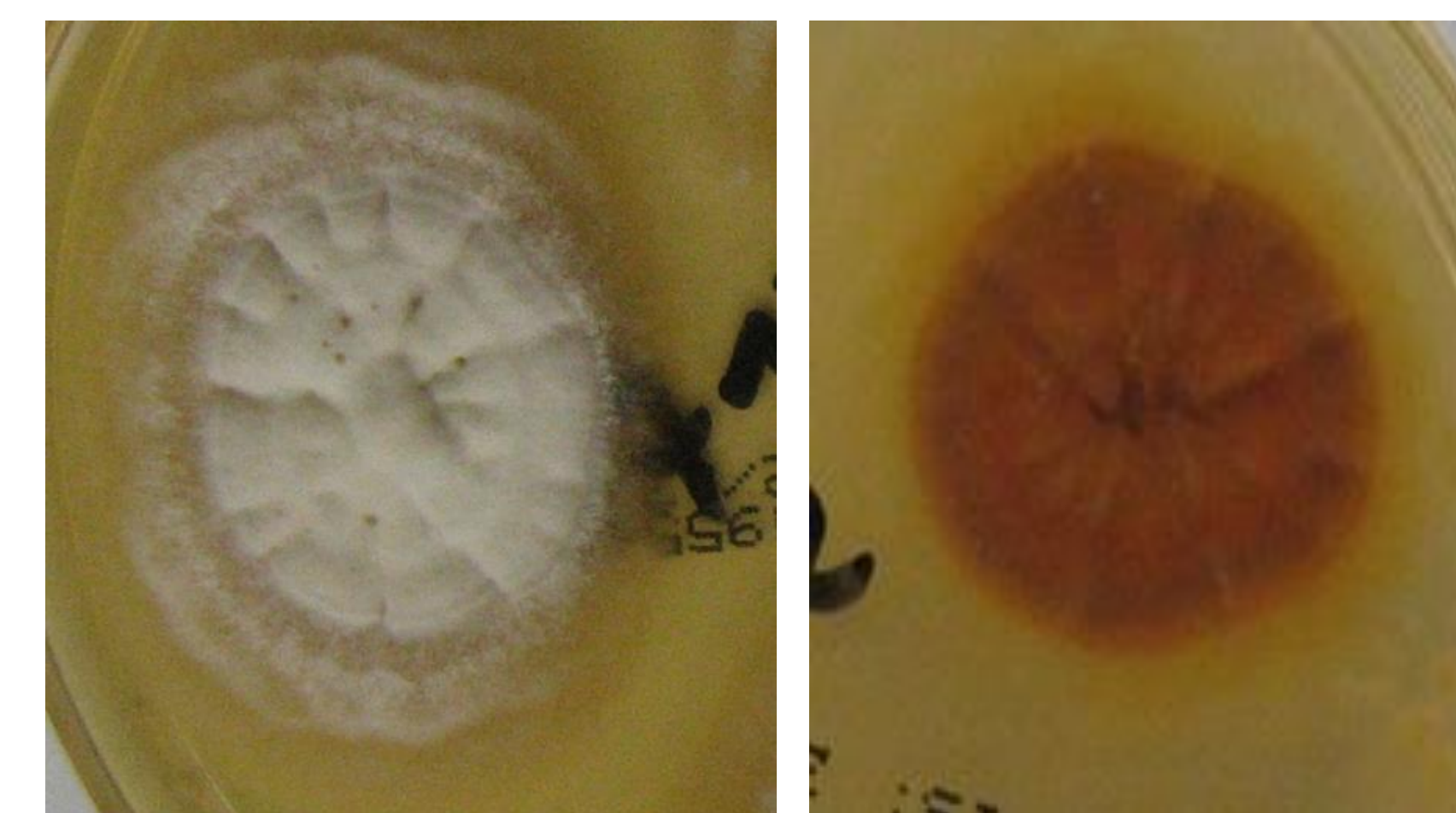


Figure 3 a Figure 3 b

Figure 3: *Arthroderma chiloniense*, strain 211495/17 growth at 25°C, on common mycological culture media, on Kimmig's agar, (a) upper surface; whitely (b) reverse: yellowish pigmentation

<i>Arthroderma chiloniense</i>	Growth on dermatophyte agar with Cycloheximide after 14 d	Growth on Sabouraud agar	Trichophyton agar 1-6	Urease test	Potato dextrose agar	Growth on human skin scrapings	BCMP	Growth at 37°C on Sabouraud agar	Hair perforation test	Cand ID agar	Crossing trials on oatmeal agar
Lab. no.211495/17 no.211496/17 no.216228/16	yellowish pigmentation on reverse; microconidia (small, elongated, alongside hyphae or in clusters next to conidiophores), later arthroconidia and many chlamydospores; macroconidia absent	like dermatophyte agar	surface white to cinnamon in color, central furrow, granular, border lacerated, few reverse pigmentation. After 14 d, diameter was 18 mm (T 1-5) and 10 mm (T 6)	pos.	Almost no plication on surface, only delicate yellowish pigmentation, few crenation, granular, many microconidia	good	strong proteolysis, purple stain	neg.	good growth, but no perforating organs	turquoise on reverse	negative with both other strains

Table 2: Morphology and physiology - Investigated by Prof. J. Brasch, Kiel in August 2017

In August, 2017, an outbreak due this dermatophyte occurred in Kiel. In 4 patients without spatial contact the proof was provided. This fungus has been described as the new dermatophyte species *Arthroderma chiloniense* in 2018.

Finally, the 4 investigated strains from the years 2011-2017 could clearly be identified as the dermatophyte *Arthroderma chiloniense* sp. nov. For molecular diagnostics, the strain CBS 144073 = DSM 106167 with the acc. number LT992885 from Kiel was used as a reference strain.

Conclusion

A. chiloniense is a new geophilic dermatophyte which was first described in Kiel in 2018. This species is apparently widespread in Germany. Isolated from humans with suspected dermatophytosis of the skin or nails, it can be assumed that *A. chiloniense* has pathogenic potential.

References:

- Brasch et al. *Arthroderma chiloniense* sp. nov. isolated from human stratum corneum: Description of a new *Arthroderma* species. *Mycoses* 2019; 62 (1): 73-80.
- de Hoog et al. Toward a novel multilocus phylogenetic taxonomy for the dermatophytes. *Mycopathologia* 2017; 182: 5-31

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