

***Microsporium gypseum* infection in a horse with severe sweet itch**

Microsporium gypseum-infectie bij een paard met erge zomereczeem

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A BSTRACT

In a horse with severe sweet itch and a history of corticosteroid treatment for this disorder, a single, well-circumscribed and crusty white lesion was present on the thigh. The geophilic dermatophyte species *M. gypseum* was cultured from the lesion. The lesion was treated topically once a week with an enilconazole emulsion for four weeks. Full recovery was noted after two months. This case suggests that sweet itch combined with systemic corticosteroid treatment, may act as predisposing factor for dermatophyte infection. In addition, the importance of correct isolation and identification of the causal agent is highlighted.

SAMENVATTING

Bij een paard met erge zomereczeem en een voorgeschiedenis van corticosteroïdebehandeling voor deze aandoening, werd een welomschreven, cirkelvormig letsel met witte korstvorming opgemerkt. De geofiele schimmel *Microsporium gypseum* werd geïsoleerd uit het letsel, waarna een vier weken durende topische behandeling met enilconazole werd gestart. Twee maanden na de behandeling was het letsel volledig hersteld. Deze case-report laat vermoeden dat zomereczeem in combinatie met systemische corticosteroïdebehandeling als risicofactor kan optreden voor een dermatofyteninfectie. Verder wordt het belang van een correcte staalname, isolatie en identificatie van de oorzakelijke kiem bediscussieerd.

INTRODUCTION

Dermatophytosis or ringworm is a superficial skin infection caused by dermatophytes. These filamentous fungi invade keratinized tissues, such as nails, claws, hair and stratum corneum of humans and animals causing mild to severe, localized or diffuse infections. Dermatophytes are classified in the genera *Epidermophyton*, *Trichophyton* and *Microsporium*. They can also be divided into three ecological groups according to their natural host or habitat. Humans are the natural host of anthropophilic dermatophytes. Zoophilic dermatophytes have one or more animal species as natural host, but as most of these fungi can also infect humans, they should be considered zoonotic. Geophilic dermatophytes have the soil as main reservoir, which may act as source of infection for animals and humans (De Hoog et al., 2000).

Dermatophytosis is one of the most common skin diseases in horses (Pilsworth et al., 2007). During an epidemiological survey carried out in Italy (Perugia), a prevalence up to 9% was found in riding horses (mainly *T. equinum*, no *M. gypseum* isolates). In all cases, infection was associated with clinical signs (Moretti et al., 1998). Main clinical features in horses include alopecia, erythema and crusting. Lesions are often restricted to skin areas in contact with the saddle or other horse tack (Chermette et al., 2008; Wobeser, 2015). In the present case report, dermatophytosis in a horse due to the geophilic *Microsporium gypseum* is described.

CASE PRESENTATION

An eight-year-old Friesian gelding presented in autumn 2015 with a single, well-circumscribed, slightly

elevated, dry, crusted and alopecic lesion on the thigh (Figure 1). The horse had a history of extreme sweet itch, for which it had been treated with corticosteroids (dexamethasone, 30 mg/daily per os) during summer. At the time the lesion appeared, the horse was still under corticosteroid treatment and was wearing an eczema blanket, which completely covered the lesion. Based on the clinical aspect of the lesions, dermatophytosis was suspected.

Prior to sampling, the skin lesion was superficially decontaminated with a 70%-ethanol solution and air-dried to reduce the number of contaminants. Hairs were plucked and scales were scraped from the margin of the lesion using a sterile scalpel blade. Skin scrapings and hairs were inoculated at several points on Dermasel agar (Oxoid, Basingstoke, UK), supplemented with penicillin G (1000IU/ml) and streptomycin sulphate (1mg/ml). Plates were incubated at 25°C and checked daily for growth. To prevent overgrowth by saprobic fungi, suspected dermatophyte colonies were purified on Sabouraud dextrose agar (SDA) (Oxoid). The identification was deduced from macro- and microscopic features on SDA. Colonies were stellate, with a marked powdery aspect, cream-colored to cinnamon-tan with whitish aerial mycelium in the center of the colony and with a yellowish-buff to brownish verso (Figure 2). Microscopic examination of the purified culture revealed very abundant macroconidia and sparse microconidia (Figure 3). Macroconidia were septated, fusiform, thin- and rough-walled and arranged in dense clusters. Some macroconidia had a flagellated appendix (Figure 3A). Microconidia were sessile or stalked, smooth- and thin-walled and clavate (Figure 3B). Based on morphological features, the isolate was identified as *M. gypseum*. To confirm the diagnosis, the ITS1-5.8S-ITS2 ribosomal DNA region of the isolate was amplified using the panfungal primers ITS1 and ITS 4 [6] and sequenced. BLAST search in the ITS RefSeq database (NCBI) revealed a 100% sequence similarity with *M. gypseum*. Given the limited extent of the lesions, topical therapy was initiated with an enilconazol emulsion (Imaverol, Janssen Animal Health, Beerse, Belgium), once weekly, for four weeks. The lesion improved gradually and full recovery was achieved after two months.

DISCUSSION

In this report, a case of equine dermatophytosis due to the geophilic dermatophyte *M. gypseum* is described. The main etiological agent of dermatophytosis in horses is the zoophilic dermatophyte *Trichophyton equinum*, which is highly contagious among horses and may also infect humans (Chermette et al., 2008; White et al., 1990). Other zoophilic dermatophyte species, such as *Microsporum canis* (including the former *Microsporum equinum*) (De Hoog et al., 2000), *Trichophyton mentagrophytes* and *Trichophyton verrucosum*, are less frequently involved (Moretti



Figure 1. Clinical aspect of a *Microsporum gypseum* infection in a Friesian horse, which presented as a single well-circumscribed and crusty lesion on the thigh.

et al., 1998; Cabañes et al., 1997; et al., 2000; Khosravi and Mahmoudi, 2003). Hitherto, infection due to *M. gypseum* has only occasionally been reported in horses (Khosravi and Mahmoudi, 2003; Tanner, 1982; Chiers et al., 2003).

To the authors' knowledge, there is no evidence of transmission of *M. gypseum* infections between horses, even though this could be theoretically possible, for example by common use of saddle blankets. Although transmission to humans from animals cannot be entirely excluded (Chermette et al., 2008; Romano et al., 2000; Romano et al., 2009), ringworm due to *M. gypseum* is not considered zoonotic. As *M. gypseum* lives saprobially in the soil, the outdoor environment constitutes the main source of infection. The risk of infection is higher for horses that are not stalled, living outdoor (Chermette et al., 2008).

Dermatophyte infections in healthy horses are considered to be self-limiting (Chermette et al., 2008; Wobeser, 2015; Scott and Miller, 2011). However, treatment of active infection is appropriate to advance healing of the lesions and to reduce spread of the infective arthroconidia into the environment (Chermette et al., 2008; Wobeser, 2015). When tackling infections due to zoophilic dermatophytes, antimycotic therapy may also help to avoid spread of the infection to other animals and humans.

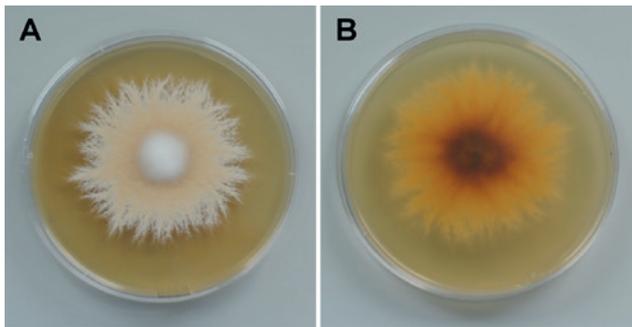


Figure 2. Macroscopical aspects of the purified *Microsporum gypseum* isolate, incubated on SDA for 7 days 25°C; A. recto; B. verso.

In the present case, the combination of sweet itch and the use of immunosuppressive drugs may have acted as predisposing factors. Sweet itch is a chronic, recurrent, seasonal dermatitis in horses caused by an allergic reaction to the bite of *Culicoides* spp. and is therefore often referred to as insect bite hypersensitivity (Van Grevenhof et al., 2007). The symptoms include intense pruritus, and the scratching may result in skin lesions and secondary infections. As a rule, the mane and tail are affected. However, in horses with severe signs, lesions may be spread over the entire body (Halldorsdottir and Larsen, 1991; Björnsdottir et al., 2006). So far, no connection between dermatophyte infection and sweet itch has been reported in the literature. Only Scott and Miller (2011) have mentioned that skin damage caused by ectoparasites (e.g. lice and biting flies) is probably important in the establishment and spread of dermatophytosis. The use of immunosuppressive drugs such as glucocorticoids, on the contrary, is known to entail an increased risk of developing fungal infections, including dermatophytosis (Chermette et al., 2008; Scott and Miller, 2011; Van Rooij et al., 2012; Guillot, 2013; Miller et al., 2013). Glucocorticoids interfere with first-line immune defences, mainly by suppressing the function of macrophages and inhibiting lysozyme synthesis (Panarelli, 1994; Papich, 2013).

Infections due to *M. gypseum* in horses may be

more common than generally thought. Many cases of dermatophytosis in horses are not reported and the causal agent is often not identified. Isolation and identification of the causal agent may prove challenging. For example, to ascertain the cause of a dermatophytosis, proper specimen collection is of the utmost importance. The equine hair coat is a source for bacteria, saprobic moulds and yeasts that may complicate the isolation of causal dermatophytes by their fast (over) growth (Scott and Miller, 2011). Therefore, it is important that lesions are disinfected with 70% ethanol to reduce the occurrence of contaminants. Furthermore, scales should be scraped off and/or hairs should be plucked (not clipped) from the margins of the lesions. Even though commercial PCR kits are available to rapidly identify certain dermatophytes, including *M. gypseum*, they are often limited to the detection of only one species. Correct identification of the causal agent may help to identify the source of infection and to estimate the risk the infection spreads to other animals or humans.

CONCLUSIONS

To the authors' knowledge, this is the first case to suggest that sweet itch in combination with systemic corticosteroid treatment may act as predisposing factor for the development of dermatophytosis. In this paper, the importance of correct isolation and identification of the causal agent is also highlighted.

AVAILABILITY OF DATA AND MATERIALS

The data supporting the authors' findings are contained within the manuscript. Sequences are available in the EMBL/Genbank/DDBJ repository (accession number: LN886514; <http://www.ebi.ac.uk/ena/data/view/LN886514>). The *M. gypseum* isolate was deposited in the BCCM/IHEM repository (accession number: IHEM 26589).

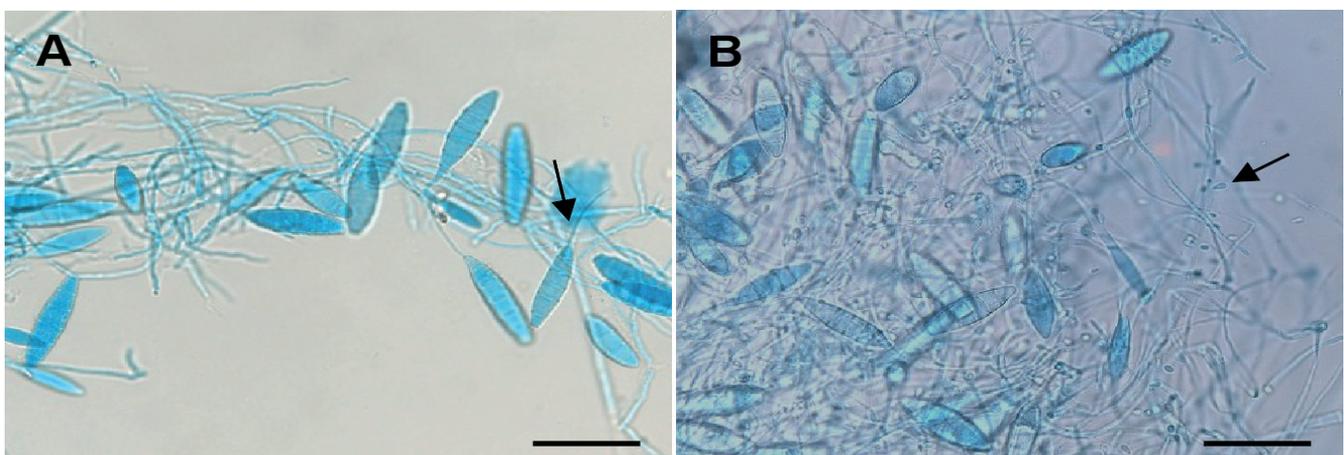


Figure 3. Microscopical morphology of the *Microsporum gypseum* isolate after purification and incubation on SDA at 25°C showing A. predominantly rough-walled, spindle-shaped macroconidia and a flagellated macroconidium (arrow) and B. sparse, club-shaped microconidia (arrow); scale bar: 50µm

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