

Mycotic Keratitis in a Horse Caused by *Aspergillus fumigatus*. The First Reported Case in Finland

By R. Aho, M. Tala and M. Kivalo

National Veterinary Institute, Regional Laboratory, Oulu, Finland,
Department of Surgery and Department of Anatomy and Embryology, College of Veterinary Medicine,
Helsinki, Finland and Research Center for Pathogenic Fungi and Microbial Toxicoses,
Chiba University, Japan.

Aho, R., M. Tala and M. Kivalo: Mycotic keratitis in a horse caused by *Aspergillus fumigatus*. The first reported case in Finland. Acta vet. scand. 1991, 32, 373–376. – The first identified Finnish case of equine mycotic keratitis caused by *Aspergillus fumigatus* is described. The clinical picture, the sampling method, the macro- and micromorphology of the causative fungus and the therapy applied are reported in detail. Therapy with natamycin (Pimafucin® 2.5 % eyedrops, Gist-Brocades) was successful.

fungal keratitis.

Introduction

The eye of the horse is continually being subjected to challenges from a variety of fungi in the environment. Since injury to the cornea, not at all uncommon in farm animals, is one of the most common predisposing factors leading to infection of this tissue, it is surprising that fungal keratitis is so seldom reported. Equine mycotic keratitis has been reported by a few authors, but the mycological examination has been incomplete in many of the cases. Moore *et al.* (1983) reported *Aspergillus* spp. to be the most common causative agent for equine mycotic keratitis. Friedman *et al.* (1989) later described a case caused by *Pseudallescheria boydii* and Marolt *et al.* (1984) examined another case caused by *Aspergillus oryzae*. Several more clinically oriented papers report lists of fungal agents associated with keratitis in the horse, including *Aspergillus fumigatus* (Beech *et al.* 1983, Bistner & Riis 1979, Coad *et al.* 1985,

Hodgson & Jacobs 1982, Kern *et al.* 1983, Mitchell & Attleberger 1973). Since fungal keratitis in animals may have been overlooked earlier in our country, we report this first identified case of equine fungal keratitis caused by *Aspergillus fumigatus*.

Materials and methods

A ten-year-old crossbred mare had been suffering from keratitis for 3 weeks and had been treated with an antibacterial ophthalmic drug. As no response was noted, the horse was sent to the Large Animal Clinics at the College of Veterinary Medicine, Helsinki, Finland. At that time the horse showed epiphora, severe pain and considerable pus excretion from the left eye. The eyelids were swollen. Because of the pain the horse did not allow examination without sedation. A greyish area about 50 mm long with an ulcer was found in the cornea. Systemic sul-

fadoxine-trimethoprim (Borgal[®], Hoechst) was administered during the first week of hospitalization.

A deep cornea sample from the ulcer was taken by scraping carefully under general anaesthesia and stained with Giemsa's stain. This direct mount revealed pieces of branching, septate hyphae and numerous granulocytes, and led to a sample being sent to the mycological laboratory of the National Veterinary Institute's Regional Laboratory in Oulu, together with the stained direct mount for confirmation.

The sample was cultured on 3 media routinely used at this laboratory. They were Sabouraud (2%) glucose medium without cycloheximide and nutritionally poor base medium (Aho 1980) with and without cycloheximide (0.5 mg/ml).

Results

A pure culture of *Aspergillus fumigatus* Fresenius 1850 was seen on all the plates. The colony morphology conformed macroscopically and microscopically (Fig. 1) to the descriptions given of this fungus (Raper & Fennel 1965). A colony on Potato dextrose agar grew rapidly and was deep green in colour after 2 weeks of incubation at room temperature. On Czapek Dox agar the colony was light brown. The conidial heads were typically columnar, and the vesicles flask-shaped and fertile over the upper half. The sterigmata were uniseriate and the conidia globose and slightly rough, 2.5–3 µm in diameter.

Antimycotic treatment was initiated. Since there were very few choices available for the antifungal treatment of keratitis in Finland, the eye was treated with a solution of 1 cc natamycin, (Pimafucin[®] 2.5% eyedrops, Gist-Brocades) in 4 cc sterile sodium chloride, which was applied 4 times a day for 5 weeks via a polyethylene tube inserted into

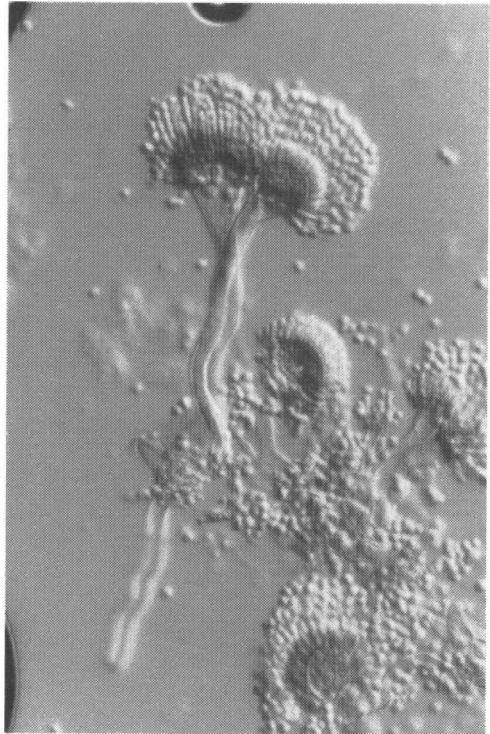


Figure 1. Conidial heads of *Aspergillus fumigatus* (800 ×).

the upper fornix through eyelid. The eyelids were sutured together for corneal protection and support. The treatment was combined with systemic antibacterial medication of trimethoprim-sulphadiazine (Oriprim[®], Orion) and eye medication containing only chloramphenicol (Oculo-Klorita[®], Lääkefarmos), with atropin (Oftan-Atropin[®], Star) to relieve pain and synechia formation.

The horse left the clinics after 5 weeks, at which stage the corneal ulcer had healed. The treatment was considered successful after 2 months' follow-up. Only a small scar was seen in an otherwise functional eye.

Discussion

Fungal infection in the cornea, whether primary or secondary, may be suspected on the

basis of a history of typically chronic keratitis, which responds poorly to the usual antibacterial therapy. The typical clinical symptoms, also seen in this case, consist of epiphora, blepharospasm, conjunctival and scleral congestion, lacrimation or occasionally ulceration (Bistner & Riis 1979, Render *et al.* 1982). The diagnosis must be based on screening of an appropriate tissue sample and an adequate mycological examination, however, because spores of several potentially pathogenic fungal species can be found in the transient flora of the normal eye. The incidence of *Aspergillus* spp. in the normal outer eye varies from 2.4 % (McLaughlin *et al.* 1983) to 56 % (Samuelson *et al.* 1984), and 1 survey (Riis 1981) shows 88 % of horses to carry living fungal spores in the conjunctival sac without any signs of clinical manifestation.

Both Wilson & Sexton (1968) and Bistner & Riis (1979) point out the importance of careful sampling. When an ulcer is found, the sample should be taken from the lesion. The fungal hyphae may not be present in the superficial layer of the cornea, but only deep in the corneal stroma. Sedation and local anaesthesia are necessary for adequate sampling, and in this case samples had to be taken under general anaesthesia due to the aggressive nature of the horse. Examination of a direct mount is also essential in order to confirm the presence of fungi in the tissue, which together with isolation of the fungus in a pure culture minimizes the possibility for diagnostic error. The importance of examining the direct mount received additional support in this case, because it was this that led the clinicians to suspect a mycotic infection.

Early diagnosis of mycotic keratitis is necessary for successful treatment. Ulceration of the cornea can easily cause panophthalmia and loss of the eye, especially if corticoste-

roids are used for treatment (Bistner & Riis 1979). The therapy usually has to be started before any mycological diagnosis is available, and the choice of drug depends more often on the antifungal agents available in the country than on the causative agent alone. Fortunately natamycin has proved effective against *Aspergillus* as well as *Fusarium* spp. (Beech *et al.* 1983, Kern *et al.* 1983), and it is also the least irritating drug when applied to the eye. The newer antifungal drugs introduced in the 1980's, imidazole derivatives such as miconazole and ketoconazole, are recommended by Coad *et al.* (1985) for cases involving *Aspergillus* spp., but these drugs were not available for ophthalmic use in the present instance.

Antifungal therapy is always long and depends on the severity of the infection. Several applications of the ophthalmic drug are recommended per day, and Render *et al.* (1982) recommend that the therapy should be continued for at least 2 weeks after the cornea has healed.

References

- Aho R: Studies on fungal flora in hair from domestic and laboratory animals suspected of dermatophytosis. *Acta path. microbiol. immunol. Scand. B* 1980, 88, 79–83.
- Beech J, Sweeney CR, Irby N: Keratomycosis in 11 horses. *Equine vet. J.* 1983, suppl. 2, 39–44.
- Bistner SI, Riis RC: Clinical aspects of mycotic keratitis in the horse. *Cornell Vet.* 1979, 69, 364–372.
- Coad CT, Robinson NM, Wilhelmus KR: Antifungal sensitivity testing for equine keratomycosis. *Amer. J. vet. Res.* 1985, 46, 676–678.
- Friedman DS, Schoster JV, Pickett JP, Dubielzig RR, Czuprynski C, Knoll JS, Wolfgram LJ: *Pseudallescheria boydii* keratomycosis in a horse. *J. Amer. vet. med. Assoc.* 1989, 195, 616–618.
- Hodgson DR, Jacobs KA: Two cases of *Fusa-*

- rium keratomycosis in the horse. *Vet. Rec.* 1982, *110*, 520–522.
- Kern TJ, Brooks DE, White MM: Equine keratomycosis: Current concepts of diagnosis and therapy. *Equine Vet. J.* 1983, suppl. 2, 33–38.
- Marolt J, Naglic T, Hajsig D: *Aspergillus oryzae* als Ursache einer keratomykose beim Pferd. (*Aspergillus oryzae* as the cause of keratitis in the horse). *Tierärztl. Prax.* 1984, *12*, 489–492.
- McLaughlin SA, Brightman AH, Helper LC, Manning JP, Tomes JE: Pathogenic bacteria and fungi associated with extraocular disease in the horse. *J. Amer. vet. med. Assoc.* 1983, *182*, 241–242.
- Mitchell JS, Attleberger MH: *Fusarium* keratomycosis in the horse. *Vet. med. small. anim. Clin.* 1973, *68*, 1257–1260.
- Moore CP, Fales WH, Whittington P, Bauer L: Bacterial and fungal isolates from Equidae with ulcerative keratitis. *J. Amer. vet. med. Assoc.* 1983, *182*, 600–603.
- Raper KB, Fennell DI: *The Genus Aspergillus*. Williams & Wilkins Co., Baltimore 1965.
- Render JA, Vestre WA, Carlton WW: Oculomycosis in animals. *Mod. vet. Pract.* 1982, *63*, 539–545.
- Riis RC: Equine ophthalmology. In: Gelatt KN (ed.): *Veterinary Ophthalmology*. Philadelphia, Lea & Febiger, 1981, p. 576.
- Samuelson DA, Andresen TL, Gwin RM: Conjunctival fungal flora in horses, cattle, dogs and cats. *J. Amer. vet. med. Assoc.* 1984, *184*, 1240–1242.
- Wilson LA, Sexton RR: Laboratory diagnosis in fungal keratitis. *Am. J. Ophthalm.* 1968, *66*, 646–653.

Sammanfattning

Mykotisk keratit hos häst orsakad av Aspergillus fumigatus.

Mykotisk keratit hos häst orsakad av *Aspergillus fumigatus* beskrivs första gången i Finland. Klinisk bild, provtagning, makroskopisk och mikroskopisk morfologi av svampen samt terapi rapporteras i detalj. Terapin med natamycin (Pimafucin® 2.5 % ögondroppar, Gist-Brocades) var effektiv.

(Received September 14, 1990; accepted October 8, 1990).

Reprints may be requested from: Riitta Aho, National Veterinary Institute, Regional Laboratory in Oulu, P. O. Box 517, SF-90101 Oulu, Finland.