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# AN OUTBREAK OF RINGWORM IN KARAKUL SHEEP CAUSED BY A PHYSIOLOGICAL VARIANT OF *TRICHOPHYTON VERRUCOSUM* BODIN

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ABSTRACT

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An outbreak of ringworm in Karakul sheep occurred during 1973 among the flocks of at least 14 farmers in South West Africa and the northern Cape Province. Infections spread from one farm to another as a result of introducing infected stud rams. On one farm a few cattle, a goat and a horse developed lesions after being in contact with infected sheep. Some of the attendants handling infected sheep also contracted the disease. Strains recovered from infected animals resembled *Trichophyton verrucosum* morphologically, but when grown on laboratory media they did not require an exogenous source of vitamins, which was found to be indispensable for strains of this species studied previously.

## INTRODUCTION

Although ringworm appears to occur only occasionally in sheep, outbreaks have been reported in several countries. These include France where Guilhon, Charton & Durieux (1955) and Guilhon & Obligi (1956) isolated both *T. verrucosum* and *Trichophyton mentagrophytes* from infected animals in a flock of Merino sheep. *T. verrucosum* is the only species which Kielstein & Weller (1965) were able to isolate in Germany from ringworm cases in several flocks of sheep. The same species was isolated by Pepin & Austwick (1968) in Britain from an outbreak in a flock of Suffolk ewes. In the U.S.S.R., Sharapov (1962) recorded the occurrence of ringworm caused by *T. mentagrophytes* and *T. verrucosum* (only 1 case) in Karakul sheep. He found that rodents acted as the source of infection.

This paper describes, for the first time in Southern Africa, an epizootic of ringworm in Karakul sheep and gives an account of observations made on the aetiological agent.

## MATERIALS AND METHODS

Specimens of hair and skin scrapings from lesions in sheep were taken by state veterinarians and forwarded to this laboratory. A portion of each sample was mounted in 10% KOH and examined microscopically. The remaining material was plated out on Sabouraud's agar containing chloromycetin (0,25 mg/ml) and cycloheximide (0,5 mg/ml). Pure cultures were grown on Sabouraud's agar at different temperatures and examined after 14 days. Nutritional requirements of isolates were investigated on Difco *Trichophyton* Agars according to the method of Georg & Camp (1957).

## OBSERVATIONS

### *Field observations*

The outbreak was first noticed early in 1973 when sheep on a farm in the Griekwastad district showed lesions suggestive of ringworm. Further observations on farms in the northern Cape Province and South West Africa revealed an increasing number of infected animals. Towards the end of 1973 the epizootic had involved the flocks of at least 14 farmers in the districts of Upington, Griekwastad, Karasburg, Keetmanshoop, Mariental, Omaruru, Gobabis and Windhoek.

It was clear that the infection had spread from one farm to another as a result of introducing infected stud rams among flocks. Ringworm was not observed in other animals, except on 1 farm where some Jersey cows, 1 goat and a horse developed minor lesions after being in contact with infected sheep. Some of the attendants handling infected sheep also developed ringworm lesions.

In general the percentage of infected sheep was low. On most farms only 1 or 2 cases were found but on others 10% and even up to 30% of the herd were infected. Lesions were mostly located on the head, especially around the ears, eyelids, horns and on the dorsum of the nose, but also occurred on the legs, the groin and around the tail (Fig. 1–6). Cases with fleece involvement were rare. The most conspicuous symptoms of the disease were loss of hair and the formation of white scales. In some cases crusts came loose from infected foci and gave rise to raw lesions which bled readily (Fig. 5). In more advanced cases large crusted lesions were formed (Fig. 3).

Superficial lesions usually healed spontaneously but severe cases were often resistant towards different methods of treatment. One pure-bred ram was so severely infected that it recovered only after several months of treatment with micro-sulphur suspended in oil and the use of various other fungicidal preparations such as 3-ethylamino-1,2-benzisothiazole-hydrochloride (Ectimar*), 3-benyl-5-carboxymethyltetrahydro- 1,3,5- thiabiazin - 2 - thion sodium (Defungit**) and phenylmercuric acetate (Sporodyl***).

### *Microbiological features*

Specimens of infected hair were available for investigation from 10 of the 14 farms where ringworm was diagnosed in sheep. The manner of hair invasion was an endo-ectotrix type. Large arthrospores, measuring 4–5 $\mu$m, formed a sheath over the surface of the hair, but also occurred within the hair (Fig. 7).

Strains of the same dermatophyte species were recovered from all specimens, although in primary cultures 2 different colony forms developed (Fig. 8). Isolates of Form 1 on Sabouraud's agar at 28°C grew slowly. The colonies, which showed predominantly a submerged mycelium, attained a diameter of 15 mm after 14 days. At 37°C growth was very poor and the small, yellowish, asteroid colonies were not more than 10 mm in diameter after 14 days.

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* Bayer
** Hoechst
*** Burroughs Wellcome

FIG. 1 Typical circumscribed area of alopecia on the dorsum of the nose

FIG. 2 Lesions which have progressed in a circular fashion from around the eyes to adjacent areas of the face

FIG. 3 Large crusted lesion in the poll region

FIG. 4 Extensive hair loss and scaling of epithelium on greater part of head. Note that the fleece is not affected

FIG. 5 Crusty scabs on legs, showing a raw surface after removal

FIG. 6 Thick crusts on leg in a long-standing case

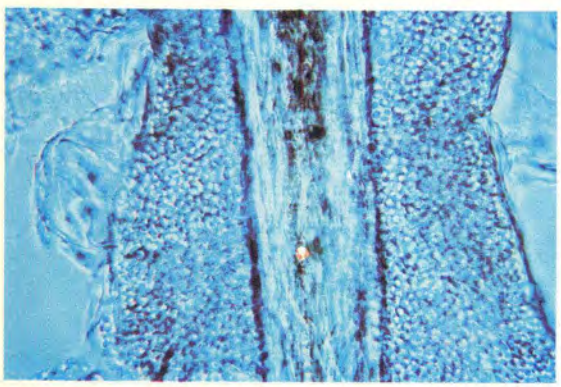

FIG. 7 Infected hair enclosed by a thick sheath of arthrospores

FIG. 8 Primary culture of *T. verrucosum* on Sabouraud's agar showing small and large colonies of different shape and colour. (The colony with the black pigment near the periphery is a contaminant)

Microscopical examination of such colonies revealed many globose chlamydospores arranged in chains of varying length.

Isolates of Form 2 grew rapidly on Sabouraud's agar. After 14 days the diameter of colonies at 28°C and at 37°C were respectively 40 and 30 mm. At both temperatures considerable surface growth of white, downy mycelium was produced and numerous ovoid to pyriform microconidia, measuring 1,5–2,0 by 2,0–3,5 $\mu$m, were present alongside the aerial hyphae. With frequent subculturing the growth rate of initially slow-growing colonies became rapid. Microconidia of the same size as those in the downy colonies occurred on scant aerial hyphae at the periphery of the flattened, water-soaked colonies.

Nutritional tests were performed on isolates of the 2 colony types. Both strains developed on the $NH_3NO_3$ as well as the casein vitamin-free agar media and produced equal amounts of growth on the *Trichophyton* Agars.

## Discussion

On the basis of microscopical morphology and the mode of *in vivo* hair invasion the fungus from the Karakul sheep appears to be representative of *T. verrucosum*. Macroconidia were not observed but these are normally absent in many strains of *T. verrucosum*. On the basis of colony size and shape, degree of downiness and pigment production, strains may be designated as varieties *album, discoides* and *ochraceum* of the species. Georg (1950), who made a comparative study of many strains previously described as different species, showed that these names are based on highly variable characteristics. Since one form of colony may change upon subculture to another form, the morphology of colonies cannot be used to distinguish between varieties of *T. verrucosum*.

Zoophilic dermatophytes tend to show a specific host adaptation or host preference. *T. verrucosum*, for instance, is considered primarily a pathogen of cattle, while infections in other animals or in humans are uncommon and can usually be traced to contacts with infected cattle. There was no indication that cattle were the source of infection in the present outbreak of ringworm in Karakul sheep. In previous outbreaks, ringworm in sheep due to *T. verrucosum* also appeared not to have originated from infected cattle, although such a possibility was investigated by Kielstein & Weller (1965). Vanbreuseghem (1967) isolated *T. verrucosum* from infected goats and from one black-head sheep running with the goats in Somalia. No reference was made to contact between these animals and ringworm-infected cattle.

For the differentiation of some closely related dermatophytes their physiological characteristics must also be taken into account. Georg & Camp (1957) found that routine nutritional tests can be used as an aid in the identification of certain *Trichophyton* species. They studied the nutritional requirements of 100 strains of *T. verrucosum* and reported that all strains, irrespective of colonial morphology, require either thiamine or both thiamine and inositol. Isolates from the Karakul sheep, on the contrary, showed no essential requirements for these vitamins. The fact that these strains are autotrophic with respect to thiamine and inositol indicates an important dissimilarity between the variety of *T. verrucosum* causing ringworm in sheep and the variety of this species causing ringworm in cattle.

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