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Occurrence of human dermatophytes in northern Finland

PENTTI KOSKELA, JARMO TURUNEN & HILKKA GREUS

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The majority of the dermatophytes (Moniliales, Deuteromycetes) from clinic patients in northern Finland identified in culture, 90 %, fall into three species, *Trichophyton rubrum* (Castellani) Sabourad, *T. mentagrophytes* (Robin) Blanchard and *Epidermophyton floccosum* (Harz) Langeron & Milochevitch, in order of current prevalence. This species range is identical to that found in the south of Finland. Cases of *T. rubrum* infection have increased particularly markedly in recent years.

Pentti Koskela, National Public Health Institute, P.O. Box 267, SF-70101 Kuopio 10, Finland.
Jarmo Turunen and Hilkka Greus, Department of Medical Microbiology, University of Oulu, Kajaanintie 46 D, SF-90220 Oulu 22, Finland.

Introduction

Reports have been published in recent years on increases in skin conditions attributable to dermatophytes (Moniliales, Deuteromycetes) in a number of countries (e.g. Friedrich & Heise 1974, Miguens & Espinosa 1980), and a corresponding account is available concerning the south-western parts of Finland (Havu et al. 1977).

The present paper sets out to describe the situation in northern Finland by analysing findings from fungal cultures made in the mycological laboratory of the Department of Medical Microbiology, University of Oulu, over the period 1972—1981.

Material and methods

A total of 61605 fungal samples from clinic patients in the northern Finnish provinces Oulu and Lappi were examined in 1972—1981 in the mycological laboratory of the Department of Medical Microbiology, University of Oulu, and of these 14615 concerned cases of dermatological infections.

Epidermal scales, hairs and nail clippings were inoculated on glucose-peptone agar, Dixon's agar and malt agar with added penicillin and streptomycin (Lodder 1971), and the fungi isolated were classified by macro- and micromorphology, and when necessary by urease activity, by vitamin requirements, etc. (Beneke 1957, Ajello et al. 1963, Emmons et al. 1977, Rebell & Taplin 1979).

Up to 1978, direct microscopic examination in KOH (20 %) was carried out on nail clippings only, and on other samples when requested, but in later years all dermatological samples were examined directly under the microscope.

Results

After an increase in 1972—1973, the number of fungal samples remained relatively constant from 1974 onwards, but the number of dermatological samples and positive dermatophyte cultures continued to increase (Fig. 1). During the study period, a dermatophyte, yeast or mould, or some combination of these, was isolated from 8330 dermatological samples. In proportional terms, these groups accounted for 12 %, 30 % and 15 % respectively of all dermatological samples.

The majority of the dermatophytes identified in cultures, 93 %, belonged to three species: *Trichophyton rubrum* (Castellani) Sabourad, *T. mentagrophytes* (Robin) Blanchard and *Epidermophyton floccosum* (Harz) Langeron & Milochevitch (Table 1). *T. mentagrophytes* was still the most common species at the beginning of the study period but this species was overtaken by *T. rubrum* in later years. *E. floccosum* caused small epidemics in 1975—1977, but it is still rarer than *T. mentagrophytes* (Fig. 2). *T. violaceum* Sabourad apud Bodin, *T. tonsurans* Malmsten and *T. verrucosum* Bodin were rarities in cultures, and the dermatophyte isolations did not include any strain of *Microsporum canis* Bodin.

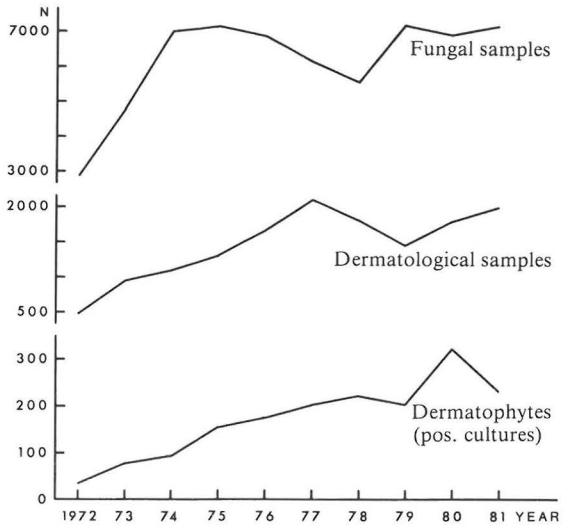

Fig. 1. Numbers of fungal samples studied at the laboratory of the Department of Medical Microbiology, University of Oulu, in 1972—1981, numbers of fermatological samples and findings of dermatophytes in cultures.

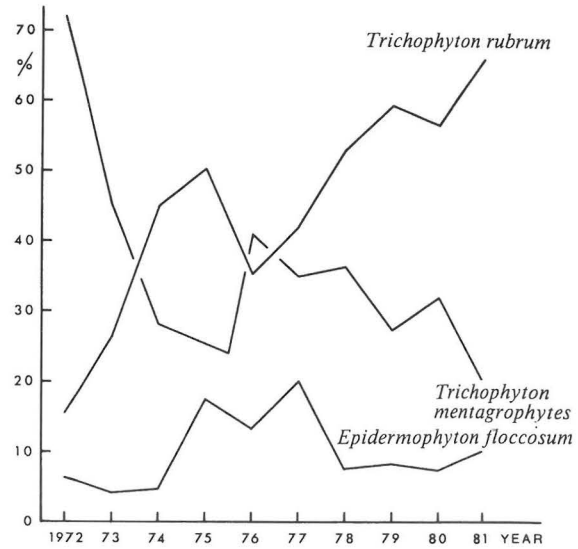

Fig. 2. Annual occurrences of the three most common dermatophytes identified in 1972—1981, as % of all positive dermatophyte cultures.

Dermatophyte infections occurred in both sexes, the frequency being higher in males than in females, and in all age groups, though only a few cases were found in patients below 10 years (Fig. 3). The typical patient was a man in the age 20—40 years with dermatophyte infection in the region of the lower limbs, the most common sites being the toe webs, toe nails and groin (Table 1, Fig. 3).

E. floccosum occurred as the scourge of younger men, preferentially in the groin or between the toes, while the *Trichophyton* species affected a greater age range of subjects, both male and female, growing in the nails and on both bare and hairy skin (Table 1, Fig. 3). These latter also favoured the toe webs, and *T. rubrum* occurred frequently in the male groin. The rare instances of dermatophytes in children involved the *Trichophyton* species.

During the last four years, in 4 % of all dermatological samples filamentous fungi were seen on microscopy but cultures remained negative. About 60 % of these native positive/culture negative samples were nails.

Discussion

The species range, relative prevalences and site preferences of the dermatophytes identified in the present material from northern Finland are practically identical to those reported for south-western Finland (Havu et al. 1977), even though the spread of *T. rubrum* and *E. floccosum* still lags behind that noted in the south by a matter of a few years. Cases of *T. mentagrophytes,* the most common dermatophyte in southern Finland in the 1940's (Pätiälä 1945, 1950) and in the 1950's (Kahanpää 1960), are now equivalent to only a third of those of *T. rubrum* in the Turku area, while *E. floccosum* has already achieved the same frequency level as *T. mentagrophytes* in the positive cultures. *M. canis* was still relatively common in southern Finland in the 1960's (Sonck & Lundell 1969), but appears to have become a rarity over the last decade (Havu et al. 1977), and does not seem to occur in northern Finland at present.

The trends noted in Finland are by no means unique. According to Miguens and Espinosa (1980) cases of tinea capitis caused mostly by *M canis* have decreased during the period 1951—1977 in Spain, while most of the other forms of tinea have increased, and today in Spain as in many other countries (Dvořák & Otčenášek 1969, English & Lewis 1974, Friedrich & Heise 1974, Blank & Mann 1975), *T. rubrum* is the most common dermatophyte.

Various foot infections occurred most frequently in this material (Table 1). Tinea pedis and the fungi causing it seem to be more common in summer (Pätiälä & Härö 1950) and in some special groups such as prisoners (Kalliomäki & Nyrke 1950), soldiers (Päti-

Table 1. Positive findings of dermatophytes in 1974—1978, by location on body and sex of patient.

Location on body	*E. floccosum*			*T. mentagrophytes*			*T. rubrum*			Others			Total		
	♂	♀	S	♂	♀	S	♂	♀	S	♂	♀	S	♂	♀	S
Groin	60	1	61	7	—	7	31	1	32	3	1	4	101	3	104
Toe web	17	4	21	54	24	78	45	32	77	7	7	14	123	67	190
Toe nails	1	2	3	18	29	47	48	61	109	7	4	11	74	96	170
Finger nails	—	—	—	3	10	13	27	18	45	3	1	4	33	29	62
Foot	4	1	5	23	29	52	25	19	44	7	6	13	59	55	114
Trunk	17	2	19	22	11	33	21	13	34	4	8	12	64	34	98
Hand	—	—	—	3	8	11	9	3	12	—	4	4	12	15	27
Face	—	—	—	7	7	14	—	—	—	—	1	1	7	8	15
Scalp	—	—	—	5	3	8	—	1	1	—	2	2	5	6	11
Not known	1	1	2	11	10	21	15	12	27	1	—	1	28	23	51
Total	90	11	111	153	131	284	221	160	381	32	34	66	506	336	842

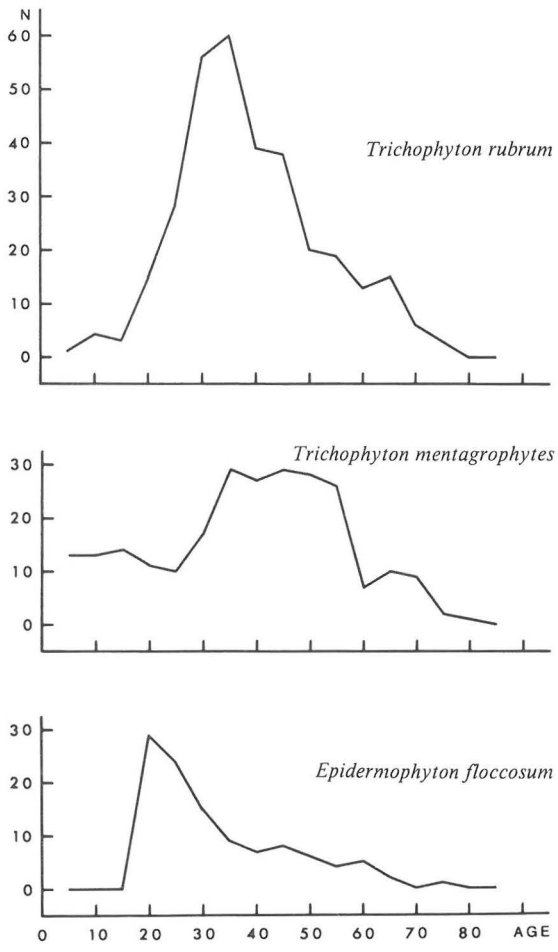

Fig. 3. Distribution of the tree most common dermatophytes by age of patient, in 1974—1978.

älä & Härö 1950), industrial workers (Pirilä 1951) and patients with rheumatoid arthritis (Vainio et al. 1957). According to Pätiälä and Härö (1950) the incidence of dermatophytes on asymptomatic feet of Finnish conscripts varies from 1.4 % (winter) to 5.4 % (summer), and in the same subjects Lundell (1970) found an increase of 15 % units in frequencies of foot dermatophytes (from 3.7 % to 18.7 %) and yeasts (from 62 % to 77 %), mostly without subjective symptoms, during the first five months' military service.

The higher prevalence of dermatophytosis in men than is women was largely attributable to groin and toe web infections caused by *E. floccosum* and *T. rubrum* (Table 1). The predominance of toe web infections may well reflect the generally accepted low standard of foot hygiene among men, while for anatomical reasons the male groin is highly susceptible to chafing, and thus also to infection.

A part of dermatological samples, in spite of filamentous fungi seen on microscopy, remains negative in cultures. The high proportion of nails in native positive/culture negative samples, found also in this material, is well known (English & Lewis 1974). Thus the isolation results do not give the exact prevalence of dermatophytes in patients but only of those successfully cultured. The species range in failed cultures, however, is obviously similar to that in samples from corresponding sites with successful cultures.

Moreover, the results, including both culture isolations and native findings reflect no more than the "tip of the iceberg", accounting for only some of those patients possessing clinical symptoms, as many cases are known to be treated without any fungal examination. Similarly, patients will generally only report for treatment once a long-term infection which has remained more or less symptomless (cf. above) develops into an acute condition. It thus remains uncertain what dermatophytes actually occur in the population,

how common they are, and to what extent the proportions of various species conform with those observed among the patients seeking treatment.

The reasons for an increase in dermatophyte infections are generally held to lie in the preference for tight-fitting, chafing clothing made of synthetic fibres likely to promote perspiration, the growth of travel, crowding together on bathing beaches, and swimming and public baths, etc., and the popularity of household pets.

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