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Addendum

After the recent reports by Meenan and Hillary (1969*a* and *b*) that UK2054 given intranasally may have some effect on influenza infection, this route of administration was tried in volunteers infected with rhinovirus type 9. A suspension of UK2054 of either 15 mg per ml or 40 mg per ml was given as nasal drops, eight times daily, from 1 day before until 5 days after inoculation of virus. The total dose of drug per day was either 7.2 mg or 19.2 mg. Nine volunteers received the less concentrated drug suspension and 14 the more concentrated: 22 received placebo. Colds occurred in 7 of 23 drug-treated volunteers and 8 of 22 controls, and the severity of the symptoms was the same in the two groups. Laboratory evidence of infection, as revealed by virus isolations and specific serological responses, was shown in 15 of 23 volunteers who received active drug and 16 out of 22 controls. The higher dosage of drug showed no advantage in comparison with the lower.

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THE BACTERIAL FLORA OF TRICHOMYCOSIS
AXILLARIS

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TRICHOMYCOSIS axillaris is a condition in which nodules appear on the hair shaft in the axilla, particularly on the portion nearest the skin. The nodules appear to be composed of masses of bacteria, and the condition receives clinical attention when staining of the clothing occurs, presumably due to the growth of chromogenic bacteria. The subject has been reviewed by Lane (1919) and Crissey, Rebell and Laskas (1952).

Paxton (1869) first described trichomycosis axillaris and recorded the growth of a white mould from affected hairs. Subsequent investigations have not confirmed Paxton's findings and in recent studies only the diphtheroid flora has been considered. Trichomycosis has been attributed to one particular species of diphtheroid, *Corynebacterium tenuis* (*sic*) (Crissey *et al.*), but the observations of McBride, Freeman and Knox (1968) do not support this view. Shehadeh and Kligman (1963) had suggested that trichomycosis represents the overgrowth

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of hair by the diphtheroids normally found in the axilla, but the evidence of McBride *et al.* was not sufficient to confirm or deny this suggestion.

During studies on erythrasma the opportunity arose of collecting affected and control hairs from two separate populations. This paper reports the findings.

MATERIALS AND METHODS

Population A. In an institution for the mentally retarded, 230 (26 per cent.) of 874 patients had trichomycosis axillaris. Hairs from 76 affected patients and from 49 unaffected (control) patients were examined. Sixteen patients also had trichomycosis of scrotal hair; three of the 16 had no trichomycosis in the axilla.

Population B. In a group of 113 normal adult males at a physical education centre, 31 showed trichomycosis axillaris. Hairs from 27 affected individuals and from 19 controls were examined.

TABLE I

Total number of separate diphtheroid isolates per person

Population	Trichomycosis present or absent	Number of persons	Total number of isolates	Isolates per person	Probability (P) of difference
<i>A</i>	Present	76	210	2.8	} $P < 0.001$
	Absent	49	88	1.8	
<i>B</i>	Present	27	73	2.7	} $P < 0.001$
	Absent	19	15	0.8	

The axillae were examined under Wood's light in darkness; affected hairs fluoresce and are easily seen, and a few samples were removed with sterile forceps and scissors. The hairs were shaken in 3 ml of broth on a shaker (Baird and Tatlock Ltd, 330/0012) at full power for 5–10 min.; the suspension was inoculated on to blood agar and incubated aerobically at 37°C for 2 days. Individual colonies, each representing apparently different strains, were subcultured to obtain pure cultures. Diphtheroid organisms, defined here as Gram-positive pleomorphic rods showing metachromatic granules with Albert's stain, were tested for ability to produce acid from glucose, maltose, mannose, galactose, lactose, sucrose, fructose, inulin, salicin and dextrin in serum peptone water. Production of urease, catalase and oxidase, ability to reduce nitrate and produce indole, MR and VP reactions and lipophilic and lipolytic properties on Tween 80 were also assessed. Subcultures on tissue-culture medium no. 199 containing 20 per cent. calf serum and 2 per cent. agar were examined for fluorescence under Wood's light (Sarkany, Taplin and Blank, 1961).

RESULTS

In population *A*, 265 women were examined; only 14 (5 per cent.) were recorded as having trichomycosis, largely owing to the absence, whether natural or artificial, of axillary hair. The women were not therefore considered further. In all, 216 (35 per cent.) of the 609 males in population *A* were affected, and, apart from those in the age-group under 14, who lacked axillary hair, no difference in age incidence was seen. In the tables, the 39 males under 14 years have been excluded.

In population *B* all the individuals were between 18 and 22 yr. The incidence (26 per cent.) of trichomycosis did not differ from that in the same age-group in population *A* ($0.1 > P > 0.05$).

In this paper we have regarded as a separate isolate any organism that differed in respect of one or more of the tests from others, isolated from the same hair. There were many more isolates recovered from affected than from control hairs (table I).

When we used the pilot scheme for the classification of cutaneous diphtheroids devised by Evans (1968), the proportion of Evans' group-D organisms was found to be significantly higher ($P < 0.0001$) in affected hairs, than in the controls (table II). The proportion of

TABLE II

Classification of axillary diphtheroids based on the scheme proposed by Evans

Evans group	Isolates of this group as percentage of corynebacterial isolates from	
	affected hairs*	unaffected hairs
A	6	18
B	0	0
C	1	0
D	47	28
E	0.3	0
F	20	18
G	21	29
Not classifiable	5	8

* Total number of corynebacterial isolates: from affected hairs 283, from unaffected hairs 103.

group-A strains was correspondingly lower. In Evans' scheme these two groups differ essentially only in nitrate reduction.

In population *A* the hairs were also examined for carriage of Gram-positive cocci. No difference was found between affected hairs (38 per cent. of the 76 yielded cocci) and control hairs (41 per cent. of the 49 yielded cocci).

TABLE III

Relation between trichomycosis and fluorescent axillary flora

Population	Trichomycosis present or absent	Number of persons	Percentage of persons with fluorescent diphtheroids	Probability (P) of difference
<i>A</i>	Present	216	24	} $P > 0.2$
	Absent	354	20	
<i>B</i>	Present	31	48	} $0.01 > P > 0.001$
	Absent	82	20	

Factors associated with trichomycosis axillaris

In addition to bacteria we also looked for associated factors that might have some bearing on the aetiology. Swabs taken directly from the axillary skin were inoculated on medium 199 and examined for fluorescence by Wood's light (Sarkany *et al.*) Fluorescent organisms were isolated significantly more often from swabs of axillae affected with trichomycosis than from controls in population *B*. The same was, however, not found in population *A* (table III). There was no significant difference in isolation of fluorescent organisms from the hairs themselves, nor was there any relation between trichomycosis and clinical erythrasma in either population ($P > 0.2$).

In population *B* axillary swabs were inoculated directly on a medium for the isolation of *Mima* and *Herellea* spp. (Mandel, Wright and McKinnon, 1964) and on blood agar, and examined for the presence of Gram-negative rods. The carriage of Gram-negative organisms in persons with trichomycosis was higher, but does not reach statistical significance (48 per cent. compared with 38 per cent. in the controls).

Subjects in population *B* were classified according to whether they used axillary deodorants regularly or not (table IV). The difference between affected and control persons is significant ($0.05 > P > 0.02$). However, there was no significant association between the use of deodorants and the carriage of Gram-negative organisms ($\chi^2 = 3.7$; $P > 0.2$).

The ponderal index, the somatotype and the skin-fold thicknesses had been calculated for the individuals in population *B* by Dr H. E. Robson, to whom we are indebted for permission to use these values. There was no significant correlation between these values and the incidence of trichomycosis axillaris.

TABLE IV
Relation between trichomycosis and use of deodorants in the axilla
(population *B* only)

Trichomycosis present or absent	Number of persons	Percentage of persons using deodorants	Probability (P) of difference
Present	31	10	} $0.05 > P > 0.02$
Absent	82	30	

DISCUSSION

Shehadeh and Kligman (1963) suggested that the diphtheroids found in trichomycosis were those normally present in the axilla. Although Crissey *et al.* (1952) had suggested the specific name *Corynebacterium tenue* for the diphtheroids that they isolated, their strains were not homogeneous in biochemical characteristics. At present there is no really satisfactory scheme for the classification of cutaneous diphtheroids and the scheme proposed by Evans (1968) is a tentative one. The strains described by Crissey *et al.* cannot be classified adequately by the use of Evans' scheme. Our finding of a high incidence of Evans' group-D organisms on hair affected with trichomycosis therefore depends on the validity of a dichotomous classification based on single characters. Further work is needed on this point.

Affected hairs yielded more isolates than the controls. Moreover, there was a higher incidence of both fluorescent diphtheroids and Gram-negative organisms in swabs taken directly from the axillary skin of individuals with trichomycosis than in those without, although the results do not reach statistical significance. These findings might suggest that axillae affected with trichomycosis axillaris support a larger microbial population, rather than that the hairs themselves are especially "attractive" to bacteria.

Apocrine glands occur mainly in the axillary and perineal regions, and these are also the sites affected by trichomycosis. Apocrine sweat is a viscous fluorescent fluid which is secreted intermittently into the upper part of the hair follicles in these areas. It dries to form a hard varnish-like substance which retains its fluorescence and tends to become yellow in colour (Hurley and Shelley, 1960). Individuals with trichomycosis used axillary deodorants less frequently than the controls and this might reflect a lower standard of personal hygiene. We are still investigating whether apocrine secretions and bacteria together form the masses seen on the hair.

SUMMARY

The bacterial flora of axillary hairs from persons with and without trichomycosis axillaris has been examined. Affected hairs bore a larger number of diphtheroid species than control

hairs and a higher proportion of isolates from trichomycosis were found to belong to Evans' group D.

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BIOCHEMICAL REACTIONS OF DIFFERENT SEROTYPES OF *PASTEURELLA HAEMOLYTICA*

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ACCORDING to Smith (1959, 1961) strains of *Pasteurella haemolytica* can be divided into two biotypes, A and T, differing in colonial appearance, growth rate, pathogenicity, sensitivity to antibiotics, and biochemical reactions. More recently, Biberstein, Gills and Knight (1960), using an indirect haemagglutination technique based on soluble surface antigens, detected ten serotypes of *P. haemolytica*. This number has now been increased to 12 (Biberstein and Gills, 1962; Biberstein and Thompson, 1966).

Biberstein and Gills found that strains of the 11 serotypes of *P. haemolytica* known at that time could be correlated with the A and T types described by Smith. Serotypes 3, 4 and 10 were type T and the rest were type A. Since, however, they tested fermentation reactions with only a limited range of substrates, and since they examined only one strain each of serotypes 4 and 11, two strains of serotype 10 and none of serotype 12, it was thought important to test the reactions of several strains representing each of the 12 serotypes with a wide range of substrates. The present paper reports observations made on at least three strains of each of the 12 serotypes of *P. haemolytica* except serotype 8, of which only two strains were available.

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