DANDRUFF AND SEBORRHEA

I. Flora of "Normal" and Diseased Scalps[1]

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INTRODUCTION

Confusion in dermatologic nomenclature which Savill (1) attributed in part to changing conceptions without complete abandonment of older terms, is well exemplified in conditions and diseases of the scalp. In many instances one may readily detect tinea capitis, psoriasis and other well defined entities. In the group of conditions known as dandruff, scurf, seborrhea, pityriasis capitis and seborrheic dermatitis or seborrheic eczema the differentiations may not always be sufficiently clear-cut in a given instance to suggest a definite entity. Sabouraud (2) contributed greatly to our knowledge of these conditions and his findings form the basis for much of our present knowledge.

Sabouraud (2) described the following:

1. Pityriasis simplex (seborrhea sicca) in which dry scales are noted. Pityrosporon ovale is found in abundance.

2. Pityriasis steatoides: The scales are loosely adherent and waxy. Pityrosporon ovale is present in abundance and Staphylococcus albus is usually present.

3. Seborrhea oleosa: Oiliness is present on the scalp in varying degree and is frequently present on the face, chest and back as well. Hair loss is usually noticeable. A microbacillus is found in scrapings from the scalp and Pityrosporon ovale and Staphy-

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lococcus albus are not present. In oily scalps unaccompanied by loss of hair, the microbacillus is absent (Savill (3)).

4. Pityriasis circinata (seborrheic dermatitis; seborrheic eczema.) In this condition there is visible erythema beneath the loosely adherent waxy scales. Hair loss is not a feature and may not take place. Pityrosporon ovale is usually to be found.

Barber (4) regards individuals who have excessively oily skins and in whom a faulty diet leads to the development of eczema as manifesting the seborrheic state. According to Goldsmith (5) "it is still not settled whether dandruff, or pityriasis capitis is only a form of seborrhea in which the secretion dries to form scales, or whether it is due to an infection."

Rulison and Highman (6) stated their belief that dandruff is not essentially seborrheal and that the combination of seborrhea and dandruff is not common. They considered the whole subject to be confusing but agreed in the main with the classification of Sabouraud previously quoted. Templeton (7) found that patients with oily, greasy dandruff could be separated into six groups according to the combinations of organisms present.

During recent years many studies have been made of the possible pathogenic rôle of Pityrosporon ovale. Originally described by Malassez (8) and also known as the bottle bacillus of Unna, the investigation of its pathogenicity has been hindered by the difficulty in obtaining a cultural growth. Success in growing the organism was reported by MacLeod and Dowling (9) in 1928. Previously Unna (10), Engman (10), Castellani (11), Templeton (7), Acton and Panja (12), and Ota and Huang (13) reported occasional success in attempt to cultivate the fungus. Templeton (7) employed a preparation containing beerwort agar. Moore (14) used wort agar (Difco), a medium made specially for the cultivation of yeasts; subcultures were usually made after three or four days. Moore (14) reported success in isolating P. ovale from approximately ten per cent of cases and attributed his failure in the remainder to a considerable concomitant growth of common air-borne fungi. It was possible to inoculate other mediums successfully from a vigorous primary growth.

In a report on the possible rôle of Pityrosporon ovale as the

cause of seborrheic dermatitis, Moore, Kile, Engman and Engman (15) found that inoculation of the cultures which they believed to be Pityrosporon ovale in human subjects and in animals frequently resulted in the development of a "dermatitis of erythema or brown scaliness," the histologic picture of which resembled that of seborrheic eczema. They stated that the reproduction of a dermatitis, as reported by MacLeod and Dowling (9) was the most convincing evidence in favor of the etiologic importance of a microbe. In a prior report Moore (14) doubted that the organism isolated by MacLeod and Dowling (9) was Pityrosporon ovale. It would seem, therefore, that rigid control tests both as to subjects and as to the inoculated material are essential in order to determine pathogenicity by inoculation experiments. Cutaneous tests by Moore, Kile, Engman and Engman (15), in eighteen patients with different extracts prepared from the cultural growth of Pityrosporon ovale resulted in a number of positive reactions. These reactions were manifested by the development of an area of erythema at the site of injection and in a few instances a scaly red dermatitis appeared. No mention was made of control tests.

The object of this paper is to report the study of the flora of scalps of a series of 100 patients in New York City.

MATERIALS AND METHODS

The investigation was three-fold: (1) clinical; (2) bacteriologic; and (3) mycologic.

1. *Clinical Investigation.* One hundred unselected individuals were studied, including physicians, nurses, technicians, and patients from the dispensary and in private practice. Several clinical findings were used to classify the individuals. These were: (1) loss of hair; (2) dryness or oiliness of the scalp; (3) scaling; and (4) the presence of acute inflammation, evidenced by erythema, exudation or crusting. Loss of hair was determined by the history, apparent thinning, regression of the anterior hair line and by the removal of hair by gentle traction with the fingers. Dryness or oiliness was determined partly by the history, when this could be reliably obtained, particularly in correlation with the elapsed time from the previous shampoo before examination; and by examination. In all cases it was arbitrarily decided that one week should elapse between the shampoo and examination.

The individuals were divided clinically into the following groups (16):

Group 1, normal. No hair loss and scalp neither abnormally dry nor oily. No scaling (dandruff) present.

Group 2a. Abnormal dryness of scalp without noticeable hair loss. Scaling present. Corresponds to Sabouraud's pityriasis simplex (Unna's seborrhea sicca).

Group 2b. Abnormal dryness and scaling of scalp with apparent hair loss.

Group 3a. Excessive oiliness of the scalp with or without scaling. When scaling was present the condition probably corresponds to Sabouraud's pityriasis steatoides. There may or may not be hair loss.

Group 3b. Excessive oiliness of scalp with or without scaling. Noticeable hair loss. Corresponds to Sabouraud's seborrhea oleosa.

Group 4, seborrheic eczema. Acute or chronic inflammation usually with greasy scaling, with or without hair loss; the retroauricular spaces, chest or back frequently affected. Corresponds to Sabouraud's pityriasis circinata.

Group 5. Miscellaneous diseases of the scalp, including: tinea capitis, psoriasis, acne varioliformis, alopecia areata, etc.

2. *Bacteriologic Studies.* Scrapings were obtained with a sterile scalpel. Extraction of hair was made from a cleansed area of skin in order to avoid overgrowth of cultures with surface organisms. Specimens were obtained as follows:

1. The unwashed scalp. An area was selected usually on the crown of the head and after the hair was parted the scalp was scraped and the material so obtained was immediately planted in meat-infusion broth containing 1 per cent dextrose.

2. The washed scalp. After a specimen was taken from the unwashed scalp an area immediately adjoining was thoroughly cleansed with a small square of sterile gauze moistened with 70 per cent alcohol. The surface of this area was then scraped with a sterile scalpel and the scrapings inoculated into a 1 per cent dextrose meat-infusion broth for aerobic cultivation. At the same time an anaerobic culture was made using 15 c.c. of meat infusion broth enriched by the addition of 1 c.c. of human plasma.

3. The hair root. For this specimen the same area was utilized as described above after a second cleansing with alcohol. A hair was extracted with a pair of sterile forceps and the portion from below the surface of the scalp was clipped off with a pair of sterile scissors into the mediums. Not less than two hair roots so obtained were used for aerobic cultures and the same number was used for anaerobic cultures.

All cultures were incubated at 37° Centrigrade. After twenty-four hours the aerobic cultures were streaked on blood agar plate and reincubated. Twenty-four hours later individual colonies were picked from the plates and inoculated into carbohydrate fermentation broths for the determination of species. Classification was made according to Bergey (17) and Gordon (18) and Fleming (19).

The anaerobic cultures were studied after one week's incubation. If growth was present it was inoculated in shake cultures of dextrose agar and incubated for a week after which time a suitable tube was selected, opened and the colonies smeared. True microaerophilic or anaerobic growth was determined by the distinct line at which growth began below the surface of the agar. In the first 25 cases cooked meat medium was utilized for the anaerobic cultures but it was later decided by the character of the resulting growth that this medium held no advantages over the simpler meat infusion broth enriched with human plasma, as used for the washed scalp.

3. *Mycologic Studies.* The chief object was the determination of the incidence and number of Pityrosporon ovale on the five groups of scalps mentioned above. Scales and hair were removed with a sterile scalpel, placed on a glass slide and stained with methylene blue. Microscopic examination was satisfactory with a magnification of 430 diameters. Material was also planted on solid dextrose agar. Moore only obtained cultural growths of Pityrosporon ovale in 10 per cent of his cases and our chief reliance was placed in the demonstration of Pityrosporon ovale in stained preparations.

RESULTS

1. *Bacteriologic.* The results may be noted in the table. It may be seen that a fairly constant flora exists on all types of scalps. The washing with alcohol usually caused a diminution in the number of positive findings. However, in one series the number of positives increased after this procedure. In the table Staphylococcus epidermidis I and II are combined as also are scurf Staphylococcus I, II and III. Of the latter scurf Staphylococcus I was the type most frequently found. The total percentage of individuals from which scurf Staphylococci were recovered rises from 24, 25 and 50 in groups 4, 5 and 1 respectively to 70 in group 3A, 90 in group 2A and 100 in group 3B. In group 2B the percentage falls to 36. In contrast to the wide variations above, the comparative uniformity of the findings of Staphylococcus epidermidis in the varous groups (20, 6, 27, 20, 33, 12-25) is notable. Staphylococcus aureus was found infrequently in all groups; Staphylococcus albus was present in from 50 to 91 per cent of the cases, the highest finding being recorded in the miscellaneous group (group V). Microaerophilic diphtheroids (Sabouraud's microbacillus; Gilchrist's acne bacillus) were present in only 15 per cent of normal scalps and in 25 per cent of scalps with diseases other than dandruff or seborrhea. In groups 2, 3 and 4, however, the percentage of positive findings varied from 62 to 83. It is also to be noted that the highest percentages (72 & 83) were in those groups in which there was noticeable alopecia.

2. *Mycologic.* Pityrosporon ovale was found in representatives of all types of scalp conditions. Seventy per cent of normal scalps harbored the organism. It was absent in only 2 cases out of total of 60 cases in groups 2 and 3 but in these two instances a

diligent and repeated search failed to demonstrate the organism. We observed that the organism was present in greater numbers in the dry, scaly group, perhaps because of the increased amount of

Organisms Recovered from 100 Scalps
(Expressed in percentage)

GROUP	NUMBER OF CASES IN GROUP	STAPH. ALBUS	STAPH. EPIDERMIDIS	SCURF STAPH.	STAPH. AUREUS	DIPHTHEROIDS	UNDETERMINED BACTERIA, RODS AND COCCI	PITYROSPORON OVALE*
1. Normal:								
Scalp	20	70	20	50	10	5	55	70
Hair roots		25		30		15	25	
2. A. Dryness without loss of hair:								
Scalp	33	81	6	90	6	3	30	97
Hair roots		21	3	39		63	33	
2. B. Dryness with loss of hair:								
Scalp	11	81	27	36	18		45	90
Hair roots		18	18			72	45	
3. A. Oiliness:								
Scalp	10	80	20	70			20	100
Hair roots		10	10	50		70	20	
3. B. Oiliness with loss of hair:								
Scalp	6	50	33	100	16		50	100
Hair roots						83	33	
4. Seborrheic eczema:								
Scalp	8	50	12	12	12	12	62	75
Hair roots		12		24	24	62	50	
5. Miscellaneous other scalp diseases—controls:								
Scalp	12	91	25	25	25		25	66
Hair roots		50		16	16	25	50	
Totals:								
Scalp	100	76	17	61	11	3	39	86
Hair roots		22	4	28	4	47	35	

* Pityrosporon ovale was identified by direct examination of scrapings—not by culture.

material obtainable for examination. In isolated instances the number of organisms in normal scalps was quite large. An analysis of the clinical findings of the 14 patients in which the

organism could not be recovered, did not reveal any significant features to account for the result. Fungi of the following genera were also found: Aspergillus, Macrosporium, Alternaria, Rhizopus, Chaetomium, Mucor, Cryptococcus, Torula, Dematium and Mycoderma. The charting of these growths was omitted because they were irregular in their occurrence and nothing suggested that they were pathogenic.

COMMENTS

Our results are in substantial agreement with those of Templeton (7) who found Pityrosporon ovale in 69 per cent of 26 patients with normal scalps. He also found that the organism sometimes occurred as profusely in these cases as in cases of pityriasis simplex. The occurrence at times of the organism on all types of scalps and the fact that it may occasionally be found in as large numbers on the normal scalp as on one with severe dandruff leads one to consider the possibility that this yeast is a saprophyte and grows well in the presence of scaling or in sebaceous material but is not responsible for the presence of these findings. It is apparent that the true significance of Pityrosporon ovale cannot be determined merely from its presence or absence on the scalp, and that the finding of this fungus has little if any diagnostic value.

The rôle of the scurf Staphylococcus is equally in doubt, but from our preliminary studies the arguments for its etiologic significance are no more and no less logical than those founded on the incidence of Pityrosporon ovale. On the other hand, on the basis of occurrence, our results tend to confirm the work of Sabouraud, indicating that the microaerophilic diphtheroid (microbacillus of Sabouraud) which has the morphologic and cultural characteristics of Cornebacterium acnes may be associated with baldness.

SUMMARY

In a survey of the scalps of 100 patients an arbitrary differentiation was made into five groups based on clinical features common to each group. The presence of scurf staphylococci in a

high percentage of scalps of both dry and oily types in contrast to the low incidence on normal scalps or on scalps the sites of diseases not related to ordinary alopecia, may be of significance. Anaerobic diphtheroids were found in the highest percentage in the groups in which there was noticeable alopecia, and were of negligible incidence on normal scalps or scalps the sites of diseases not related to common baldness.

Pityrosporon ovale was a frequent finding in all groups. It was present on 70 per cent of normal scalps and on 66 per cent of the scalps on which there was a concomitant skin disease. In the dry or oily, scaly scalps (with and without alopecia) the percentage incidence was almost uniformly 100. A consideration of the patients on whose scalps Pityrosporon ovale was not found, failed to elicit any noteworthy features to account for the absence of the organism. A number of saprophytic molds and other fungi were cultured, but none with significant regularity.

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