patients who do not desire surgery and cannot have radio-iodine, and is used with many other patients for varying reasons.

We would suggest that the procedure outlined above, while simplifying the management of such cases, diminishes the risk of goitrogenesis and of worsening of the eye signs without impairing the therapeutic effects.

We should expect the procedure to be similarly suitable for preparing the thyrotoxic patient for operation, provided iodide is given in addition over the last two weeks. We are at present investigating the latter method.

Summary

A preliminary report is made of the practicability of treating thyrotoxicosis with both methylthiouracil and thyroxine to simplify the control of dosage. The results were apparently as satisfactory as the published results obtained with antithyroid drugs alone.

A basic standard dosage was used (enough methylthiouracil to control all but exceptional thyrotoxicosis and the minimal normal thyroxine requirements—that is, methylthiouracil, 50 mg., and L-thyroxine, 1 mg., thrice daily); this standard dosage, unaltered, suffices for the maintenance treatment of most patients, provided signs of goitre enlargement are sought and when seen are countered by giving additional thyroxine. If the adequacy of the control of thyrotoxicosis is doubted the methylthiouracil dose can be increased.

Among the first 32 cases completing a course of nine or more months of such treatment, in 18 (56%) the thyrotoxicosis was still fully remitted one year later, in no case had the eye signs significantly worsened, and in all except one the goitre size had decreased.

We are indebted to Glaxo Laboratories Ltd., who supplied the pills for this trial.

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Aided by a grant from the National Institute of Mental Health of the United States Public Health Service, the Yale Centre of Alcohol Studies recently surveyed current American work on alcoholism. Their findings, originally printed in the *Quarterly Journal of Studies on Alcohol* (1952, 13, 421–511), have now been published as a separate booklet entitled “Alcoholism, 1941–1951: A Survey of Activities in Research, Education, and Therapy.” Although the main emphasis is naturally on American studies in this field, much of the material included in the book is of general application and likely to interest workers elsewhere. The book is comprised of six sections each written by members of the staff of the Yale Centre, and with an introduction by the Director of the Centre. The sections are entitled: Sources of Scientific Information; the Status of Physiological Knowledge; Social Science Research; the Treatment of Alcohol Addiction; Programmes on Alcoholism in the United States, 1952; and Activities of State Departments of Education concerning Instruction about Alcohol. Copies of the book may be obtained from: *Quarterly Journal of Studies on Alcohol*, 2162 Yale Station, New Haven, Connecticut, price \$1. per copy.

PITYROSPORUM OVALE AND SOME SCALY CONDITIONS OF THE SCALP

BY

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The part played by the organism *Pityrosporum ovale* in the aetiology of a number of conditions of the skin has been much debated. By some it is held to be the prime and only cause of dandruff of the scalp and “seborrhoeic” eczema of the body; by others it is denied that the organism is anything but a harmless saprophyte which thrives under the cultural conditions provided by certain diseases. The problem is not made any easier by the confused and confusing terminology which has been applied to the group of conditions variously labelled as dandruff, pityriasis capitis, seborrhoea, seborrhoeic eczema, pityriasis circinata, the eczemas, etc.; the list could be made very much longer. So far as this paper is concerned, I hope to avoid lengthy discussion of the problems of seborrhoea, male-pattern baldness, and seborrhoeic eczema, and to confine my attention to certain scaly conditions of the scalp. It is not entirely possible to do this, as the three diseases often coexist with the subject under consideration.

Review of the Literature

Sabouraud (1902) held quite firmly that the cause of dandruff, or pityriasis simplex of the scalp, was infection with *P. ovale*. In addition, when the scalp became infected with an organism variously named the polymorphic coccus of Cedercreutz or the morococcus (Unna), but which seems to be the same organism as the *Staphylococcus epidermis albus* of Welch, the nature of the scaling changes from a dry condition to one which appears to be greasy, and is termed pityriasis steatoides or serosa. To add to the problem the scalp might also be affected with the acne bacillus, held by Sabouraud to be the cause of increased sebaceous secretion on the skin, thus causing an oiliness of the scalp, with an aetiology differing from the supposed greasiness of pityriasis steatoides.

Darier (1920), however, propounding his doctrine of “kerosé,” was of the opinion that pityriasis capitis is but a manifestation of the underlying state which is characterized by a brownish dirty-yellow complexion, slight thickening and hyperkeratosis of the skin of the centre of the face, scalp, and other areas, and enlargement of the pilosebaceous follicles with hyperkeratosis of their openings. He regarded the kerosé as a constitutional condition normal to certain types of person rather than a disease, and that *P. ovale*, the acne bacillus, and the polymorphic coccus grew best on this type of “soil,” but were in no way responsible for any disease or for the varying manifestations of kerosé.

Sabouraud was not able to culture *P. ovale*, but Macleod and Dowling (1928) cultured an organism which they thought to be *P. ovale*, and which they believed to be the cause of dandruff of the scalp. In addition, by inoculation experiments with their culture on the normal skin they produced lesions which they thought were identical with those of seborrhoeic eczema. However, it was later realized that the organism was not *P. ovale* but *M. pinoyi*, a fact acknowledged by Dowling (1939) himself. Unfortunately the original experiments are still cited in many modern textbooks of diseases of the skin and hair as if they are the proof positive that *P. ovale* is the cause of seborrhoeic eczema and dandruff. Why the later repudiation by Dowling

is not more widely known is difficult to understand, but Savill (1952), a strong supporter of Sabouraud, still writes as if it had never been made.

Templeton (1926) managed to culture the organism and made some scrapings from "normal" scalps and from scalps affected with pityriasis simplex and with oily dandruff. Of the 26 normal scalps it is significant to note that 13 were those of children under 15 years of age. *P. ovale* was present in 69% of these cases which were devoid of dandruff, in 27 out of 28 cases of pityriasis simplex, and in 85% of cases afflicted with oily dandruff. Templeton had some difficulty in deciding where dry dandruff ended and oily dandruff began, and I would agree with his conclusion that the two merge together imperceptibly. It is by no means easy to distinguish the minute details described by Sabouraud, and I suspect that many who describe his classification have difficulty in doing so themselves. Dry dandruff, or pityriasis simplex, is easy to recognize; so also is dry dandruff made greasy by sebaceous secretion. On the other hand, I am by no means convinced of the separate existence of pityriasis steatoides or serosa, which seems to be, as described by Sabouraud, an eczematous condition of the scalp more often to-day called seborrhoeic eczema.

Ota and Huang (1933) cultured *P. ovale*, and, after pointing out that the organism grown by Macleod and Dowling was not the same as their own, they attempted to repeat their experiments. They concluded that *P. ovale* was not the cause of seborrhoeic eczema, as they were unable to obtain more than a transient erythema with their inoculations. Moore and his colleagues (1936) cultured *P. ovale* and believed that they were able to produce lesions of seborrhoeic eczema by percutaneous inoculation, and could recover the organism later from the lesions. Unfortunately it was by no means clear (a) why some inoculations "took" and others did not; (b) what were their criteria for seborrhoeic eczema; and (c) whether the organisms they recovered were the same as those they inoculated or those which were on the skin of the patient before the experiment was started. Kile and Engman (1938) were able to find *P. ovale* in 21 out of 24 cases of seborrhoeic blepharitis, and thought that by inoculation of cultures on to scalps "clinically free from seborrhoeic eczema" they were able to cause scaling, itching, and lesions "like seborrhoeic eczema" after an interval of two weeks, during which the scalp remained unwashed. Unfortunately, again there was a total absence of control experiments, and the results cannot be held to be in any way conclusive.

Bigham (1937) made scrapings and cultures from patients with various scalp dermatoses and scalps, and detected the presence of *P. ovale* and a "yeast-like organism." He was able to find *P. ovale* in 20 control "normal" scalps and in all of seven cases of seborrhoeic eczema. He was also able to recover the organism from the scalps of patients affected with diseases such as psoriasis and pityriasis rosea, so he concluded that the *P. ovale* was not the cause of seborrhoeic eczema. Mackee *et al.* (1938) examined the flora of the scalps of 100 unselected persons and were unable to find any correlation between the incidence of *P. ovale* infection, seborrhoeic eczema, and normal scalps. In further studies Mackee *et al.* (1939) were unable to show any relationship between the type of skin and the presence or absence of various organisms, including *P. ovale*.

Barber (1948) concludes that *P. ovale* is the cause of simple dandruff and also says that dandruff is very rare before the age of 9-10. He believes that circulating androgen is necessary for the active growth of *P. ovale* and that oestrogen inhibits its growth. He also states that the administration of oestrogen to males with acne causes cessation of dandruff and diminution of seborrhoea, and that the local application of oestrogen diminishes dandruff. From these observations one assumes that Barber regards androgen and oestrogen as having a direct stimulating or inhibiting action on the growth of *P. ovale*. Unfortunately he is not precise on this point, as, after outlining Darier's views on kerose, he considers that many of the complications

of this state, such as acne and increased sebaceous secretion and pityriasis capitis, are a direct androgen effect without the need for any organism such as *P. ovale* to cause the increased desquamation from the scalp. Again one does not know whether any of these views are supported by crucial experiments. Eller and Eller (1949) were unable to detect any changes in the skin of normal young women or in men after the inunction of oestrogen ointment, but they did not carry out their experiments on the scalp. If oestrogen has a direct inhibiting action on *P. ovale* one would expect that the organism would be absent during pregnancy. That this is not the case is shown under Survey 3 below.

Survey 1

Examination was made of scrapings taken from 200 normal scalps selected in such a way that the scalps were devoid of any active lesion or inflammatory condition other than dandruff or sebaceous secretion. Also, apart from diffuse thinning or male-pattern baldness of the hair, no abnormality of the hair was included in the series. The sexes were represented equally and were divided into ten-year age groups, from 0-9 to 80+ years. Each of the first eight groups contained 12 cases of each sex; the last group had four of each sex.

Method. — The scalps were examined and the presence or absence of dandruff was noted, as was the state of the hair, degree of hair loss, and degree of seborrhoea.

With a small Meibomian scoop scrapings were taken from six different areas of the scalp radiating in linear fashion from the vertex. The material collected was placed on a slide, mixed with 90% alcohol to facilitate spreading, heat-fixed, stained with methylene blue, and examined microscopically with the 1/12-in. objective lens. The slides were examined for the presence of *P. ovale*, and, depending on the numbers present, the findings were classified as follows:

P.O. — : After an extensive survey of many fields the organism was not seen.

P.O. scanty: The organism was found in numbers up to about 10 after a prolonged search of the slide.

P.O. + : The organism was present, a few being seen in most fields examined.

P.O. ++ : Present in all fields in numbers up to about 20 in the majority of fields.

P.O. +++ : Present in large numbers in most fields examined.

P.O. ++++ : Present in large numbers and clumped together in masses in many of the fields examined.

This classification is admittedly an arbitrary one, depending in some degree on the person examining the slides. Nevertheless it seemed to work, and after a little experience it became a simple matter to assign a case to its proper category. Although this classification was useful when it came to assessing certain individual factors, such as greasiness of the scalp correlated with the number of organisms present, it was found simpler to group together the first three subdivisions as category A and the second three as category B for the purposes of recording the overall results.

The dandruff findings were recorded as follows:

D — : No scaling or flaking seen on any part of the scalp.

D slight: Fine white powdery scaling seen in a few areas on the scalp.

D+ : White powdery scaling seen with ease, but not in large quantities.

D++ : Large amounts of scaling and flaking present, with, in some cases, adherent greasy scaling over much of the scalp.

Results.—*P. ovale* was absent or scanty in 12% of cases—14 male and 10 female. Dandruff was absent or slight in 56.5% of cases—67 male and 46 female. Of these, 48 male and 33 female cases came into category B when the dandruff findings were correlated with those of *P. ovale*. Nine male and nine female cases with the finding "dandruff +/++" came into category A for the *P. ovale* result. Thirty cases showed "seborrhoea" of the scalp. Of these, all except one had infection with *P. ovale* in the range of category B, and nine of these showed the organism clumped in large masses (P.O.+++). Some degree of hair loss, ranging from diffuse thinning to severe Hippocratic baldness, was seen in 49 cases : 38 of them fell into category B for the *P. ovale* finding. The results when divided up into age groups were as follows :

0-9 years	P.O.	Category B	33.3%	Dandruff +/++	16.5%	of cases
10-19	"	"	83.0%	"	58.3%	"
20-29	"	"	71.0%	"	46.6%	"
30-39	"	"	83.0%	"	50.0%	"
40-49	"	"	87.5%	"	50.0%	"
50-59	"	"	79.0%	"	41.5%	"
60-69	"	"	82.0%	"	37.5%	"
70+	"	"	72.0%	"	47.0%	"

These results may conveniently be plotted as a graph, as shown on the previous page.

Survey 2

It is known that *P. ovale* is a lipophilic organism, and during the course of the first survey of scalps it soon became clear that those cases having oily or greasy scalps would show the organism in abundance. In short, it seemed that the presence of sebaceous secretion was the ideal basis on which the organism could flourish. In order to make this point more evident scrapings were taken from the nose and naso-labial folds and from the eyelids of 20 patients. The skin of the nose is rich in sebaceous glands and secretion, whereas the eyelids appear to remain comparatively free from grease. The two areas are contiguous, so it would be perfectly possible for the organism to spread from one site to the other or be transferred by the fingers of the individual or by washing.

Results.—(1) Nasal scrapings gave the following results : P.O. +, 9 ; P.O. ++, 9 ; P.O. +++, 2. In all these cases the organism was found without much difficulty. (2) Eyelid scrapings gave the following results : P.O. —, 3 ; P.O. very scanty, 13 ; P.O. +, 3 ; P.O. ++, 1. In 16 cases (80%) the organism was not found or only found with considerable difficulty after a prolonged search of the slide.

Survey 3

As mentioned earlier in this paper, it has been suggested that under the influence of oestrogenic stimulation the infection of the scalp with *P. ovale* diminished. That there was no significant difference between the degree of infection in male and female cases in the first survey would seem to disprove this thesis, but in order to attempt to settle the matter examination was made of the scalps of 32 pregnant women attending an antenatal clinic, their ages ranging between 17 and 42 years.

Results.—(1) *P. ovale* was present in all cases, and, except for two who showed P.O. +, all the cases came into category B. (2) Dandruff was absent or slight in 19 cases and +/++ with some degree of seborrhoea in 13. (3) If these cases are grouped into age groups 17-29 and 30-43, and compared with non-pregnant women in the first survey of similar ages, the following results are obtained :

P.O. Category B :	Pregnant cases, aged 17-29	..	22 out of 23 (96%)
"	Non-pregnant cases, aged 17-29	..	12 " 16 (75%)
"	Pregnant cases, aged 30-43	..	8 " 9 (89%)
"	Non-pregnant cases, aged 30-43	..	17 " 18 (94%)

Thus, so far as the first of these age groups is concerned, there seems to be a definite increase of infection in the pregnant cases ; and in the second group the difference is not

sufficiently great to be of significance. Certainly there is nothing in these results to suggest that increase of circulating oestrogen diminishes the degree of *P. ovale* infection. The great majority of these women were in the last trimester of pregnancy, when the quantity of oestrogen would have been at its highest and when the stimulation would have lasted for not less than six months. I conclude, therefore, that circulating oestrogen plays no part in determining the degree of infection of the scalp with *P. ovale*.

Survey 4

It has already been suggested that *P. ovale* thrives best in a medium containing sebaceous secretion. This supposition is given support by the findings in nine cases of tinea amiantacea. All these cases showed a dry silvery scaling of the scalp, fine and adherent, in some cases covering most of the hair-bearing area, in others more patchy in distribution. In addition, some cases showed flexural lesions of the seborrhoeic type. *P. ovale* was not found in two cases, was found with difficulty in very small numbers in six, and was classified as P.O. + in the remaining case. It would seem that the excessive dryness of the scalp was a factor responsible for the very low degree of infection with the organism. In parenthesis it should be said that I would agree whole-heartedly with the thesis put forward by Brown (1948) that the disease is due to underlying emotional factors, and I would prefer the title of "neurodermatitis of the scalp" to the outmoded one of tinea amiantacea.

Survey 5

During the course of these investigations 17 cases of psoriasis of the scalp were seen and scrapings taken.

Results.—*P. ovale* was absent in 11 cases, scanty in one case, + in three cases, and +++ in two. Of these last two, one had a very greasy scalp and the other had such a slight degree of scaling that it could be differentiated from ordinary dandruff with some difficulty. In the main, the scalps examined were dry and the scrapings were taken from the centres of obvious and well-demarcated patches of psoriasis. Once again it seemed that the dryness of the lesion and the absence of sebum was the cause of the slight degree of infection with *P. ovale*.

Survey 6

In the past, claims have been made that inoculation of the skin with cultures of *P. ovale* would produce lesions of seborrhoeic eczema. As has already been indicated, the methods used are open to criticism, and conflicting results have been obtained when scrapings from "seborrhoeic" lesions have been examined for the presence of the organism.

In the course of this investigation 16 cases were diagnosed as suffering from seborrhoeic eczema. Eight cases showed generalized flexural lesions involving the scalp, ears, neck, axillae, breasts, umbilicus, perineum, and intergluteal fold. In six scalp scrapings *P. ovale* was absent or scanty in five and + in one. In 20 scrapings from behind the ears and other body areas mentioned, the organism was scanty in one retro-aural scraping and absent in all the others, although a monilia-like organism was present in one specimen taken from an intergluteal lesion. Scrapings taken from four cases of pityriasis circinata of the chest showed the organism to be absent in three cases and scanty in one. In four cases having seborrhoeic eczema of the ears and scalp five scrapings were taken—one showing P.O. ++, one scanty P.O., and three negative.

From the findings in the admittedly rather small number of cases one would not deduce that *P. ovale* was the cause of the disease. Unless secondary infection was present—and cultures invariably produced a pure growth of coagulase-positive *Staphylococcus aureus*—the lesions were red, scaly, and remarkably dry, an observation much in keeping with that of Percival (1936), who comments on the lack of seborrhoea in cases of seborrhoeic eczema.

Discussion

It has been the aim of this investigation to support the thesis that *P. ovale* has nothing to do with the cause of dandruff, seborrhoea, or seborrhoeic eczema. In consequence I would strongly support the conclusions reached by Martin-Scott (1952), which were backed by cultural and inoculation studies.

In the first survey of 200 "normal" scalps one of the most striking findings was the sharp rise in the incidence of dandruff and degree of *P. ovale* infection at puberty. Another point of interest was the greater degree of dandruff and slightly larger number of heavy *P. ovale* infections in the female than in the male. The sudden increases of dandruff and heavy *P. ovale* infection at puberty might lead one to suppose that the two conditions are causally associated, but other factors must be considered, notably the increase of sebaceous activity at that age.

It was noted that of 30 cases with "seborrhoea" of the scalp all except one showed a heavy *P. ovale* infection, and that 38 out of 49 cases with some degree of hair loss showed the same finding. Sabouraud thought that increased sebaceous secretion led to hair loss, and more recently Flesch (1951) has shown that squalene, a normal constituent of sebum, will cause loss of hair when applied to the skin of rabbits. In short, it seems that it is the heavy sebaceous secretion which permits *P. ovale* to flourish in these cases—a reasonable conclusion, as the organism is very lipophilic. The later surveys of nose and eyelids and of various dry scaly conditions of the scalp and body all tend to support this view, and in consequence the increased infection at puberty is to be expected owing to the increased greasiness of the skin at that time.

For additional proof that *P. ovale* does not cause dandruff I would point to the 48 males and 33 females who showed slight or no dandruff in the presence of heavy *P. ovale* infection. In addition it was possible to find comparable degrees of infection on the skin of the nose without any sign of scaling or abnormality of the surface.

This, of course, does not lead us any nearer to understanding the precise cause of dandruff, but I would suggest that it is the normal desquamation of the scalp, similar in every respect to the "invisible" scaling on other parts of the skin caused by the normal replacement of cornified cells. The difference lies in the retention of the scales by the hair of the scalp—a suggestion which might seem to derive support from the shorter hair and more frequent scalp-washing in the male, who shows a lower incidence of heavy dandruff when compared with the long-haired female, whose scalp is washed less often lest her "waves" should cease to remain permanent.

The suggestion that androgen increases and oestrogen decreases the degree of dandruff would seem to be unsupported by the findings in the 32 pregnant cases, and also by the greater incidence in the female than in the male. Nevertheless it is difficult to resist the conclusion that endocrine factors must have something to do with the sharp increase at puberty, although I would not agree with Barber's statement that dandruff is rare before the age of 9-10.

This paper, it must be admitted, is largely iconoclastic and offers little constructive suggestion to explain some of the conditions described. However, to attempt to explain the causes of seborrhoeic eczema and neurodermatitis of the scalp would take me far beyond the scope of this investigation, as many factors other than the bacteriology of the scalp would need to be considered. Nevertheless it is hoped that *P. ovale* will no longer be regarded as the major or only cause of the conditions discussed, and, although many of the findings are of a negative type, I have yet to read of any convincing evidence in the shape of inoculation studies which would support the thesis that *P. ovale* is the cause of dandruff or seborrhoeic eczema.

Summary

Some of the problems concerning the relationship of *Pityrosporum ovale* to dandruff and other "seborrhoeic" conditions of the scalp and body are discussed and the literature on the subject is briefly reviewed.

Examination was made of 200 normal scalps and the degree of infection with *P. ovale* was correlated with the degree of dandruff present. From the findings it was considered that there was no evidence to justify the theory that *P. ovale* caused the dandruff. Instead it was suggested that the degree of infection was influenced by the quantity of sebaceous secretion, and that the increased flow of sebum at puberty would explain the rise in the incidence of infection at that age. It was also noted that the amount of dandruff was heavier in the female than in the male.

The suggestion that sebaceous secretion was the main factor influencing the degree of infection with *P. ovale* was supported by the findings in scrapings taken from the skin of the nose when compared with scrapings from eyelids in 20 cases. Further support was given by the findings in nine cases of tinea amiantacea, 17 cases of psoriasis of the scalp, and 16 cases of seborrhoeic eczema of the scalp and trunk. In most of these dry scaly conditions the organism was absent or was found only in small numbers.

The suggestion that oestrogens diminish the degree of dandruff and *P. ovale* infection receives no support from the findings in the 100 male and 100 female normal scalp scrapings. Examination of the scalps of 32 pregnant women, most of whom were in the last trimester, showed a rather greater degree of infection when compared with non-pregnant women of the same age groups.

It is concluded that *P. ovale* is not the cause of dandruff but is a harmless organism on the scalp which thrives best in the medium provided by a heavy flow of sebum.

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The county health department of Cheshire has performed a useful service in publishing *A Cheshire Index*, a booklet listing in alphabetical order and in five sections (a) the county districts and civil parishes, (b) civil parishes with place-names therein, (c) place-names of the administrative county, (d) county boroughs and place-names therein, and (e) place-names outside Cheshire with a Cheshire postal address. In a modestly worded preface the department invites the correction of any error of omission or insertion. Similar lists of the place-names of the other counties in the United Kingdom would be a boon to all those who have to verify the names of villages, hamlets, and district localities in larger towns.