In this case it appears that, although several sources of sepsis were present, we hit on that causative of the ocular condition, and eliminated it with happy results.

Any discussion as to the relationship of certain forms of choroiditis and retinitis, of embolism or thrombosis of the central artery of the retina, and of thrombosis of the central vein or of its tributaries to various forms of focal sepsis, I must leave to others. I have seen examples of each of the above-mentioned conditions during the past year, and in each of them a fulminating focus was present in the body which in my opinion bore an etiological relationship to the ocular condition. As there is no known means of influencing such embolism or thrombosis, it is clear that elimination of the focus, which was undertaken whenever possible, could not prove the relationship by curing the condition.

Hyperaemia of the retina at the macula, unaccompanied by other fundus changes, is very frequently found to be present in conditions in which toxic products are being poured into the circulation. It is usually accompanied by changes in the vitreous, and sometimes by changes in the lens. If the toxæmia continues, pigmentary changes or definite degeneration occurs. It is remarkable that some patients with very obvious degenerative changes at the macula retain full visual acuity.

Changes in the vitreous invariably accompany any long-continued focal sepsis. The normal vitreous in children who are completely healthy and who have never suffered from tonsillar sepsis has no opacity to be seen by the slit-lamp, except vestigial filaments. The change due to sepsis is a naked-eye floating film, while microscopically a trabecular structure can be made out. This condition is stated in the books on slit-lamp microscopy to be normal; however, I believe it to be pathological.

Cataract is the term applied to any opacity of the lens or its capsule. Such opacity may be congenital, acquired, or traumatic; the present remarks apply only to the acquired variety. The frequency of cataract is not fully appreciated. I have published two series of cases which show that 33 per cent. of patients drawn from the upper and middle classes have opacities in the lens, as seen by ordinary focal illumination, while an additional 12 per cent. exhibit opacity when the slit-lamp is used. These series were composed of patients of whom 50 per cent. were under 40 years of age. In practically all these patients an obvious focus of sepsis was found.

In all the complete cataracts that I have examined during the last few years in hospital practice there has been either actually present or previously present a definite focus of sepsis, more often situated in the mouth than elsewhere. In the forthcoming volume of the *Westminster Hospital Reports* I have written an article on my views of cataract formation, which it is impossible even to summarize here. I may say, however, that it has been shown experimentally that certain toxic conditions can give rise to cataract. Modern ophthalmic literature states that changes in the lens are the result of the action of various toxic substances, produced by the body, on the ciliary processes, resulting in changes in the composition of the aqueous, which in turn injures the epithelium of the anterior capsule of the lens, allowing the entrance of substances which cause cataract.

I believe that the most important cause of cataract formation is the presence of long-continued focal sepsis, generally dental. Therefore it appears to me to be of the greatest importance to recognize in our patients as early as possible the slightest opacity in the peripheral cortex of the lens, to deduce from it the probable presence of a septic focus, to localize the focus, and to put the patient in the way of getting the focus eliminated.

If this was generally carried out very few cataracts would be available for operation in another ten or twenty years' time. However, as long as the ordinary well-to-do person insists on retaining septic teeth in his head, dentists will be found to patch them up and crown them, and we operating ophthalmic surgeons will still have a future before us.

On the day of writing this (May 21st) I saw at Westminster Hospital a girl, 17 years of age, with marked peripheral opacities of both lenses, which would have been

called typically senile had the patient been thirty years older. It was what is known as a coronary cataract. The vision with correction for a small degree of myopic astigmatism was fully normal. On inquiring into her history she said that she had never had sore throat, but had had one or two teeth removed which had been defective. On examining her throat she was seen to have obviously enlarged and septic tonsils, for which surgical treatment was advised. In this case the lenticular changes, which would not have been discovered unless the pupils had been dilated with homatropine, may have resulted from septic absorption either from previous dental sepsis, or more probably from the existing tonsillar sepsis. These coronary cataracts cannot be mistaken for congenital opacities, situated as they are in the cortex of the lens.

Primary glaucoma, both acute and chronic, has been stated by Lang to owe its origin to focal sepsis in many cases. In all the cases of primary glaucoma which I have seen during the last few years I have not seen one in which there was not a fulminating focus of sepsis.

Progressive myopia in children, in my experience, is always associated with enlarged and septic tonsils. It seems to me that the whole weight of the ophthalmic surgeon should be thrown in favour of early enucleation of the tonsils if they are not healthy, whether or not the fibroblasts of the sclerotic have already begun to yield to the normal intraocular pressure, as the result of their weakening by the absorption of toxic products.

The effect of focal sepsis on intraocular operations is very marked. This is true of children with septic tonsils who have to be operated on for congenital or lamellar cataract, or for adults with dental sepsis who require operation for cataract or glaucoma. In all cases of adults, when time permits, a thorough scaling of the teeth should be carried out before any of the teeth are extracted, and an interval allowed to elapse before the intraocular operation is done. If there is not time for this the ophthalmic surgeon can, in a somewhat amateur fashion, diminish the danger by the daily application of tincture of iodine to the gums and necks of the teeth, after thorough scrubbing with brush and powder.

Conclusion.

In concluding I realize that I have been unable to deal with this subject fully or adequately. However, such opinions as I have expressed are based on personal experience. At the hospitals where I and my assistants carry on our clinical work during four days each week, it is open to any ophthalmic surgeon to see what is being done, and to note the results we obtain from an acute appreciation of the dangers of focal sepsis.

EPIDERMAL INFECTIONS WITH YEAST-LIKE ORGANISMS;

WITH SPECIAL REFERENCE TO SEBORRHOEIC ECZEMA.*

BY

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KNOWLEDGE concerning the group of epidermomycoses occurring in England, and, generally speaking, northern and temperate climates, caused by organisms resembling yeasts has grown enormously during the past ten to fifteen years. It is a group that has emerged from a heterodox assortment of dermatoses formerly named according to their chief objective symptoms—for example, intertriginous eczema, onychia, paronychia, etc. There followed a period during which it became known that in certain cases these dermatoses were caused by fungi—other, of course, than ringworm; but, generally speaking, the fungi were not precisely classified and were described generally as saccharomyces, or yeasts.

* A paper read in the Section of Dermatology at the Annual Meeting of the British Medical Association, Manchester, 1929.

Nowadays, although the botanical position of these organisms is still obscure, their morphology and biochemical characters have been the subject of important studies by mycologists. The whole subject is, of course, vast and complex, and could not in any circumstances be presented by me in all its bearings. My object will be to attempt a brief outline of the facts regarding the epidermomycoses as they appear to me to concern the clinician especially. I will then attempt to bring another great group of common dermatoses into line with them.

The epidermomycoses are caused by one family of organisms only, known as the Oösporaceae. Although resembling yeasts morphologically, in that they are mainly round or oval bodies which multiply predominantly by budding, and biologically in that some of them ferment sugar, they really belong to a lower order of fungi than yeasts, inasmuch as their mode of reproduction is of the simplest order, ascospore and even endospore formation being unknown among them. They are, therefore, fungi imperfecti or hyphomycetes. They are classified by Castellani in the following way.

They belong to the order Thallosporales—that is, reproduction takes place by adaptation of the thallus or vegetative body to the purpose of reproduction. This order is again subdivided into the suborders Blastosporineae and Arthrosporineae, to the former of which the yeast-like fungi belong. The characteristic feature of this suborder is that reproduction takes place predominantly by budding. The Blastosporineae are again divided into families of which two, Cryptococcaceae and Oösporaceae, contain the various genera concerned. Thus the family Cryptococcaceae contains the genera *Cryptococcus*, *Torula*, and, according to Castellani, *Pityrosporon*. The chief characteristic of these genera is that they never form mycelium. The Oösporaceae possess genera in which mycelium is present either in the tissues or in culture. Oöspora, oïdia, and monilia belong to this family. According to some authorities this subdivision is artificial and unnatural, for it is well established that the morphology and even the biochemical characteristics of the fungi imperfecti may undergo certain changes under different conditions of growth, both as parasites and in culture. A fungus which might, for example, in certain conditions be classed as monilia might appear, under other conditions, as a *Cryptococcus*, or vice versa.

The yeast-like organisms responsible for the epidermomycoses belong chiefly to the genus *monilia*, of which the definition given by Castellani is as follows: They are Oösporaceae possessing budding and mycelial forms *in situ*, the latter often being long and branched, and in culture mainly budding forms. Dextrose and other carbohydrates are fermented with the production of gas. The most important species is the thrush fungus, *Monilia albicans*, but there are many known species which have been differentiated from one another by biochemical tests.

In clinical practice examination of scales taken from a monilia infection generally shows very long, thin mycelium, with occasional lateral thallospores and grape-like clusters of spores arranged lateral to the mycelium. It is not possible to distinguish between one species and another without making biochemical tests. As parasites, the fungi grow best on moist intertriginous surfaces, and the dermatoses caused by them are found chiefly, in the natural folds—principally the inguino-crural, intergluteal, submammary, interdigital, and the nail folds. They may also attack the general surface when warmth and moisture are artificially provided, as in continuous water-bath therapy, or as an extension of an intertriginous monilia infection, or when the necessary conditions are naturally provided—for example, by the combination of warm weather and hyperidrosis, certain cases of dysidrosis, for instance, being caused by monilia. The nails may also be attacked.

Space will not permit me to attempt a chronological statement of the earlier recorded cases of monilia infection, and, in any case, this task has already been very well performed by others. Shelmire, for example, made an excellent summary of the subject in 1925, with a complete bibliography. In his paper he refers to all monilia in-

fections as thrush infections. He draws attention to six main types of infection: (1) generalized cases occurring in those subjected to continuous water-bath therapy; (2) cases occurring in nursing infants; (3) intertriginous cases; (4) paronychia; (5) infections of the nails; (6) dysidrosiform eruptions. The continuous water-bath cases are known especially in Vienna. The primary efflorescence is composed of dark red infiltrated papules, which become confluent and form areas of polycyclic appearance. As in all cases of monilia infection, the site of maximum growth of the fungus (in this case the border) is marked by a whitish epithelial accumulation.

Thrush infection in nursing infants is not very uncommon. As R. Craik points out, the thrush fungus is a fairly common inhabitant of the alimentary canal of infants. The lesions occur primarily round the anus and in the inguino-crural region in the form of intertrigo, and sometimes spread to other folds, notably the neck; the lesions, as in other cases of monilia infection, consist of erythematous-squamous spots and patches, which become confluent with others. Some of them may be vesicular or pustular. An extensive fatal case has been described by Schamberg. The mother of the infant in this case also had thrush infection of the nipples.

Intertriginous monilia infections are not at all uncommon and are now well recognized. Whitfield reported one of the earliest cases in 1908, describing the fungus as yeast-like. In 1914 cases were recorded by Gougerot and Gancéa, and Hudelo and Montlaur. They recognized the causal fungus as being closely related to thrush. The folds principally attacked are the intergluteal, inguino-crural, submammary, and interdigital. The characteristic features are: whitish and sodden epithelial accumulation at the bottom of the affected fold with an outlying erythematous-squamous eruption, beyond which isolated scaly spots, vesicles, and pustules are usually found. Generally speaking, they lack the sharp outline of epidermophyton infections, and the actual fold is more attacked than in the latter disease. In some cases, however—for example, one described by Engman—no clinical distinction can be made. I had recently a very typical case, in which the patient, in addition, had suffered from seborrhoeic dermatitis for several years. The fungus was easily found in the scales from the erythematous-squamous spots, and epithelial accumulation in the fold by the ordinary method of examining in liquor potassae.

A special type, of which the clinical picture is well recognized, is the *erosio interdigitalis blastomycetica* of Fabry. The third interdigital space is usually attacked first. The lesion has a sharp margin and is covered with sodden macerated epidermis, which may be detached to display an underlying reddened base. It occurs chiefly among those who have to do wet household work and who have hyperidrosis. When it occurs on the toes it is difficult to distinguish it from interdigital epidermophytosis. In a case of my own the fungus was cultivated in the laboratory at St. John's Hospital for Skin Diseases, and a living culture was planted in another interdigital space after lightly scarifying. A group of erythematous-squamous papules was produced exactly similar in appearance to the spots which often outlie the intertriginous lesions. I have performed similar experiments on several other cases in which monilia has been discovered in scrapings and subsequently cultivated. In all cases inoculation has produced erythematous-squamous spots, but never vesicles or pustules. The artificial lesions have always cleared up without treatment within two or three weeks. It is, no doubt, impossible to produce the exact conditions which are present in the disease as it occurs naturally, and the short duration of artificial lesions is no argument against the pathogenicity of the organism.

Monilia is an important cause of dysidrosiform eruptions on the hands and feet. These usually occur in association with sodden interdigital erosions, but not invariably. In a case of my own, that of a woman who suffered from a recurrent vesicular eruption on the palms and lateral aspects of the fingers with desquamating areas surrounded by a detached epidermal collar, monilia was found in the scales and cultivated. An artificial inoculation with

her culture produced squamous lesions similar to the desquamated areas.

I have no personal experience of monilia infection of the nails, and I believe it to be rare. I have read the cases, however, described by Pellier in 1914, and by Avit Scott in 1927. Pellier's case was that of a man in whom two of the nails on each foot were opaque, thickened, and friable. Microscopical examination showed very rare mycelial elements and an abundance of large globular and oval spores. The fungus was grown on maltose agar and submitted for an opinion to Professor Vuillemin, who pronounced it as being closely related to *Endomyces albicans*. Avit Scott's case was very similar—that is to say, the nails were opaque, thickened, and friable, resembling, in fact, ringworm infection, but a microscopical examination of the nails and subsequent culture showed it to be monilia.

Cases of mycotic paronychia in which monilia may be found in the pus exuding from the nail fold are now no longer regarded as rare. The essential characters are painful inflammation and bolster-like swelling of the nail folds, exudation of pus from beneath the fold, and in cases of long duration more or less distortion of the nail itself. They occur chiefly in those whose occupations necessitate frequent immersion of the hands in water. The first cases were reported in German literature, and following this several have been described in America and in England.

Shelmire reported a group of cases and experimented on himself with the organisms which he isolated. He inoculated a fresh culture beneath his own nail fold and noted that in twenty-four hours the fold became swollen and tender; acute paronychia developed within four days. The artificially produced condition cleared up within a fortnight. Kingery and Thienes reported a group of cases occurring in the fruit-canning industry; they performed the same experiment on themselves, with the same results. On account of their rapid recovery these authors did not consider their experiments to be positive evidence of the causal relations of the organism to the condition. In view, however, of the similar experience that others have had with regard to the short duration of the lesions produced by artificial implantation of this type of fungus, I believe their pathogenic role may be accepted in these cases of paronychia.

I now pass to the more controversial side of this subject—namely, the nature of the spore of Malassez and the part played by it in the common group of dermatoses named by Unna seborrhoeic eczema, by Brocq psoriasiform parakeratoses, by Darier eczematides, and in England generally known as seborrhoeic dermatitis. I do not propose to attempt a detailed description of the clinical features of this common disease, which, in any case, is well known to us all in its typical manifestations, although I think everyone will agree that cases occur in which the diagnosis may be extremely difficult.

The starting point of seborrhoeic dermatitis is almost always the scalp, which is found to be the site either of the disease itself or of a well-marked degree of dandruff. If a dandruff scale is stained with methylene blue or Giemsa, the fungus known as the spore of Malassez, or pityrosporon of Sabouraud, or flask bacillus of Unna, is readily seen in groups consisting of spores of various shapes and sizes, of which the commonest is the flask-shaped form consisting of a large oval or round body giving off a small roundish process suggesting a budding yeast. Spherical and sausage-shaped forms are also found in sizes ranging to 3.7μ in length by 2.6μ in breadth. Unna believed that the fungus was the cause of pityriasis of the scalp, or dandruff, and that in combination with another organism, which he named the morococcus, it was also the cause of seborrhoeic eczema. His view was that the scales fell from the scalp to the neck, face, chest, and back, and in seborrhoeic subjects gave rise to the disease. This is the view which has been held almost universally up to the present. Unna further expressed the opinion that only by culture of the fungus and artificial reproduction of the disease could its etiology be definitely established. The precise nature of the morococcus is still the subject of various opinions, but, generally speaking, it is regarded as a species of staphylococcus.

For many years attempts have been made to cultivate this fungus, and although fungi resembling yeasts have been grown both from dandruff and from seborrhoeic eczema, few claims have been made that the fungus grown was the actual spore of Malassez. The prior claim to this distinction is that of Mr. W. G. Garner, assistant in the pathological department of St. John's Hospital. He claimed to have cultivated the fungus from dandruff as early as 1908, using maltose agar and acid glycerin agar. Dr. J. M. H. MacLeod and I published, in 1928, an account of the method he used, the morphology and biological reactions of the fungus, and the results of some experimental inoculation in human beings. Templeton cultivated the fungus on beer-wurt agar in 1926. Acton and Panja claimed to have grown the fungus in 1927. Finally, far-reaching claims are made by Benedek with regard to the fungous etiology of the disease. In a recent publication Benedek entirely refutes all claims made in the three publications first mentioned, and states that he alone has succeeded in finding the fungus responsible for the disease and its cultural requirements, and, further, that this organism is not the spore of Malassez, which he regards as a harmless saprophyte, but an ascomycete—in other words, one of the higher fungi.

I will now summarize briefly the observations of each of these writers.

Benedek first grew his organism in 1926; he found its cultural requirements to be 8 per cent. glucose agar, glucose 8, peptone 1, agar 2, distilled water 100. The fungus grew best at a temperature of 27°C . It is grown by inoculating a quantity of material, preferably dandruff, on to the medium. He says that he is able to identify it in the scales of pityriasis of the scalp and seborrhoeic dermatitis in liquor potassae. He describes the organism as a schizo-saccharomyces, because it multiplies by fission rather than by budding. Its elements vary in size between 4.5 and 1.5μ . It is a very pleomorphic organism, and alters a good deal in appearance in old cultures. Short mycelial rods, and elements which he describes as spindle giant cells, often develop after six to eight weeks. He describes asci among the elements, and therefore regards the fungus as an ascomycete. Benedek regards this fungus as the sole cause of pityriasis of the scalp, of seborrhoeic eczema, acne, seborrhoeic rosacea, and, in several cases, of sycosis—admitting, of course, the existence of secondary infection (staphylococcal) in the last-mentioned disease—of certain axillary and pubic abscesses from which he has obtained pure cultures, and of some cases of submammary and axillary intertrigo. He disagrees with Haxthausen and Sabouraud that the pityriasis inflammatory lesions found on the face in children are of streptococcal origin, and considers that the streptococci found are only secondary invaders. He goes, however, much further than this and states that his fungus is the cause of seborrhoea itself. He considers that the words seborrhoea, seborrhoeic eczema, and pityriasis should be given up, and that these conditions should henceforward be called schizo-saccharomycosis. He claims a cure for seborrhoea itself by a vaccine made of his organism. He has been able to cultivate it from the blood, in one case of pityriasis capitis, in seven cases of seborrhoeic eczema, in sycosis twice, and in seborrhoeic rosacea and pityriasis rosea once each.

He believes that the schizo-saccharomyces is never a saprophyte, but is spread from person to person by contagion, especially from barbers' hairbrushes, from which he has invariably succeeded in making cultures, and from parents to children, thus explaining family and hereditary instances of seborrhoea and acne. He regards the scalp as a breeding ground for the parasite, and considers that it acts chiefly through its toxins, the organism responding with two pathological appearances: (1) a very marked eruptive inflammation, (2) fatty degeneration of the tissues. The last is held responsible for seborrhoea.

He produces as proof of the pathogenicity of his organisms the following experimental findings: (1) a positive complement fixation test in all cases of pityriasis or of seborrhoeic eczema; (2) production of papules and in some cases pustules by the killed organism or by its filtrate; (3) cure of cases by vaccine; (4) agglutination tests; (5)

reproduction of the disease by implantation with subsequent recovery of the fungus from the artificially produced lesion.

He describes the result of inoculation as follows: On the sixth day the place is covered with a dry crust; in eleven days scaling is present; nine days later the inoculated part still shows fine scaling. The experiments were made only on those already suffering from seborrhoeic eczema. Benedek thus regards his schizo-saccharomyces as the cause of seborrhoea and of all its complications. His organism, he says, is not the spore of Malassez, and has nothing whatever to do with it. He claims, in fact, to have found the spore of Malassez growing with his organism as a contamination.

Acton and Panja, working in India, claim to have grown the spore of Malassez on Petroff's glycerinated medium, coloured with gentian violet to inhibit the growth of staphylococcus. On this medium the primary cultures appeared as dry chalky white colonies. They gave no account of the morphology or biological reactions of the fungus that they cultivated. Like Benedek, they believe that a fungus is the cause of seborrhoea and of all its complications, but they regard the spore of Malassez as the causal fungus. They also consider that the toxin of the fungus is responsible for hyperactivity of the sebaceous apparatus, which, they point out, is not a true secretion but a speeding up of a degenerative process.

Templeton's method of cultivating the fungus was to comb scales from the scalp with a sterile comb either into a sterile Petri dish or directly on to the medium. Slight but undoubted growth occurred round the scales. Templeton's paper was illustrated by photographs showing round, oval, and some dumb-bell shaped spores obtained from the cultures. He gives no further morphological description.

In 1927 and 1928 MacLeod and I made some observations on the morphological and cultural characteristics, and the pathogenic properties of the organism cultivated by Garner. These observations have already been published, and I will do no more than summarize them as briefly as possible.

The fungus is cultivated from dandruff by scraping scales with a sterile knife on to a sterile watchglass and then planting them on maltose agar, acid glycerin agar, or in oleic acid glucose broth. The formulae are as follows:

Maltose agar:	
Agar	1.8
Granulated peptone	1
Chassaing maltose (brut de chanut)	4
Distilled water	100
Acid glycerin agar:	
Agar	1.5
Peptone	2
Glycerin	2
Distilled water	100
Oleic acid glucose broth:	
Peptone broth plus 1 per cent. oleic acid	
1 per cent. glucose	

On the solid media creamy white or slightly yellow colonies appear in three to four days, frequently contaminated by staphylococci from which they are separated by transplantation to fresh media. The organism is pleomorphic, exhibiting a marked variation in size and shape, with frequent budding forms. Mycelial filaments which are long and narrow and but little septated are found in the fluid medium. The fungus exhibits chemical activity in the presence of various sugars:

- In galactose—acidity but no gas formed.
- In maltose—acidity with slight gas.
- In glucose—acidity with slight gas.
- In saccharose, inulin, dulcitol, raffinose, lactose, and mannite—no change.

Litmus milk is unaffected. No liquefaction is obtained in gelatin. These reactions differ from those of *Monilia pinoyi*. The elements of *Monilia pinoyi* also are larger on the average in size, and exhibit much less pleomorphism both in shape and size.

This fungus was inoculated after light scarification and by intradermal injection on to the skins of normal subjects, seborrhoeic subjects, and those already suffering from seborrhoeic dermatitis. In normal subjects the results were constant, the fungus when freshly cultivated from dandruff was always pathogenic and produced a group of small follicular papules after twenty-four hours to two or three

days. These remained for about a fortnight and then disappeared. In seborrhoeic subjects the same lesions occurred, but in some cases they appeared more active than in normals, the papules being more numerous and irritable. In subjects suffering from seborrhoeic dermatitis the lesions were in some cases absolutely identical with those already present, the inoculated lesion spreading by the formation of fresh papules and clearing in the centre with desquamation. This suggested the existence of hypersensitivity of the individual towards the fungus. In each case the fungus was recultivated from the artificial lesion. In most of the cases the artificial lesions were short-lived, but in some cases they became well established and showed no more tendency to disappear than those already present.

On the strength of this evidence we believed that Garner's organism was in fact the spore of Malassez, and that this fungus alone was probably responsible for seborrhoeic dermatitis. We regarded the pyogenic organisms found constantly in association with the disease as secondary invaders.

More recently I have made comparative tests with monilias cultivated from cases of monilia infection and our fungus, and have observed that sometimes precisely similar lesions may be produced by the implantation of either species. In a case so treated quite recently the lesions not only resembled one another, but could not have been picked out from the rest of the disease, a very typical seborrhoeic. As the two fungi are very near relations, although differing morphologically and in biochemical activity, this result is not at all surprising.

Benedek recently, commenting on our work and that of Templeton, and of Acton and Panja, said that he did not regard any of the organisms described as the cause of seborrhoeic dermatitis, that none of them had anything to do with his organism, and that the value of our observations could be estimated by the fact that three observers had claimed to have cultivated the spore of Malassez, and that each described a different organism. I would like to answer this criticism without making any comparison at the moment of the properties of each respective organism. Acton and Panja gave no description of their fungus; Templeton grew very little fungus, and that which he described appeared to have the same morphology as that described by MacLeod. In any case, it is a well-recognized fact that in mycology the same species, when grown under different conditions, may undergo considerable alterations in morphology. For example, four well-differentiated species of ringworm fungi have recently been produced from one original species by variations in cultural conditions, so that in any case no absolute identity could be expected even if it were agreed that in each case the spore of Malassez had been grown. As Craik says, in an organism as variable as monilia, morphological distinctions are of little value.

The question arises as to what group these fungi belong. There appears to be no doubt that the fungus with which we experimented belongs to the monilia type of yeast-like organism, but that it is a different species from *Monilia pinoyi* and *Monilia albicans*, for example. Benedek describes his organism as a higher fungus, an ascomycete, for the reasons already stated.

I have recently had an opportunity of comparing this organism, through the kindly help of Dr. F. Reiss, professor of dermatology at Shanghai, and the courtesy of Dr. Benedek. Dr. Reiss, who had previously discussed Dr. Benedek's work with him, wrote to him and asked for cultures of his organisms for comparison with ours, a request with which Dr. Benedek kindly complied. Unfortunately, Dr. Reiss was not in England long enough to make any immediate comparison, but he gave me a subculture. This subculture has been examined in the pathological department at St. John's Hospital. I am indebted for the following report to Dr. MacLeod, Dr. Burford, and Mr. Garner.

The organism is unrelated to the spore of Malassez, and consists of:

Rods measuring from 3.5 to 4.5 μ by 1.6 to 2.0 μ . Occurring singly, spore bearing, motile, Gram-positive. The spores occur both inside and outside the bacillus.

Its cultural characters are as follows: The optimum temperature of growth is 27° C. and the maximum temperature 45° to

50° C. It grows well on ordinary sugar and glucose agar. It does not grow on Sabouraud's maltose agar at any temperature. On agar and glucose agar the growth is a pale yellowish tint. It also grows in broth and on potato. It liquefies gelatin with the production of a greenish tint.

Many sugars are fermented by it.

- In raffinose, acid and gas are produced.
- In inulin—negative.
- In dulcitol—negative.
- In maltose, acid and gas are produced.
- In mannite, acid and gas are produced.
- In litmus milk—alkaline, no coagulation.
- In salicin—negative.
- In glucose, acid and gas are produced.
- In saccharose, acid and gas are produced.
- In lactose, acid and gas are produced.

Scales from seborrhoeic scalp have been planted out upon 8 per cent. glucose agar and incubated at 27° C., and this organism has been found in association with others.

Implantations after scarification have been made upon the skin, using the spore of *Malassez* as a control. At the end of fifty-six hours no lesions have appeared in the case of Dr. Benedek's culture, whilst the usual follicular papular lesion has occurred with the implantation of the spore of *Malassez*.

Dr. Benedek's organism appears to be a sporing bacillus, and unrelated to any yeast forms.

Benedek's claims are clearly too fantastic to gain any wide acceptance. He dispenses entirely with seborrhoea and with Darier's kerosis. In his opinion there is no hereditary element in seborrhoea, only an infection with a pathogenic fungus—that is to say, there is no pre-existent soil on which the fungus will thrive, but a soil that is made by the toxins of his fungus.

Further, from the observations made in the laboratory of St. John's Hospital, it would appear that the organism is not a yeast at all. Even if it were an ascomycete, as he claims, there exists no known pathogenic ascomycete, the only possible near relation to a true yeast being the blastomycetes of Gilchrist.

Finally, he states that he regards the spore of *Malassez* as a harmless saprophyte. In all the fungous infections of the epidermis that I have mentioned at the beginning of this paper the proof of the causal relationship of the fungus in each case is not the fact that it can be cultivated, but that it can be easily seen in the scales produced by the disease. In the stained scale of pityriasis capitis or seborrhoeic dermatitis one can always see the spore of *Malassez*, but never any other fungus. This fact, I think, is the strongest possible evidence in favour of its etiological significance.

SUMMARY AND CONCLUSIONS.

From dandruff a fungus can be cultivated which, when implanted on the skin, produces a condition clinically indistinguishable from seborrhoeic dermatitis. It can be recovered from the artificial lesion by culture, and may be seen in a scraping of the lesion. The fungus appears to be a species of the monilia type of fungus, though differing, as demonstrated by MacLeod, from other known pathogenic species of this genus in definite respects. I believe it to be the spore of *Malassez* for the following reasons:

1. It resembles the spore of *Malassez* morphologically.
2. The spore of *Malassez* is always found in dandruff, and is the only fungus that can be seen inside the scales. It may therefore be regarded as the cause of pityriasis capitis, for the same reason that *Microsporon furfur* is accepted as the cause of pityriasis versicolor. Pityriasis capitis or dandruff has been regarded, since Unna, as the starting point of seborrhoeic dermatitis, and the breeding ground of the disease. The spore of *Malassez* is therefore concerned in the production of seborrhoeic dermatitis.
3. The cultivated fungus is capable of accurately reproducing the disease, not merely a crusted or scaly lesion, but one which is primarily follicular, papular, and ultimately squamous, and which, in many cases, cannot be distinguished from those already present.
4. There are marked individual differences in susceptibility to this fungus. Those with seborrhoeic dermatitis, particularly in the more acute forms, being very sensitive to it, whilst others, especially normal subjects, show a minimal response to it.

I will conclude by saying that if, as I think, the observations of MacLeod and myself which I have just related bring the groups of dermatoses that I have discussed into line with one another, the facts only substantiate the view

held by Unna, Sabouraud, and many others, that in essence seborrhoeic eczema is a fungous disease.

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DIATHERMY EXTIRPATION OF THE PHARYNGEAL TONSILS.

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THERE are many sufferers from chronic septic intoxication, apparently from the tonsils, for whom complete tonsillectomy of the ordinary kind is unsuited. People with cardiac disability, or with exophthalmic goitre, for example, belong to this class, and we must also include patients whose nervous dread of "cutting" renders the operation an ordeal they dare not face. For cases like these surgical diathermy is now being tried, and it bids fair to become the method of choice. Its action can be limited or extended according to desire; the wounds it gives rise to remain aseptic, and there is only a trifling amount of soreness during the separation of the diathermy sloughs. Furthermore, tonsils of all sizes can be extirpated, whether they happen to be small stumps hidden behind the faucial pillar or large hypertrophied tonsils touching each other in the middle line. It is merely a matter of time and patience.

Method.

Tonsils can be diathermized easily and comfortably under local anaesthesia, and, at least until they are reduced to their last remnants, surface anaesthesia is quite sufficient. The surface of the tonsil is painted over once or twice with pure adrenaline solution (1 in 1,000) in order to blanch it, and then with equal quantities of cocaine hydrochloride solution (10 per cent.) and adrenaline solution (1 in 1,000). Towards the end of the treatment, when the bulk of the tonsil has disappeared and we are nearing the capsule, infiltration of the peritonsillar region, and perhaps also of the pillars of the fauces, with 2 per cent. novocain or beta-eucaine solution is advisable in addition to the surface anaesthesia.

For active electrode I usually employ either a short, curved, blunt point, or a short needle, according to the part of the tonsil to be attacked, the indifferent electrode being applied as usual to the arm or back. The blunt active electrode is more useful in the early, and the needle more useful in the later, stages.

At the first séance the blunt electrode is passed into the supratonsillar fossa, the point being inserted as far as the capsule of the tonsil, to which this blind pouch reaches. Then, with a curved vulcanite guard protecting the anterior pillar of the fauces, the current is turned on at zero, and slowly raised in strength until coagulation appears in the tissue around it. The current is then switched off.

Our object in selecting the supratonsillar fossa for the first coagulation is that, as the pathological changes in ordinary peritonsillar abscess show, septic absorption is probably more active here than anywhere else in the tonsil. Further, a large number of crypts open into this cul-de-sac, and these we destroy straight away.

This region, then, having been put out of action, first in the one and then in the other tonsil, the surgeon may or may not proceed further at the first séance. If the patient is nervous and the tonsil small he will probably limit himself on this occasion to a single application of the