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THYROID CACHEXIA.—See *Thyroid*.

THYROIDECTOMY. See *Goitre*. (*Surgical*.)

THYROID EXTRACT. See *Organotherapy*.

TINEAS, THE.—There are included under the general term of *Tinea* several diseases of the skin, both of the hairy and the non-hairy parts, caused by the parasitic action of various kinds of fungi belonging to the order of *Hyphomycetes* or mould fungi. These fungi have an affinity for the keratinized portions of the skin and its appendages—hair, nails, and epidermis. They attack these structures in man and some of the lower animals (horses, dogs, cats, birds), and infection in the former can often be traced to the latter source.

Although these moulds thrive best upon the surface of the skin, certain varieties sometimes penetrate beyond the superficial horny structures into the corium or subcutaneous tissues, causing the so-called *kerion* and *hyphomycetic granulomata*.

In all of the various diseases caused by these fungi they may be readily detected by the following procedure: A small piece of crust, scales, hair, or pus is placed in a

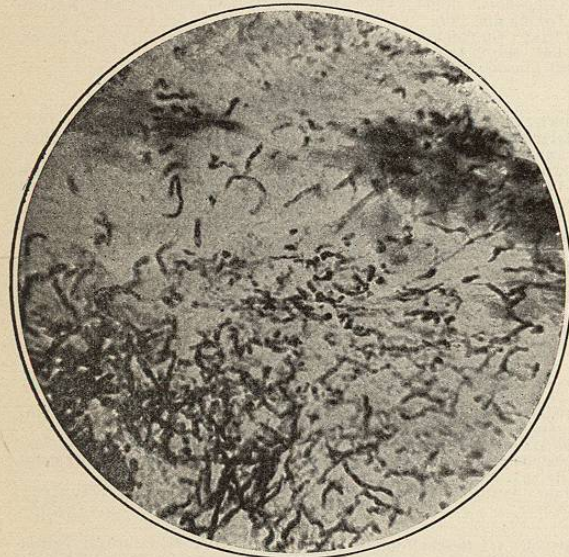


FIG. 471.—Section of Favus scutulum, showing Spores and Mycelium of the Fungus, Achorion Schönleinii. (Bausch and Lomb one-eighth inch objective, one inch eyepiece.)

few drops of liquor potassii or a weak solution of caustic soda upon a glass slide and allowed to remain for a few moments; a cover glass is then pressed gently over it. A one-seventh objective and low eyepiece will disclose the conidium or spores and the mycelium or threads, which

vary in their size, shape, and arrangement according to the variety of the fungus to which they may belong. The spores are small, round or oval, bodies; and the mycelia long, sharply defined, narrow tubes which fork or branch in various directions.

TINEA FAVOSA, or favus, is a contagious and very chronic disease of the hairy and non-hairy parts, due to

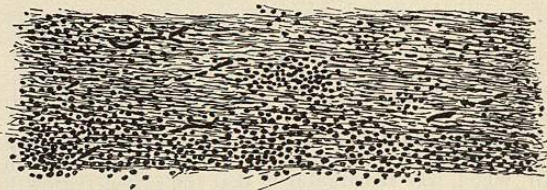


FIG. 4718.—Microsporon Audouini (small-spore fungus) in Hair. (Engman.)

the action of the fungus, Achorion Schönleinii, which causes the formation of cup-shaped yellow crusts about the hairs, and subsequent atrophy and baldness of the part.

The most common location for favus is upon the scalp, but any portion of the integument may be attacked. The nails especially are not infrequently involved by secondary inoculation from the scalp. The disease is rarely contracted after childhood, and is said to be more frequent in males. It is usually seen in this country (United States of America) among the poorer classes of foreigners, especially in Polish, Russian, German, and Italian children.

The fungus gains access to the scalp generally through direct contagion from another child, or from one of the pet, domestic animals, and shows its presence there by causing a superficial, slightly red, scaly patch, which slowly changes its aspect until it presents, at several of the follicular openings, a small yellow point pierced in its centre by a hair. These points gradually increase in size and develop into the "cups," crusts, or scutula, characteristic of the disease. They vary in size, but at an early stage show the scooped-out or cup-shape, which is produced by the luxuriant growth of the fungus at the mouth of the follicle and the rapid increase and piling up of its elements and tissue debris at the peripheral portion in a uniformly concentric manner. The convex or under surface of the scutula is rather firmly attached to the skin, at the mouths of the follicles, and when removed discloses an oozing, slightly excavated and reddened surface. If the crusts are allowed to remain for a sufficient length of time the surface upon which they rest becomes atrophic, white, and permanently bald. The yellow color of the crusts may, from the admixture of foreign material, become correspondingly modified. As the disease progresses new foci of infection may appear or the initial patch may spread peripherally, and as the scutula increase in size and numbers, they join each other, producing diffuse, "mortar-like masses," often extending over a large surface. When this occurs a peculiar mouse-nest odor is apparent.

The hairs are involved very early in the disease; their nutrition is interfered with by the mechanical influence of the mass in the follicle, and by the direct parasitic action of the fungus which grows upon the shaft and in the medulla, with the result that the hairs become lustreless, friable, brittle, and break off or fall out. When the stumps are of sufficient length a frosted or peculiar powdered effect is often seen in a reflected light, due to the access of air into the split-up shaft.

The disease is generally slow in its progress, and varies in different climates and different individuals in the rapidity of its extension and growth. The fungus, having gained access to the follicle, increases proportionately to the fertility of the soil, and produces the favus scutulum, varying in size from a pea to a silver dime, the presence of which by its pressure and probably by the toxicity of

the organism causes a mild inflammation. This inflammation and the mechanical pressure of the scutulum, if long continued, produce an atrophy of the tissues, the contraction of which loosens the crust and it is then either knocked or cast off, leaving a pinkish-white atrophic surface, free from hair. As this process of recent infection of new and atrophy of old infected follicles is continuously going on, a patch may present crusts in various stages of evolution, with atrophy between them.

Favus of the non-hairy parts presents the same essential characteristics, in the lanugo hair follicles, as upon the scalp, except in certain cases in which a special variety of the fungus or a peculiar condition of the soil causes alterations similar in appearance to those of *tinea circinata* (*favus à lésions trichophytoïdes*). In neglected cases great yellow masses may be scattered generally over the surface of the body.

Favus of the nails (*Onychomycosis favosa*) may occur in two forms: in one a scutulum is formed in the deep cells of the nail, and is distinguished as a small yellow mass through the clear nail substance above it; in the other variety the nail plate is lustreless, fissured, split, and raised from its bed, but the microscope is necessary to confirm the diagnosis.

If the characteristics of favus are kept in mind the diagnosis is not difficult, except in atypical forms, when it is necessary to demonstrate the fungus in the scales in order to differentiate the condition from certain types of eczema.

The distinguishing microscopical characteristics of the favus fungus are the predominance and great variety as to the size of the spores, the short and jointed appearance of the mycelia, and the ease with which they break up into single cells (*Kaposi*).

Prognosis.—Favus is one of the most difficult of scalp diseases to cure, and consequently a very guarded prognosis must be given; months and often years are necessary to effect a cure.

Treatment.—The indications for treatment are to remove the crusts with a sulphur salve or carbolized oil, to resort next to epilation, and then immediately afterward to apply some parasiticide, which should be rubbed vigorously into the parts. The methods of treatment and

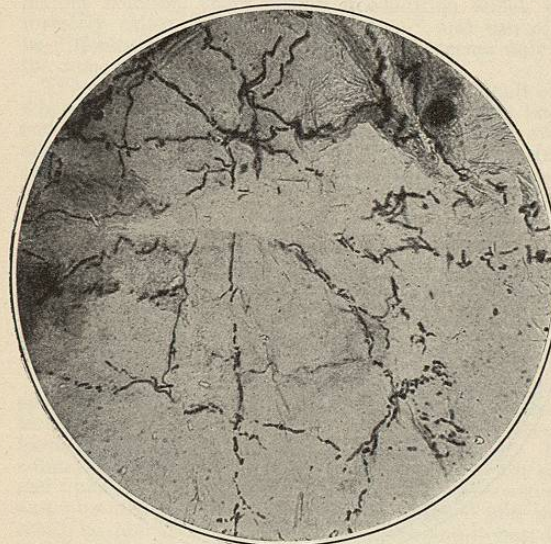


FIG. 4719.—Microsporon Audouini (small-spore fungus) in Horny Layer. (Eyepiece, three-fourth inch; objective, one-twelfth inch; oil immersion.)

agents recommended are innumerable. The hairs should be epilated well beyond the diseased area, and, whatever remedy be selected, it should be applied immediately. George T. Jackson has had good results in both ring-

worm and favus with iodine (one drachm of the crystals rubbed up in an ounce of goose grease). The writer has been encouraged by the results obtained from the thor-

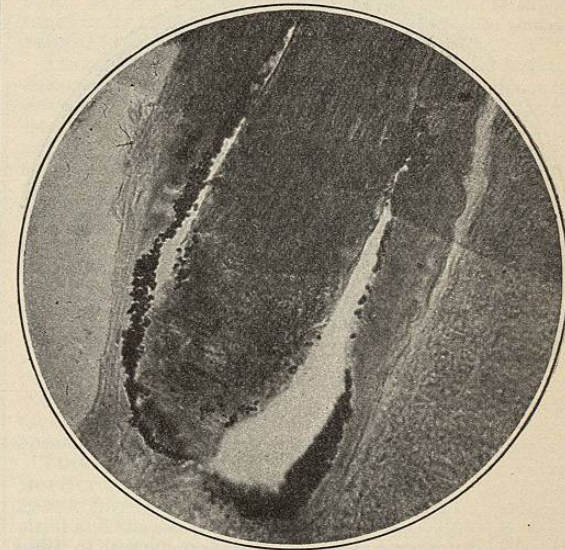


FIG. 4720.—Microsporon Audouini (small-spore fungus) in the Follicle and Hair. (Eyepiece, two inches; objective, one-eighth inch.)

ough application of equal parts of trikresol and alcohol after epilation. Sulphur, chrysarobin, pyrogallol acid, tar, and numerous other parasitocides have their advocates, however. Many of them will prove efficacious in conjunction with epilation, patience, and perseverance. The most encouraging remedy of all is probably that of radiotherapy. The patch or patches should be exposed to a tube of low vacuum for from ten to twenty minutes, two or three times a week, until the hairs fall out. This procedure often effects a cure. The healthy scalp should be protected by lead foil. Upon the glabrous skin favus should be treated as ringworm (*Tinea circinata*).

TINEA TRICHOPHYTINA OR RINGWORM.—The presence of the ringworm fungi excites upon the skin several clinical types of disease, which vary in their symptoms according to the locality attacked and the variety of the fungus concerned.

Formerly the ringworm fungi were thought to be identical until Sabouraud demonstrated (and his observations have in the main been confirmed) that they should be divided into two groups—a small-spore (*Microsporon Audouini*) and a large-spore fungus (*Megalosporon*). The latter he subdivides into *Megalosporon ectothrix* and *Megalosporon endothrix*, according to whether its elements lie outside (*ectothrix*) or in the shaft of the hair (*endothrix*), which is believed by many to be a fanciful division, as these two forms seem to be "a question of soil rather than of origin" (Crocker).

The small-spore form chiefly attacks the scalp of children, and is responsible for the majority of the resistant cases of ringworm in them. Upon microscopical examination the spores are seen to have a lack of any particular arrangement, being in irregular groups or swarms, which is characteristic. Each spore is separate from the other, and they are located outside the shaft of the hair, with a few thin, curved, branching mycelia in the medulla.

The large-spore form causes a small percentage of scalp ringworm, but is the one most commonly found in that of the beard, glabrous skin, and nails. The spores in this variety are arranged in chains with short-jointed mycelium here and there; these elements being in more or less profusion either in or outside the shaft or they may occupy both localities—an endo-ectothrix.

Wherever the large-spore fungus is found, especially

the ectothrix variety, there are more objective signs of inflammation. Sabouraud affirms that the ectothrix is

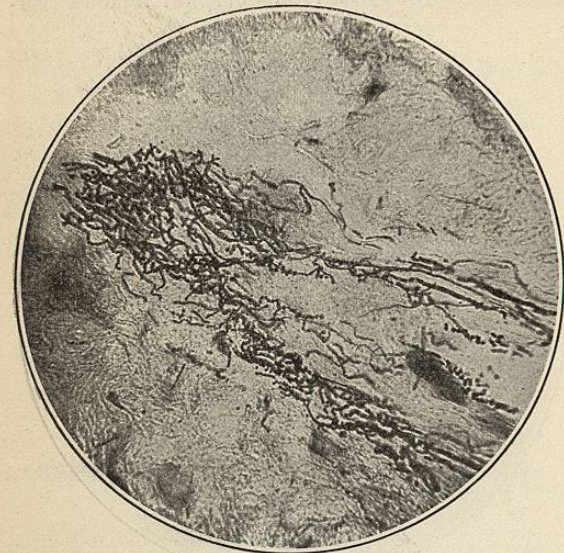


Fig. 4721.—Microsporon Audouinii (small-spore fungus) in Tissue about Follicle. (Eyepiece, one inch; objective, one-twelfth inch; oil immersion.)

always of animal origin, and is the cause of all pustular ringworms; others, however, have found the microsporon in similar conditions.

If the arrangement and location of the spores in the different forms be remembered, one can upon microscopical examination readily determine the variety to which they belong.

Trichophytosis is contagious, the fungus being conveyed by direct contact or through the media of toilet articles, wearing apparel, bed linen, etc. It is less frequent after the age of fifty, and some individuals are probably more susceptible than others. In children the scalp and in adults the glabrous skin and beard are the regions most frequently involved.

TINEA TONSURANS OR RINGWORM OF THE SCALP occurs almost exclusively before the age of fifteen years.

Since the investigations of Sabouraud and others it is necessary to treat the clinical aspects of scalp ringworm especially from a pathological standpoint, according to the variety of the invading fungus.

Microsporon Ringworm of the Scalp.—The small-spore fungus is accountable for from eighty-five to ninety per cent. of all scalp ringworms, and occurs exclusively in children. It is generally seen as one or several round or oval bald-looking patches of a slaty, dull gray color, their size dependent upon the length of time they have existed, as they begin from small points and spread peripherally. Various bizarre or gyrate outlines may be described if several patches coalesce. The infected surface, which may be more or less thickened, is covered by fine whitish scales, and the hairs are found upon close inspection to be twisted, bent, or broken off close to the scalp. This circumstance, coupled with the fact that a fine white sheath extends a short distance upon the shaft, gives the patch the appearance of being bald. When a hair is pulled it readily breaks, showing the disorganizing effect of the fungus upon it. Under the microscope the hair is seen to be frayed at the ends, and the white sheath to be composed of the fungus elements. In but few cases are there any symptoms of active inflammation.

Megalosporon Endothrix of the Scalp.—The endothrix fungus is divided by Sabouraud into two subdivisions: one with mycelium which breaks easily ("fragile") and the other with a more resistant mycelium ("resistant"). These varieties cause an alopecia, which is often quite

similar in appearance to alopecia areata. There may be one or several smooth bald patches disseminated over the scalp, with a few ill-nourished hairs scattered over it, and numerous "black dots" here and there, which upon extraction prove to be broken and disorganized hairs. The patches are irregular in shape, and in some cases are pityriatic. In this form of ringworm there may be scattered groups of a few broken hairs upon a scaly, scurfy scalp.

"Black-dot ringworm," "disseminated ringworm," "bald Tinea tonsurans" are terms formerly used by English writers to designate this form.

Megalosporon Ectothrix of the Scalp.—The ectothrix always causes more inflammatory symptoms than do the other types. The infection begins as a red, scaly ring with a distinct border composed of papules, vesicles, or, later, pustules, the hairs becoming disorganized and broken as the disease progresses. In many cases the fungus penetrates deeply into the follicle and produces marked inflammation with suppuration, forming a fluctuating mass, from which pus oozes at the openings of the follicles. The condition thus caused is known as *Kerion*. Several English observers have seen the microsporon cause the same process.

Granuloma trichophyticum of Majocchi is analogous to kerion; so also is *hyphomycetic granuloma* (Schamberg), which may simulate a malignant growth. *Conglomerate pustular folliculitis* or *agminate folliculitis* consists of a circumscribed, highly inflamed patch, occurring generally upon the hand or arm, at the follicular openings of which is a pustule or an oozing point from which pus can be expressed—a pus which contains double-contoured spheres, the spores of the Trichophyton ectothrix.

The diagnosis of scalp ringworm is made by the broken hairs and the microscopical demonstration of the fungus elements.

The prognosis as to ultimate cure is good, but from three months to a year is a conservative estimate as to the time necessary for the cure, especially in the microsporon type. Permanent baldness often remains at the site of kerion.

TINEA CIRCINATA, TINEA CORPORIS, OR RINGWORM OF THE BODY are the terms applied to the invasion of the non-hairy skin by the trichophyton fungus, all varieties

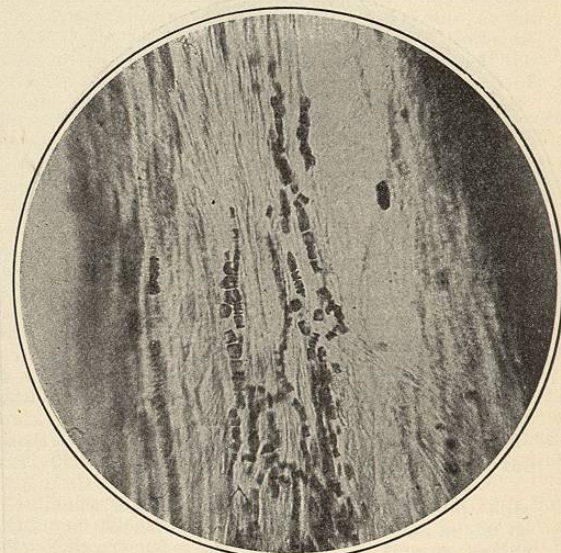


Fig. 4722.—Megalosporon ectothrix (large-spore fungus) in Hair. (Eyepiece, three-quarter inch; objective, one-twelfth inch; oil immersion.)

of which cause at the beginning of infection a circular scaly pink patch that spreads peripherally with a pinkish border, and clears up or involutes in the central portion,

leaving a faintly yellowish tinge in its wake, thus forming a ring. The border of the ring may be minutely papular or vesicular.

The rings caused by *microsporon* are small, seldom larger than a silver quarter, and are generally seen upon the exposed parts in children with ringworm of the scalp.

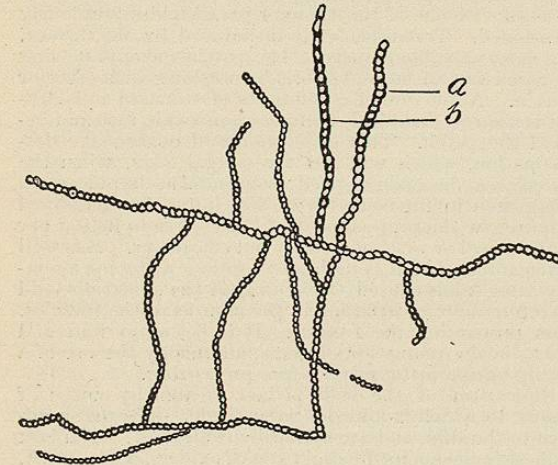


Fig. 4723.—Megalosporon Ectothrix (large-spore fungus) from Nail Scrapings. a and b, Filaments of very large spores. (Engman.)

Not infrequently in this variety small scaly, reddish plaques are seen which do not undergo central involution to form rings.

The rings caused by *megalosporon* are large, often attaining several inches in diameter; they are scaly; all the symptoms are more inflammatory than in the former type. If several points of infection occur close together, the rings may meet by peripheral extension, forming various gyrate figures.

When the infection occurs in the genito-crural or axillary regions, where the heat and moisture of the part favor the growth of the organism and a more inflammatory reaction, there ensues a condition which was formerly called "eczema marginatum," and can often be differentiated from certain forms of eczema only by the demonstration of the fungi.

The diagnosis of ringworm of the body is difficult only when there are numerous foci scattered over the body, and when the patches fail to form rings, in which event microscopical aid is necessary to differentiate it from eczema seborrhoicum of Unna and from certain analogous forms of that disease.

The disease in all its various phases is readily amenable to treatment.

TINEA BARBÆ, TINEA SYCOSIS, BARBER'S ITCH, is a folliculitis of the hairy portion of the face caused by the *Trichophyton Megalosporon Ectothrix*. The disease is generally contracted in barber shops, the fungus being most probably conveyed by the shaving brush or "pinchers" used by barbers for extracting "ingrowing hairs."

The earliest symptoms consist of one or more scaly spots or rings of a rather inflammatory nature. Scattered on or about the border of the patch are several hard, raised papules or pustules, pierced by a hair. The subsequent increase of symptoms depends upon the soil, and upon neglect or improper treatment; more papules and pustules develop, the hairs are loosened and may easily be plucked out. The part burns and itches, and is inflamed and swollen in appearance. By the massing together of a number of infected follicles, pea- to nut-sized nodules form, the surface of which becomes crusted. When the crust is removed a raw, excoriated surface is exposed, dotted by oozing points. This appearance has been compared to the cut surface of a fig; hence the term sycosis (σικον, a fig). There is only moderate tenderness or pain about these lesions.

The diagnosis of *Tinea barbæ* is readily made by the ring, by the nodules, and by painless extraction of the hairs; in mild and atypical cases it may be easily confounded with coccogenic sycosis ("non-parasitic"). The latter has not the deep lesions or lumpiness, is not so rapid in its progress, and the hairs are not loose and are painful to extract.

TINEA UNGUIUM, ONYCHOMYCOSIS TRICHOPHYTINA, RINGWORM OF THE NAILS, is due to the *Megalosporon ectothrix*. It is usually a secondary auto-inoculation from ringworm elsewhere, causing a splitting up of the nail plate, rendering it brittle, dull, yellowish, ridged or striated transversely or longitudinally; finally, the separation of the nail plate from the bed may occur. One or more nails may be involved, but seldom symmetrically.

A diagnosis from various other nail diseases which present similar symptoms can be made only by microscopical examination of the nail scrapings (Fig. 4723).

The condition is exceedingly difficult to treat successfully, and may last for years.

TINEA IMBRICATA OR TOKELAN RINGWORM is a form of ringworm which occurs in the tropics; it is characterized by the formation of large concentric rings of scales, involving a large part of the body surface, but rarely attacking the hair or follicles. It is probably due to a special variety of the large-spore trichophyton fungus.

TINEA VERSICOLOR, PITIRIASIS VERSICOLOR, CHROMOPHYTOSIS is a parasitic disease caused by the *Microsporon furfur*, a fungus, and characterized by variously sized and shaped pityriatic patches of a yellowish, fawn color, which occur most frequently upon the trunk. The disease may be said to be confined to the trunk, but it at times is seen upon the neck, arms, thighs, or other parts. Allen claims that the hairs of the pubic region often conceal a patch that may remain as a focus for subsequent reinfection. The patches begin as small, roundish, yellow, or light-brownish points, which increase in size very slowly by peripheral extension or by the coalescence of several points of infection, thus forming variously sized patches; sometimes one patch may involve a large area of skin, possibly more or less of the whole trunk. The borders of the patches are sharply defined, almost imperceptibly raised, and the surface, especially near the periphery, is slightly scaly, the scales being fine and of a dirty white color. In the dark-skinned races the diseased areas are darker than the surrounding skin. In very fair individuals it is not uncommon to find a tinge of red added to the fawn color of the patches, showing through the yellow, especially in hot sultry weather.

The infection progresses very slowly, and shows no tendency to self-limitation. The fungus, the *Microsporon furfur*, is the sole cause of the condition, and is

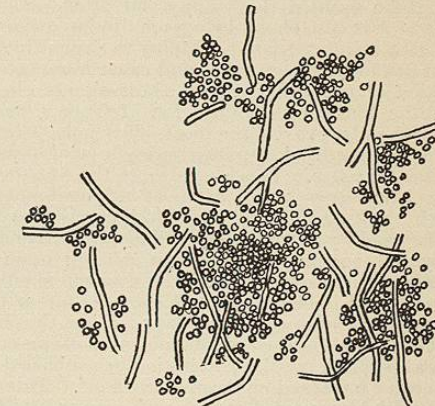


Fig. 4724.—Microsporon furfur, Fungus of Tinea versicolor. Spores and mycelium. (Diagrammatic.)

easily detected by scraping off a few of the scales and examining them in liquor potassii as before described. It is readily differentiated from the other fungi by the

large size of the conidia or spores and by their tendency to occur in groups or masses over the field; the mycelia are fine and interlace between these groups. The *Microsporon furfur* grows luxuriantly in the upper layers of the epidermis, causing no appreciable irritation, and produces by its strongly refractile spores the yellowish color of the infected regions. It is supposed to have greater affinity for a moist skin; it is therefore found most frequently in those who perspire freely. Perfectly healthy adults are attacked as well as the delicate. It is exceedingly rare in children. The disease is contagious, but mildly so, as some special condition of the epidermis besides moisture is necessary for the growth of the organism.

In all suspected cases the scales should be examined for the fungus. Mild parasitic applications cure an attack. Of these the most elegant and cleanly is a saturated aqueous solution of hyposulphite of soda, applied night and morning after a soap and water bath. A cream of ten-per-cent. sulphur precipitate in *Unguentum aquae rosarum* is equally efficacious. Various other parasitic ointments and lotions are used. The attack is easily cured, but when once a person has become susceptible recurrence is the rule; therefore each relapsing spot should at once be destroyed, with any of the agents mentioned; care also being given to the sterilization of wearing apparel and articles of the bath.

Treatment of the Various Forms of Tinea.—The cure of all the types of ringworm depends upon the efficacy with which the parasiticides are brought into contact with the offending organism. This is easily enough accomplished upon the glabrous skin but is quite difficult when the hair follicles are infected. In the latter event it is recommended to extract the hair by epilation, which often proves useless, as the hairs are frequently so badly disorganized that the least traction breaks them off close to the scalp, or just within the follicle. This, however, is not true in ringworm of the beard, where the disease is due to the ectothrix variety, with the formation of pus and the subsequent loosening of the hair. In the infection of the scalp in children, by the microsporon fungus, which disorganizes but does not loosen the hair, it is probably better to "shingle the head than to spend useless time and trouble breaking the hairs by epilation. Epilation by means of the x-rays is not indicated here as in favus, for fear that permanent baldness may ensue. The latter disease (favus) frequently produces permanent baldness independently of epilation, while it never occurs in ringworm except in kerion.

Chrysarobin, pyrogallol, oleate of mercury, iodine, salicylic acid, sulphur—in fact, all antiparasitic agents, have been used in ringworm of the scalp with more or less success. Whatever remedy be selected it is necessary that it be applied thoroughly and often, and in a medium which is capable of being manipulated into the follicle. It is also necessary to employ the agent in sufficient strength to kill the parasite and cause a not too violent reaction of the skin. Of all these agents chrysarobin, in the following combination of Unna's, has, in the writer's hands, proved the most efficacious: Chrysarobin, 2 parts; ichthyol, 5 parts; salicylic acid, 5 parts; and vaseline, 88 parts. This is applied to the whole scalp (after the hair has been cut as short as possible) twice daily, with a soft tooth brush. A cloth cap is then fastened to the head by a bandage passed along the hair line; this prevents the chrysarobin from getting upon the smooth skin or in the eyes. The latter accident should be carefully avoided. The scalp will show irritation from this treatment in from two to four days. Then the chrysarobin salve should be washed off and a soothing cream or ointment applied until all irritation has subsided and the reduced or hardened epidermis scales off. This procedure should be repeated for several courses, until the hair again grows to sufficient length to show whether or not the fungus has been entirely destroyed. Frequent microscopic examinations are a great assistance in watching the effects of the treatment. The chrysarobin discolors the skin and hair and is an heroic procedure. In young girls, and when the patient cannot be carefully

observed, less heroic measures are advisable. In all cases in which the sacrifice of the hair is not too great it should be closely cut, and some weak parasiticide applied to the whole scalp, while the patches themselves may be treated more vigorously. A very good procedure is to apply to the entire scalp a weak sulphur cream and attack the patches with one of the stronger parasiticides previously mentioned. Trikresol, lately introduced by MacGowan, is a most valuable remedy. The patches should be first rendered free of fat and debris by washing with ether or benzine. A mixture of equal parts of trikresol and alcohol is then well rubbed, with a cotton swab, into and beyond the patch. This application will cause some desquamation, which will last for several days, when the remedy may be again applied; some mild antiseptic cream being used in the mean time. Precipitated or sublimed sulphur, in the proportion of from twelve to fifteen per cent. in lard or vaseline, is slow but efficacious. It is well to remember that it is useless to continue applying a remedy after it has caused thickening of the epidermis, and therefore more obstruction in the mouths of the follicles, thus protecting the fungus. It is better to wait and assist the desquamation of the epidermis by the use of a mildly antiparasitic salve before proceeding.

Ringworm of the body is best treated by means of pastes, to which is added a parasiticide. The pastes adhere to the skin, and are not easily rubbed off. The best of these is one made of equal parts of oxide of zinc, starch, vaseline, and lanolin. To this may be added either sulphur (from six to twelve per cent.) or ammoniated mercury (four to six per cent.). Taylor recommends one to three grains of mercuric bichloride to an ounce of the compound tincture of benzoin. Resorcin, salicylic acid, ichthyol, and preparations of tar are all efficacious in salves, pastes, or lotions.

"Eczema marginatum" is, for the reasons already given, the most difficult of the so-called body ringworms to cure. In this affection pastes often prove irritating; the application of salves, dusted over with talcum powder, is more agreeable. The itching and consequent rubbing and excoriation are elements to be dealt with in this locality; therefore the use of an antipruritic, like carbolic acid, is necessary. The writer has been pleased with the following: Carbolic acid, gtt. v.; precipitated sulphur, gr. xx.; balsam of Peru, gtt. xx.; vaseline, 3 v.; lanolin, 3 iij. Lotions, unless the case is very mild, do not act well in this locality.

Tinea barbæ in the mild form is readily cured by the application of any of the parasiticides mentioned. In severe cases the crusts should be removed with carbolized or salicylated oil or vaseline; the diseased hairs should be epilated and the beard shaved, immediately after which the remedy is rubbed in. Sulphur, five to ten per cent. in vaseline, or in equal parts of lanolin and vaseline, is generally useful. Xeroform, five per cent. in olive oil, has proved valuable in the writer's experience.

In *Tinea unguium* the nail, after being scraped, should be soaked in a hot alkaline solution, and the parasitic salve rubbed in; then some of the salve should be spread upon cloth and bandaged on, or held in place by a finger cot. Unna applies, after the scraping, a solution of bichloride of mercury, in flexible collodion thinned with ether (bichloride of mercury, gr. i.-iv.; ether, 3 ij.; flexible collodion, 3 vi.).
Martin F. Engman.

TINNITUS AURIUM.—DEFINITION.—Any subjective noise, heard in one or both ears, as the result of some abnormal condition somewhere in the body.

CAUSES.—Anything which irritates the nervous mechanism of hearing, in any part, from the cortex of the brain to the cochlear hair cells. Tinnitus has been noted as an *aura epileptica* (cerebral irritation); at the onset of an attack of *syncope* (cerebral anemia); and at the time of an attack of cerebral hemorrhage (general cranial hyperæmia). It also occurs as the result of poisoning by certain drugs (quinine, salicylic acid). The precise physiology of this action is not clear, but it is probably due to cerebral irritation, since it can be readily con-

trolled by the administration of bromides. Tinnitus is also observed in meningitis. This may depend upon irritation of the auditory nerve in its course.

As commonly seen, however, tinnitus is due to some form of ear disease, and some of these cases present perhaps the most perplexing problems which the whole range of otology can offer. For it is a matter of common observation that a moderate degree of deafness may pass unnoticed for years, and finally be discovered, as it were by accident, by a patient's friends. Tinnitus, however, never fails to be a matter for complaint, causing as it does a degree of discomfort always considerable, and being often of grave danger to the patient's bodily and mental health. It has been claimed that some suicides have been caused by loud and persistent tinnitus, but the writer has not been able to find any reported cases. It is, however, almost certain that in persons predisposed to mental disease, tinnitus has led to auditory hallucinations, and thus has acted as the determining cause of an attack of insanity.

According to Sexton, fifty per cent. of all ear patients have more or less tinnitus. In the writer's experience a greater or less degree of it is so common in chronic deafness that its absence in any case is worthy of comment. It is seen in diseases of all parts of the ear. It is often a prominent symptom in cases of impacted cerumen, also in furunculosis of the meatus externus. It may also be found in cases of tubal catarrh, of stricture of the Eustachian tube, of acute otitis media, catarrhal or purulent; it is a common symptom in all forms of chronic otitis media, and in the lighter forms of otitis interna, where the auditory nerve is not completely destroyed. The worst and most obstinate cases are those of otosclerosis. This disease, which has been only of late differentiated from chronic aural catarrh, is one of the most frequent causes of tinnitus, which is usually an early, and may be during months or years the only, symptom.

Tinnitus presents itself under various forms, both as to quantity and as to quality of noise, and also as to constancy or intermittency of its occurrence. As to quantity, the noise may vary from a soft, barely noticeable rustle, as of the leaves on a tree, to an excessively loud screaming sound, like a steam whistle. The latter extreme is, of course, rare. All intermediate degrees, however, are constantly seen. The quality of the sound varies greatly. It may be high-pitched or low-pitched, blowing like the wind, whistling like the escape of steam, crackling like a wood fire, or occasionally detonating like an exploding firecracker. More serious are those rare cases in which the noise takes the form of music, or of human speech. It is always possible that in such a case we are dealing with a psychopathic patient, and we must therefore be on the watch for the development of genuine auditory hallucinations. Many patients have two or more kinds of tinnitus at once. The writer has at present two such cases under observation.

Panse (*Zeit. für Ohrenheilkunde*, 1898, p. 244) attempted to show that low-pitched sounds occur chiefly in diseases of the sound-conducting apparatus, and those of high pitch in conditions affecting the labyrinth. His conclusions are denied by Politzer, with whom the writer is inclined to agree, never having been able to satisfy himself that there was any necessary relation between the kind of noise and the anatomical condition causing it.

Constancy or intermittence of the noise is a more important feature, because it seems to have a bearing upon prognosis. In certain cases tinnitus occurs in waves, synchronous with the beat of the pulse. In these cases it is always possible that the underlying lesion is of the type of a simple congestion, which may be curable, partly or wholly. In other cases the wave of sound comes with inspiration or expiration (respiratory tinnitus). These cases are sometimes due to the rushing of the inspired air through an abnormally patulous Eustachian tube, as in a case reported by Kerrison (*Med. Record*, April 19th, 1902). In this particular case treatment was wholly successful, and the patient, a man over seventy years of age, was completely cured.

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Some patients say that they hear the noise only when lying down, and especially at night. These are usually cases of the milder type. This may depend upon the recumbent position, or more probably perhaps upon the fact that during the hours of rest one has fewer distractions than at other times. To interfere seriously with sleep, tinnitus must be very severe. There are other cases in which the tinnitus is made worse by bending forward, or by or during heavy exercise.

It must also be noted that some persons have the knack of causing at will certain sounds in the ear. These are usually clicking sounds, probably caused by opening and shutting the pharyngeal orifice of the Eustachian tube, by action of the tensor palati muscle. This action sometimes takes place involuntarily, and the noise thus produced is one of the class known as *entotic*. These noises are actual, as opposed to those which are strictly subjective, and in many cases may be heard by the examiner. Apart from the clicking caused by action of the tensor palati, there may be clonic contractions of the intrinsic muscles of the ear (tensor tympani and stapedius) which cause ticking or humming sounds. There are also the so-called vascular entotic noises, caused by anomalies of the blood-vessels. According to Politzer ("Diseases of the Ear," 1902, p. 777) they may be due to the following pathological conditions: dilatation of the arterial branches within the tympanum, changes in the carotid canal, cardiovascular lesions, goitre, cranial aneurisms, or chlorosis (*bruit du diable*). They are synchronous with the pulse, and may, in some instances, be heard by auscultation all over the head. Attempts which have been made to relieve these cases by ligating the carotid artery have given unsatisfactory results. In a case operated upon in this manner by Linsmayer, and reported by Politzer (*loc. cit.*), the operation was followed by death from softening of the corresponding cerebral hemisphere.

PROGNOSIS.—It goes without saying that the prognosis as to recovery in any given case depends upon the nature of the underlying anatomical cause. In a general way, however, it may be said that the hope of recovery from tinnitus is much less than the hope of relief from deafness. Many patients who complain of both deafness and tinnitus gain a very fair degree of hearing, while their annoying ear noise continues about the same. Cases of intermittent tinnitus offer a somewhat better prognosis than where the noise is constant, as the causative lesion is apt to be of a less permanent character. Slighter degrees of tinnitus, and those in which the noise has existed only for a short time, are more favorable than those of severer character and longer standing.

TREATMENT.—The successful treatment of tinnitus depends entirely upon the possibility of discovering and removing its cause. Therefore it may be said that the treatment of tinnitus is the treatment of diseases of the ear. Accuracy in diagnosis is essential. Every patient is entitled to the most careful and painstaking examination of which the aurist is capable. A complete history of the case must first be taken, and all possible causes, apart from the ear, must be considered. Next comes a detailed physical examination of the auricle, the external meatus, the drum membrane, and the mastoid region, followed by examination of the nose and throat. By means of the auscultation tube we should listen to the sounds that are generated while air is being forced through the Eustachian tube into the middle ear. Finally, all known means of functional testing of the hearing should be employed—voice, watch, acoumeter, the various tuning-fork tests (Rinné, Weber, Gellé); also the Galton-whistle test for the upper tone limit should be tried in order to acquire as complete a knowledge as is possible of the anatomical condition. Treatment then is directed to rectifying what is wrong, so far as this can be done. Impacted cerumen must be removed. Furunculosis or other disease of the canal calls for appropriate treatment. A retracted drum membrane or a chain of ankylosed ossicles must be restored to the normal condition by inflation, pneumo-massage, or the Lucae pressure-probe. A contracted Eustachian tube calls for dilatation by the use of