

WHITE (J. C.)

VEGETABLE PARASITES,

AND THE

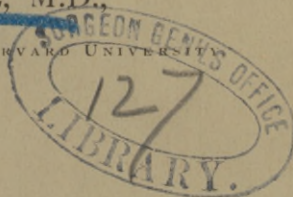
DISEASES CAUSED BY THEIR GROWTH  
UPON MAN.

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BY

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- VEGETABLE PARASITES
1. THE NATURE OF VEGETABLE PARASITES.
  2. THE DISEASES TO WHICH THEY GIVE RISE UPON MAN.
  3. PSEUDO-PARASITES.
  4. THEIR GROWTH UPON THE DOMESTIC ANIMALS.
  5. THEIR SUPPOSED IDENTITY, AND THEIR RELATIONS TO COMMON MOULDS.
  6. COMMON SOURCES OF CONTAGION, AND PRECAUTIONS TO BE USED AGAINST THEM.

## VEGETABLE PARASITES.

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### 1. *The Nature of Vegetable Parasites.*

The question of the occurrence of low forms of vegetable life upon the external surface of man at times, and of alterations in the tissues of the skin and its appendages in connection with, or in consequence of, their presence there, is no longer a matter for discussion ; it is a fact as well demonstrated as the growth of the lichen upon tree and rock. Concerning the botanical position of these forms, however, their absolute connection with some of the affections in which they are found, the identity of the different varieties, and their relations to the common moulds of decay and fermentation, there still exists a great difference of opinion in consequence of lack of knowledge on these points. The purpose of this paper is to present some account of what is known about vegetable parasites and their effects upon the exterior of man and other animals, and of the present state of information in relation to that part of the subject which is still a matter of theory and under investigation.

At the foot of the vegetable kingdom there exists a large family of so-called cryptogamous or flowerless plants, the fungi, among which the forms under consideration are generally placed, although there are recent writers who would give them a still lower rank in the scale of creation, and, on account of their marked dissimilarity to plants in most respects, would make of them an entirely independent group of organisms. Like many of the moulds, nothing can be learned of their structure by the unaided eye, and in some cases even their existence can only be determined by the high powers of the microscope.

Examined by this instrument, the growths in question are

found to consist of elongated, extremely slender, thread-like cells or tubes, more or less branched or intertwined, and divided transversely by partition walls here and there. This, the nutritive or vegetative part of the fungus, is called *mycelium*. It may increase directly by subdivision into cells which have also the power of branching and self-multiplication, or by the production of innumerable, minute spherical or ovoid cells at the ends of certain of its branches, either enclosed in capsules called sporangia, or growing in bunches or bead-like chains, when they are called *conidia* or *spores*. These conidia, when detached, may be found single, united in rows, or divided into compound cells, and each of these is capable of reproducing the mycelium in turn. If these cells or the mycelium be placed in a liquid under proper conditions, their substance, or plasma, as it is called, becomes cloudy and subdivided into innumerable and infinitely small, free cells, which have the power of multiplying by self-division again, and which are either motionless or exhibit peculiar movements among themselves. One of these forms is called *micrococcus*, a term applied not only to what is really known to be the most minute and elementary form of fungus growth, but to much else of indefinite character in the shape of granules detected universally in matter under certain conditions by the highest powers of the microscope. The term is strictly applied to the more or less spherical cells or points,—those which are somewhat elongated and swollen at one or both ends being called bacteria; while those united in minute chains are called vibriones. These are supposed to be the primitive forms of organic life, and are of late much and loosely referred to in the discussions upon the germ-theory of disease. As a phase in the life of the parasitic fungi they claim our attention here.

Placed in suitable fluids these infinitely small cells develop into other and much larger cells of various shapes, which are found either single or united in rows with lateral branches, which increase by budding, and may assume an elongated form like mycelium. They are the submerged form of fungus life, and are known as ferment cells, of which the beer or yeast plant, the wine and vinegar plants, and the milk ferment are well-known examples. This form is capable of reversion to the micrococcus, or under more favorable circumstances probably of attaining to the higher mycelial and conidial development

above described. It is a form of special interest from its close resemblance in shape and size and manner of growth to the spores which form by far the greater portion of the fungus growths parasitic upon man, but which are regarded rather as sterile mycelial elements. The forms which demand our attention, therefore, are, to repeat, the cell-like spores or conidia, the tube-like mycelium, and the myrococcus granules.

These are the forms which make up the structure of the moulds, and the varying predominance of some one or more of these elements, their shape and size, constitute the only distinguishing features formerly recognized among them. Such variations were generally regarded as specific characters, and upon such views mycological systems have hitherto been based, but recent observation has shown that such a system of classification is wholly wrong; that moulds assume a great variety of forms according to the nature of the soil and the atmospheric condition under which they grow; and that many of the most common of those formerly recognized as distinct species are but varieties of some one well-known individual, prevented from attaining their perfect development by the circumstances of their position. Such tendency to variation has been termed Pleomorphism, and must be farther considered in connection with some of the questions above referred to. It is enough for our present purpose to recognize the possibility that the simple spores and mycelium, which make up almost wholly the growth of the vegetable parasites under consideration, are not the only or highest phase of development of which they are severally capable, and that under other conditions they might present appearances so unlike these as to have no apparent connection with them.

The important part which these humble forms of vegetation play in the economy of nature may only be briefly alluded to here. The processes of fermentation by which fruits and cereals are converted into wines and beer, and these in turn into vinegar, by which the sugar of milk is changed to lactic acid, and many other transformations by which new chemical products are obtained, are exhibitions of their influence over the metamorphosis of matter. They are the active agents, too, in those less obvious changes by which dead matter, so called,

is resolved into its ultimate elements and converted into a state best fitted for the support of future vegetation.

But it is not wholly upon decaying, or at the expense of inanimate objects, that fungi flourish, nor are the results of their operations always as beneficial as those just mentioned. The existence of the destructive wheat bunt and rust, and of the poisonous ergot of rye, the disastrous disease of the vine, the potato rot, and the dry rot of the hardest oaks, show how such insignificant creations may change the destiny and destroy the health of nations. They prove too that fungi may attach themselves to, and live at the expense of, the living tissues of other plants, and, as Berkeley says, although they may not prey upon cells full of vital energy, life is so depressed by the presence and contact of tissues already diseased, that the healthiest soon fall victims to the deadly encroachment of the spreading mycelium. Upon the higher organization of animal life, too, we find the same destructive agencies at work. The domestic fly glued to the window-pane, and surrounded by its pall of white spore dust, oftenest calls our attention to this fact, and the muscadine of the silkworm has been as destructive to large manufacturing districts in France as the oidium to the celebrated vineyards of Madeira. The well-known spheriæ of New Zealand, objects apparently dried plant at one end, dried caterpillar at the other, furnish another instance of the mastery of their living host by fungi. Such victories of the vegetable over animal life, and the seeming metamorphosis, are foreshadowed by the fabulous transformations of Clytie and Daphne.

The effects which fungi produce by their presence upon the surface of man are never fatal in character or in any way injurious to his constitution; they are, however, the cause of serious deformity and discomfort, as will appear in the following account of the several affections in which they occur. The number of these diseases has been constantly changing since Schoenlein in 1839 first recognized the cryptogamic character of the crusts of Favus, according to the discoveries of observers and the varying views which writers on these subjects have expressed from time to time. There are those who profess to believe in the impossibility of a plant's attaching itself to animal tissues under any circumstances; but such an opinion, as stated at the beginning, requires no notice, as this part of the



question is settled. There are others who, from the fact that the spores of various fungi are occasionally detected in the effete scales of Psoriasis, the crusts of Eczema, and in other cutaneous diseases, the non-parasitic nature of which no one questions, claim that their presence in all other cases is equally insignificant. Such a conclusion is as unsound as would be that of a botanist who should deny the cryptogamic nature of the various parasitic growths upon the forest tree, because the crevices of its bark catch and retain the scattered spores which the wind is always sweeping through the air. Then there are certain affections in which fungi have been discovered by some, and not recognized by other reliable observers: the former maintaining that the plant is the cause of the abnormal appearances which constitute the disease, the latter that it is only occasionally and accidentally present. Great difference of opinion prevails therefore with regard to the position of several of these affections, not only as to whether they are to be considered of parasitic origin, but as to their mutual relations among those who claim the latter.

On the other hand, there are three well-marked and important affections of the skin and its appendages which reliable authority universally admits to be produced by the presence of fungi upon and within their tissues, and these will be first considered. They are called Favus, Herpes tonsurans, and Pityriasis versicolor.

## 2. *The Diseases to which they give Rise.*

### FAVUS.

The first of these, Favus, is the one in which, as already stated, the existence of a vegetable parasite was first recognized. It may be briefly described as an affection of the scalp and external covering, characterized by the formation of large, yellow crusts. The shape of these crusts is peculiar, being concave upon their upper and exposed surface, circular or ovoid in outline, and presenting concentric rings rising like the seats of an amphitheatre from the central depression towards the elevated margin as they increase by peripheral growth. In size they vary from a minute point scarcely discernible by the naked eye to flattened masses a half inch in diameter when separate, and an eighth of an inch or more in elevation above the surface of the skin at their edges. Distinct crusts may by confluence, however, form large patches in which their

characteristic concavities may be more or less blended and lost. These peculiarities of shape are caused by their seat and the method of their growth. The minute elements of the fungus gain entrance to the tissues of the skin upon which they thrive through the opening of the hair follicle, and from this as a central point extend downwards into the hair canal, and outwards in all directions into the epidermis. At first a minute globular mass is formed, but as the growth increases peripherally it is held down at its centre by the clinging of the hair-sheath to the hair, while in the free epidermal tissues around it is allowed an upward growth. It is the presence of the hair in the centre of each crust, therefore, which mainly causes the concavity of the crusts. Upon the scalp where the hairs are best developed this shape is longest retained, while upon the general surface of the body, where it is much less frequently met with, the crusts when large wholly lose this peculiarity and form irregular-shaped masses projecting to a much greater elevation above the surface. If we remove one of the small and perfect crusts, which is easily done by the nails, or a blunt instrument, we shall find its under surface convex, and that it is seated upon a smooth and shining depressed surface, which soon rises again to the level of the surrounding skin, and reproduces the crust. The color of the crusts when young is bright orange, fading to a pale lemon color when older. The odor is disagreeable, resembling, as it is thought, somewhat that of mice, a significant fact in connection with its frequent occurrence upon these animals. These appearances may be modified by the bursting of the crusts by rough handling and the discharge of their contents, or inflammation may arise beneath them from the same cause, and the pus and blood mingling with them give rise to the formation of large scabs.

There is a stage, however, in Favus, preceding the appearance of the crusts, which is generally overlooked, and which strongly resembles the appearances peculiar to the disease next to be described. This is best studied by observing the effects of inoculation upon portions of skin not covered with hair. This is most successfully accomplished by enlarging the openings of hair-follicles by a needle, and applying to the punctures a drop of water containing favus particles. In a few days a red spot is noticed which is somewhat scaly upon the surface, and increases in size, apparently healing in the centre, as it spreads outwards. Sometimes groups of small vesicles or papules may be seen within the patch. These appearances, so strongly resembling ringworm, may last three or four weeks, and disappear without the production of a true favus crust, if the growth should not chance to enter the canal of the hair follicles

seated within its border; but generally minute masses of the characteristic yellow color may be seen, or characteristic favus cups are formed after a while. This early stage is rarely noticed upon the scalp for two reasons: it is concealed by the hairs when present, and the larger development of hair there leads to the more easy and rapid formation of the crusts which obscure it. Favus is so rarely seen upon other parts than the scalp, that this stage is little understood, and when observed has been without doubt mistaken for ringworm in many instances. This error, or an occasional chance coincidence of the two affections upon the same portion of the skin, has given rise to the opinion, held by some dermatologists, that the fungus is the same in both diseases. This is a question, however, which will be considered further on.\*

\* During the preparation of this paper I have been watching upon my own arm the growth of the favus fungus, inoculated according to the method of Peyritsch.

On November 2d, material from a favus crust, removed from a patient in the skin ward of the Massachusetts General Hospital was rubbed up with a little water so as to form a thin paste. This was smeared over a portion of the fore-arm, where the openings of four contiguous hair-follicles had been just previously enlarged by drilling into them with a needle. An inch above this spot a needle loaded with the same moistened favus matter was bored into three hair follicles also. The parts were then covered with a piece of cotton cloth, and sticking plaster was applied over all.

November 4th.—The follicles thus treated were red and slightly elevated.

November 7th.—Appearances as on 4th.

November 13th.—Follicles of the upper patch much more swollen than those of the lower, and the skin surrounding both points of insertion reddened.

November 20th.—Follicles of upper patch still more prominent than the others, and the skin surrounding them, half an inch in diameter, considerably swollen.

December 7th.—The dressings, which up to this time had been only momentarily removed for inspection, were not replaced, and the parts were covered simply by the ordinary clothing. Both patches were red and covered with yellow, scaly matter, the borders being somewhat elevated and papular. Some of this matter was scraped off, and the parts were then washed for the first time.

December 11th, four days after washing.—The surfaces of both patches have become covered again with yellowish-white scales, and two of the follicles in the upper patch are quite prominent.

The scaly matter removed from the surface was examined by the microscope, and presented the following appearances: The epithelial cells, of which it mainly consisted, were filled with groups of fungus cells, resembling in all respects those of achorion, and quite unlike those of the parasite of *Tinea tonsurans*. A very abundant growth of mycelium was also seen running through the masses of epithelium in all directions. One of the lanugo hairs from the patch was also removed, and, after maceration in a solution of potash, was found to be permeated by favus cells throughout.

December 27th.—The parts are still unchanged, except that they are less red beneath the scaly surface, and the elevated margin has flattened down to the general level of the skin. The spots have not enlarged, and no true, characteristic favus cup has formed. They would not be generally considered as favus, if seen without the above knowledge of their history, and they might easily have been mistaken for ringworm.

February 20th.—The skin of the above parts has returned to its natural appearance. The fungus did not succeed in establishing a permanent hold upon the tissues.

Such are the appearances produced by the growth of the favus plant upon the human skin; the effects and symptoms to which it gives rise need but a brief mention. Upon the general surface of the body it causes various degrees of irritation, sometimes sufficient to excite an eczematous condition of the surrounding skin if scratched, or some immobility of the joints of the limbs, if there seated; but generally its presence is productive of little inconvenience. Upon the scalp, however, its effects are of a more serious nature. The hairs soon begin to change in color, becoming gray or white, lustreless, stiff and brittle, and after a while break off at the surface, or are discharged by suppuration with the surrounding favus masses. In this way the disease spreads over the whole scalp in time, the baldness beginning generally at the front and lateral portions, while the hair upon the occiput may retain its position for years. The baldness may be temporary only, in case the hair follicles are not destroyed, but the presence of so much foreign matter within them may give rise to so violent an inflammation that they and the hair-growth are forever destroyed. In this way the firm, white and atrophied condition of the scalp is produced so characteristic of old cases of favus. In some instances atrophy of the bones of the skull even, has been observed. It will be easily understood how, by combing and scratching, or by self-rupture of the crusts, and by the changes of position in the bandages worn to conceal its presence, favus-matter may be transplanted from one part of the scalp to another.

Upon the constitution and health generally favus has little or no effect. It is often seen upon sickly-looking and consumptive children, but such coincidence indicates only neglect most favorable to the progress of both the local and general affection. It may possibly thrive more vigorously upon the devitalized tissues of a person debilitated by consumption, but its alleged connection with this disease or dependence upon hereditary or constitutional predisposition, rests upon no proper foundation.

Favus affects the nails too occasionally; generally in persons either carrying the growth in some other position, or having charge of those affected by it. Their substance, which is only modified epidermal tissue, becomes yellow and opaque, their longitudinal striæ are more marked, and their surface has a rough and tuberculated appearance. The external layers of cells are easily detached, and are found filled with the parasitic growth, while sometimes a well-defined favus mass perforates the nail from below.

If now we examine by the microscope the matter of which the

favus crust is composed, upon whatever part of the body it may be growing, we shall find in addition to more or less epithelium, 1st, innumerable, minute cells of an irregular ovoid shape, attached to each other in groups or rows, of about the  $\frac{1}{30000}$  of an inch in diameter; 2d, others more or less swollen at one end, or divided or branched; 3d, long and very slender tubes extending from the masses of cells, and more or less subdivided by partition-walls and branched; and 4th, granular matter so small as to be without definite form, even when examined by the highest powers. These objects constitute, it scarcely need be said, the elements of a fungus as already described. The first two forms are the spores or conidia, the third is the mycelium, and the last the micrococcus. They are not distributed evenly throughout the favus mass. The spores predominate in the centre of the cup, while the micrococcus and mycelium are found more largely at its circumference and extending into the surrounding epidermis, which holds it encapsuled. The cells of the skin, in the earlier stage of the disease above described, and likewise the outlying portions in the neighborhood of the crust when formed, will also be found to contain the same elements, although the spores are in much smaller proportion. If we remove the hair which pierces the centre of one of the cups, with its sheath attached, we shall find the walls of the latter distended with innumerable spores and mycelium shooting out into the surrounding tissues. If the hair be one sufficiently long affected to present to the eye the appearances already described, it will be found when examined by the microscope, after maceration in a solution of potash, to be permeated by hollow canals running lengthwise between its fibres, and by beaded tubes extending longitudinally throughout its substance. Rows of conidia may also be seen encircling the shaft of the hair. These appearances are to be traced from the atrophied bulb for a considerable distance after the hair emerges from the skin.

The fungus growth in the nail is the same in all respects as in the epidermal tissues elsewhere. The fungus in favus has always hitherto been called *achorion schœnleinii*, in honor of its discoverer. Whether it is still to be looked upon as a species peculiar to this disease, as identical with those found in the other parasitic affections of the human skin, or as only a modified form of some common mould, are points to be considered farther on.

Favus is a rare disease in comparison with the affections remaining to be considered. It is mostly met with upon the heads of poor children, for its elements seldom succeed in developing upon surfaces frequently washed or brushed. Although positively con-

tagious, it is so in far lower degree than some of the varieties of ringworm to be described, and it seldom if ever runs through schools and asylums like the latter. It is frequently observed upon several members of the same family, however, and to be developed successively and only after long periods of daily contact amongst its individuals. Its artificial transmission by inoculation is also a matter of difficulty, although recent attempts performed by puncturing the hair follicles for the admission of the fungus have been much more successful than when other methods were used. It affects children more frequently than adults, and is comparatively more common in the country than in cities. Its course is always slow; left to itself it may last a life-time upon the scalp, or until it has entirely destroyed the hair, in which case a spontaneous cure is possible. Upon other portions of the body its duration is by no means so chronic, and its eradication by treatment, compared with its seat upon the scalp, a simple matter. The same happy result might be obtained there, did not the hairs which pierce the crusts retain them in position, and also contain a store of seed which continually gives rise to new life. It is on this account that favus upon the scalp is one of the most obstinate affections known.

#### RINGWORM.

Under this general name will be described certain diseased conditions of the skin of various parts of the body, so unlike in their appearance as to have been considered distinct affections up to very recent date, and to be still called by different names, and to be the subject of more animated discussion at present, perhaps, than any other point in dermatology. Ringworm of the scalp, called herpes tonsurans or tinea tonsurans; ringworm of the general surface of the body, called herpes circinatus; ringworm of the beard and sycosis, both called "barber's itch" at times, as well as by other names; eczema marginatum, a peculiar affection of certain parts of the body, so called by Hebra in his original description; and the majority of the cases of parasitic disease of the nails, called onychomycosis, are all caused by the growth of one and the same fungus, hitherto generally entitled trichophyton tonsurans. The great dissimilarity in the appearances of these affections is due, as we shall see, mostly to peculiarities in the seat and stages of the parasitic growth.

Ringworm of the general surface of the body is familiar to all. It begins as a red spot, slightly elevated above the surrounding skin, which is covered in a few days with minute papules or vesicles of very short duration, or with little white scales. It increases

rapidly in size, flattening down in the centre as it expands, so as to form a circular patch, the elevated border of which consists of a ring, an eighth or a quarter of an inch in width, of the same papules, vesicles, or scales, while the central portion appears red and scaly. Thus it goes on sweeping outwards like the cryptogamic fairy ring upon the soil, and forming complete circles sometimes six inches or more in diameter, which then appear as rings simply, as the redness and scaliness of the enclosed skin disappear after a while. Sometimes, however, the disease starts up afresh within the district already swept over, and rings within rings may be formed. Generally, after reaching any considerable size the disease dies out at certain portions of the border or rim, for want of proper nourishment or suitable soil, and segments more or less broken are left to advance over the uninvaded regions of the skin. Generally, too, new spots appear before the disease has lasted long, the result of self-inoculation, which run the same course. Their seat is most commonly the neck and face, or these are the parts generally the first to be affected from their greater exposure, but the whole surface of the body may be more or less successively swept over before the disease is exterminated, or may exhibit simultaneously the characteristic marks of its presence. When about the face and neck in children it may extend its march to the scalp, and thus give rise to one of the other varieties already mentioned; or in a man it may run through the beard and cause there similar appearances to those upon the scalp of children, or terminate finally in another form, sycosis. It may, however, affect the hairy portions of the face or scalp and for a considerable time, and yet manifest itself in no other way than by the formation of the rings already described. In the latter case the hair follicles have not become implicated, and thus the appearances and course of the disease remain the same as upon non-hairy portions of the body. Occasionally these varieties may be seen simultaneously upon one person and their conversion into one another satisfactorily observed. The sensations which accompany them are more or less itching and burning.

If some of the scaly matter be removed from any portion of the skin affected by ringworm and examined by the microscope, there will be seen mixed with epidermal cells innumerable round bodies  $\frac{1}{1000}$  of an inch in diameter arranged in groups and rows, or single, and, sparingly interspersed, long and branching tubes. These are the unmistakable elements of a fungus, and they differ from those found in favus, already described, in the shape and size of the spores or conidia, and the much smaller quantity of the mycelium.

*Eczema Marginatum.*

There is occasionally observed upon the central portions of the trunk, especially about the inner surface of the thighs and lower abdomen a diseased condition of the skin of peculiar appearance, which Prof. Hebra was the first to particularly describe under the name *eczema marginatum*. It begins as a small round patch of papules and vesicles, which itches excessively and excites scratching. As it spreads it heals in the centre, sinking down and leaving a dark red, scaly condition of the skin, while the advancing border presents constantly an elevated ridge of papules, vesicles, and other lesions of *eczema*, upon an inflamed base. The scratching aggravates the severity of the symptoms and tissue-changes, and gives a markedly *eczematous* appearance to the part. The affection differs from *eczema*, however, in the central retrogression and the concentration of its activity at the advancing edges. It may extend thus over large and continuous portions of the trunk and limbs, but the appearances never vary from the type of the raised and narrow margin of papules, vesicles, excoriations and crusts, and the dark red and scaly state of the parts earlier affected. New centres of the disease may be developed simultaneously on neighboring parts, and occasionally the same process is repeated within the borders of the old patch; the whole then exhibiting concentric rings of the character already described upon a general field of a dark red color.

This affection has been the subject of much discussion within the last few years. As early as 1864 Köbner of Breslau in his *Mittheilungen* demonstrated its parasitic nature and the identity of the fungus found in it with that of ringworm of other parts of the body, and maintained that the two diseases were the same. His statements were not received, however, with all the consideration they deserved, and it was not until Dr. Pick of Prag, three years ago, again opened the question with still more positive proofs of the correctness of Köbner's views, that they were generally adopted by dermatologists. But why is it, it may be asked, if *eczema marginatum* is identical with ringworm, a very common affection, that there has ever been this doubt as to its nature and this reluctance still on the part of Prof. Hebra to regard the fungus found in it as the essential agent in its production, although obliged at last to admit its existence there? How does it differ from ordinary ringworm of the skin? Only in the more *eczematous* character of the lesions which compose the outer and active rim, and the greater amount of congestion and pigmentation which remain behind enclosed within it. The parasite in ordinary ringworm creates a cer-



tain amount of irritation of the skin, expressed by the formation mainly of papules, vesicles, and scales. In *eczema marginatum* the inflammatory process is aggravated, as shown by the addition to the lesions just mentioned of pustules and crusts, and greater exudation beneath where the source of the irritation is most actively at work, namely, at the edge. The deeper color within indicates only a higher grade of chronic inflammation. How therefore can we account for this difference in the degree of inflammation, the exciting cause being the same in both affections? It is evident that it must be due either to peculiarity in position or in the temperament or tendencies of the persons affected. The former, no doubt, is the reason why ringworm of the parts specified should assume the peculiarities described as *eczema marginatum*, for they are specially liable to a form of eczematous inflammation, and its chronic character will explain why a true eczema of the same parts might at times be converted into this form of disease. No doubt, however, that both position and individual tendencies operate in its production, for we may have ordinary ringworm of the same parts presenting none of the peculiarities of the *eczema marginatum* form, and on the other hand true eczema may affect them indefinitely as such without becoming accidentally inoculated with the fungus of, and converted into, ringworm. *Eczema marginatum*, then, is to be regarded either as ringworm of certain parts exciting an eczematous inflammation in addition to the lesions ordinarily produced by itself, or as ordinary eczema modified by the subsequent development upon it of the parasitic elements of ringworm.

Of the real nature of the affection, however started, there can be no doubt. Removing some of the epidermal cells from the border we shall find by the microscope precisely the same fungoid elements that we found in the scales of ringworm, conidia, mycelium, and micrococcus, although after the disease has existed for a long time they are often difficult of detection. Were this not sufficiently conclusive both as to its parasitic nature, and its identity with ringworm, we have in addition the experiments of Köbner and Pick, both of whom succeeded in producing unmistakable ringworm upon their own skins by transplanting some of the scales from cases of *eczema marginatum*, and the observation of many that ordinary ringworm has been seen to become converted into *eczema marginatum* after existing some time.

This disease is not of very frequent occurrence. It has been observed by Hebra to affect especially shoemakers and horse-soldiers, occupations most likely to add an eczematous character to a ringworm existing upon the thighs, or to generate a local eczema

of the parts for the later engrafting of parasitic elements. The disease occurs also upon other parts than those already mentioned; in and about the axillæ, for example, and upon the female breast. In India it is of not unfrequent occurrence, and is there called Burmese ringworm. The subjective symptoms are an exaggeration only of those above attributed to ringworm of other parts.

*Ringworm of the Scalp.*

The third variety of ringworm to be described is that seated upon the scalp, and, owing to the presence there of the hairs, its appearance and course differ greatly from those belonging to the forms affecting the non-hairy portions of the skin already mentioned. It is called *Herpes tonsurans* or *Herpes tonsdens* by the various writers on skin diseases, just as ringworm of the skin is called *Herpes tonsurans* or *H. circinatus*, although in no way allied to true *Herpes*. It would be better to adopt the title *Tinea tonsdens* or *tonsurans*, to correspond to *Tinea favosa*, the most acceptable title for *favus*. The terms *tonsurans* and *tonsdens* suggest the most striking feature of ringworm of the scalp, as the disease first manifests itself by the falling of the hair in circular spots, although not close to the skin as if shaven, as in alopecia areata, an affection to be described below, but by breaking off one or two lines from the surface and leaving the irregular stumps to project. The surface of these circumscribed patches is harsh, owing to the projection of the hair follicles as well as of the stumps, and from the thick coating of dry and diseased epidermal cells and the parasitic elements present. This, however, is not the first stage of the disease, although that which first attracts notice. It is preceded generally by the same appearance of circles of erythema, spreading outwards and healing at the centre as in ringworm of the skin, but without as markedly elevated a rim as in the latter. These, being concealed by the hairs, generally escape observation, and it is only by watching the development of new points of inoculation, as the disease progresses, that its early stages may be generally studied. After gaining a hold upon the epidermal cells, as shown by these manifestations, with which we are already familiar, the fungus soon affects the hairs; they become dry, lustreless and brittle, and break very easily, leaving the stumps projecting from the prominent follicles, as already described. As the disease spreads outwards from its central starting point, large, bare spots are formed, several inches in diameter, which may coalesce and thus give rise to a very large and continuous patch; or many separate points scattered over the scalp may give a spotted appearance to the

whole head. Thus the outlines of the affection are constantly changing in every case, but the minute and surface appearances of every spot are always the same, viz.: the stumps of hair, the white scaly matter, and the prominent follicles resembling shagreen, or the skin of a plucked fowl, as variously described by writers.

If the patches increase in size sufficiently to run down upon the neck or forehead, where there are no large hairs, the appearances change abruptly to those of ringworm of the skin; and on the other hand should, in a case of the latter, the affection sweep from the face on to the scalp, there are at once developed the characteristic features we are describing. It is by no means uncommon to observe both forms of the affection upon the same child; that is, the tonsurans upon the scalp and the circinatus upon the face forming continuous parts of one large ring, or to find in one child of a family the scalp affected, and upon the skin of another child or of the parent well-marked circles of ringworm.

Occasionally, however, other appearances are observed, which must be referred to individual temperament. When the irritation produced by the parasite, generally of slight character, is excessive, vesicles and pustules of considerable size may arise upon the affected parts, which terminate in thick crusts; or in other cases large nodules or tumors may be developed from the inflammation of the hair follicles, sub-epidermal abscesses, which open by several mouths and for a long time discharge a glutinous matter; a condition similar to that observed at times when the beard is affected, as will be seen below. Such cases may give rise to partial and permanent baldness, but fortunately they are rare.

Left to itself ringworm of the scalp, like favus, tends to perpetuate itself indefinitely. The hairs repeatedly fall and are reproduced, until the soil contains no more nutriment for the plant, or the follicles are obliterated by inflammation, in both of which conditions a local spontaneous cure of the disease results. It will sometimes apparently disappear more or less entirely, but almost always acquires new life, and thus may go on for years unless arrested by treatment.

If we pull out one of the hairs changed as described, and examine it by the microscope, we shall find the bulb much changed in appearance, flattened and distorted or, perhaps, wholly destroyed; the shaft, or all that remains of it, irregular in outline, and its free end splintered and jagged, like the uncut portion of the stump of a tree. The various structures of the hair are scarcely distinguishable, and the longitudinal fibres are distended and forced apart by the parasitic growth. This is seen to consist of an innu-

merable number of spores or conidia, covering the outside of the hair, and penetrating its tissues throughout its length. But little of the myceloid growth is seen. The epidermal cells surrounding it, and those which make the scaly matter covering the general surface of the bald patch, are likewise filled with the same elements. These are identical in appearance with those already described as discovered in the other varieties of the disease.

Ringworm of the scalp is a frequent affection among children, and often occurs upon the same individual and at the same time with ringworm of the general surface. The one may readily give rise to the other upon another person. In adults, however, it very rarely affects the scalp, and it may exist for months upon the hairy portions of the face, and extend from these parts over large portions of the body without appearing upon the head. Indeed, I have never seen but one adult thus affected, while the beard in gentlemen, as will be explained in another connection, is very frequently the seat of ordinary ringworm. Unlike favus, it is of more frequent occurrence in cities than in the country. It is in orphan asylums that it is most commonly found, and the introduction of a child affected with it is often the cause of an outbreak which may spread among scores of the inmates and last for months, before it can be exterminated. It causes some degree of itching, and, as just stated, occasionally a circumscribed inflammation sufficient to destroy the hair follicles, and thus produce partial baldness, but it does not affect the health in any way.

*Ringworm of the Beard.—Sycosis.—Barber's Itch.*

Ringworm of the beard presents very unlike appearances at different times, so dissimilar in fact as to pass generally for entirely distinct diseases. As just stated, it is in one form a very common affection among young men, and its real nature is then readily recognized even by the patient. The latter appearances are those of ordinary ringworm of the chin and those of the scalp affection just described, more or less combined, and are called simply ringworm. They may be designated as the

*First Stage.*—It begins, as upon the non-hairy portions of the face or body, in the form of small points, which generally attain the size of a pea or a cent, before they attract much attention. They spread rapidly in a circular form, flattening down in the centre as the elevated margin of papules or vesicles enlarges, and are accompanied by a considerable degree of itching and burning. The centres of the patches remain more or less reddened and scaly, but seldom present the white, branny look, so characteristic of their

seat upon the scalp; probably because the parts are so much more frequently washed. The sides of the face are its most common starting-point, from which the rings may spread in every direction, or new ones may be started from these upon other parts by self-inoculation; the itching causing frequent rubbing with the hands, and in this way transference of the parasitic elements elsewhere. When the circle spreads beyond the beard, the appearances of such portions of the patch are identical with those of ringworm originally started upon the general surface of the skin. The disease may thus run on for some time in the beard without any apparent change in the hairs, but sooner or later, the period varying greatly in different cases, the hairs begin to fall from the parts affected, thus defining the patches more conspicuously than before. The hairs break off a short distance above the surface, and leave ragged stumps, as on the scalp. Ringworm of the beard primarily occurs generally upon those parts of the face which are shaven, or in other words upon those persons who are shaved; much less frequently upon others, for reasons to be hereafter given. On this account it seldom exists long without attracting attention, and its effects and changing phases may be carefully studied. It may extend from the shaven portion of the face into parts of the beard worn long, or, beginning in the form of herpes circinatus upon the neck, spread upwards into the long hairs of the face, but it seldom primarily gets a seat in a full beard. The fashions of wearing the beard, or the methods of shaving practised by the barbers in different countries, may have much to do with the comparative frequency of occurrence of this stage of ringworm of the hairy portions of the face among various nations, certainly a great difference in this respect exists; German writers, including Prof. Hebra, saying that simple tinea tonsurans of the beard seldom if ever occurs in their large cities. In France, on the other hand, it is spoken of as more prevalent. Here at any rate it is of very common occurrence, as will be shown in connection with the subject of the causes of the parasitic affections of the skin. It often apparently disappears, to revive again and again, and thus may run on indefinitely even for years, when left to itself, or when unsuccessfully treated. Occasionally, however, other appearances are added to the typical symptoms of the affection above given. After existing thus for months, possibly for a year or more, the beginning of those lesions of the skin becomes manifest, which characterize the second stage of the disease. Simple ringworm of the beard becomes in other words,

*Sycosis. Second Stage.*—This is an affection about which there has been even more difference of opinion expressed among derma-

tologists than in the case of eczema marginatum and its relations to ringworm. This has arisen from the circumstance that there are two affections of the beard closely resembling each other in appearance, but due to different causes, which are confounded with each other, and which bear no distinguishing titles. Sycosis may be defined in general terms as a chronic inflammation of the hair follicles of the face. It begins in the form of a small nodule about the insertion of the hair, which slowly enlarges and, if the inflammation runs high enough, discharges pus from its summit, which dries and forms a crust about the hair. This process is repeated in the individual follicles several times generally, the nodules varying in size and prominence according to the degree of inflammation. In later stages the nodules and pustules may be converted into hard and large, prominent tubercles, giving rise to thicker crusts upon their surfaces as they suppurate, or forming large, raw indurations. The tissues beneath the skin may in time become involved and large abscesses be formed. Thus the disease may go on for months or years, spreading gradually over the hairy portions of the face, and affecting sometimes the eyelashes and eyebrows. When the inflammation is excessive, the hair follicles thus affected are destroyed and permanent baldness results. Great disfigurement and local distress are often caused by it. It forms one of those chronic affections of the beard known as barber's itch.

Now it is about the *cause* of this affection that the difference of opinion above mentioned has arisen. Gruby was the first to suggest its cryptogamic character, and called the parasitic elements found microsporion mentagrophytes, mentagra being another name for the disease. Hebra and other distinguished German observers failed to discover the presence of a parasite except in very rare instances, and therefore consider its occurrence purely accidental, and in no way connected with its production. They regard the disease, therefore, as simple acne of the beard. The French observers, on the other hand, insist upon its parasitic character, but regard the fungus found as the trichophyton tonsurans, the same as that common to all the varieties of ringworm we have described, or in other words that sycosis is merely Herpes tonsurans of the beard, its final stage. There can be no doubt of the accuracy of this latter view in part, nor are the opinions of Hebra and others wholly wrong. There is a parasitic form of sycosis, there is a non-parasitic form of sycosis. Köbner, who has done so much to clear up the doubts concerning this class of affections and this disease in particular, calls the former Folliculitis barbæ, the latter Sycosis parasitaria, and his investigations show that the latter form is by no means so

uncommon in Germany as the statements of other observers teach, although there can be no doubt that it is much more prevalent in Paris and Boston than in Vienna; a fact, taken in connection with the more frequent occurrence in the two former places of simple ringworm of the beard, of important bearing upon its relations to the latter. Köbner bases his opinion, that parasitic sycosis is only the worst and most advanced stage of Herpes tonsurans, upon the following observations, stated in brief: 1st, the fungus found in both is identical in form, size and distribution; 2d, the transfer of the crusts of sycosis to the skin of the same or of another individual produces Herpes circinatus and on the other hand, of material from this, or from the head in ringworm of the scalp, to the beard of another person causes sycosis; and 3d, parasitic sycosis generally begins with ringworm of the beard.

The latest study of the disease has been made by Prof. Tanturri, whose observations may be found at length in the Italian and German journals of dermatology. His conclusions are stated in abstract in the latter as follows: 1. Herpes tonsurans generally precedes the development of phytosycosis. 2. Phytosycosis is not an accidental symptom, but the direct consequence of Herpes tonsurans. 3. Phytosycosis is still contagious, even when Herpes tonsurans no longer exists. 4. The parasite of phytosycosis is found in the hair which penetrates the nodules and pustules, and also around it; and, 5, is identical with that of Herpes tonsurans. 6. Phytosycosis is distinguished from the idiopathic sycosis by its morphological, clinical and anatomical characters. These important points of distinction cannot be given here in detail, but may be found in the journals referred to, and are also minutely discussed by Köbner in his valuable work. It must be said, however, that in many cases the mere appearances at some periods would be insufficient to distinguish the parasitic from the non-parasitic inflammation of the hair-follicles, and that the clinical history and, most important of all, the microscopic examination, are aids in diagnosis never to be discarded, sometimes indispensable. That parasitic sycosis is the latest stage of ringworm in the beard, I have no doubt remaining, for I have watched the conversion of the one into the other in several cases.

#### *Ringworm of the Nail.*

The last form remaining to be described is ringworm of the nails. Occasionally some one or more of the nails of persons affected with any of the varieties above described, or of those having the daily and long-continued care of such patients, lose their transparency, become opaque and dry, and gradually thicken. Their surface ap-

pears rough, and cracks easily, and their free edge is blunted. Their substance is brittle, and flakes off superficially in the form of scales. If these be examined by the microscope, the flattened cells of which they are composed will be found filled with a parasitic growth, consisting of long chains of conidia, more or less branched, of a few slender myceloid tubes without septa, and of small round cells or spores. Such a condition continues for years or perpetually, unless the plant is destroyed by treatment. Such cases form one of the varieties of so-called onychomykosis, a name applied to all the parasitic affections of the nails, of which, also, the favus form, already described, is another. Whether there be in fact other varieties than these two, dependent upon the growth of other fungi than those found in *Tinea tonsurans* and *T. favosa*, is a matter much discussed, but not easy of solution, because the growth of the plant in nail substance is very unlike its modes of development in the other cutaneous structures; so much so, that without the clinical history, it is often impossible to say to which of these varieties any case shall be referred.

#### PITYRIASIS VERSICOLOR.

The other remaining parasitic affection of the human skin, concerning the cryptogamic nature of which no doubt exists, bears the above name. It is also called by some writers *Tinea versicolor*. It is characterized by the formation upon the surface of yellowish or buff-brown spots of irregular outline, but slightly elevated, and covered with fine scales, which are easily scratched up by the nails, or removed by scraping with a knife. They vary in size from minute points to confluent patches of sufficient extent to cover large portions of the chest or abdomen. They chiefly affect the front trunk, beginning generally upon the chest, and may extend downward so as to cover more or less wholly the abdomen, hips, and upper thighs, and upwards to the shoulders, and thence down to the forearms, or creep around the chest to the back. They rarely appear below the knees and elbows, or ascend upwards upon the neck, and never affect the face. In other words, they do not generally grow upon those parts of the skin which are exposed to the air and light, finding rather upon those parts protected by clothing the warmth, and possibly the absence of light, essential to the development of the plant. It seldom, if ever, occurs upon children, which may be explained, perhaps, by the choice the parasite shows for the dry and outer cells of the epidermis, those of adult life being probably better adapted in this respect to its needs. It is said, also, to occur less frequently upon women than upon men; but it



is not unfrequently communicated from husband to wife, and flourishes as vigorously upon the female skin, when once started, as upon the male. When once established, it seldom disappears spontaneously, but may go on for years, perhaps dying out largely during the winter, to revive and extend over wider areas during the summer. It often gives rise to great itching of the parts affected, although in some cases the patient is not conscious of its presence through any sensations it may cause. It is often mistaken for, and confounded with, the pigment stains upon the skin called moth, liver-spots, or chloasma, an affection differing from it in position, anatomical seat, course, and clinical history.

An examination by the microscope of a few of the scales, so easily removed, from a patch of pityriasis versicolor, will readily establish its nature. We see lying between the upper layers of epidermal cells countless numbers of round conidia or spores, grouped in clusters, of high refractive power, and resembling minute oil globules. Associated with these are fine tubes of mycelium running in a net-work of endless intricacy. About the opening of a hair follicle the parasite may be seen reaching down the canal, and possibly it may run over the surface of the hair; but it never penetrates it deeply or alters its structure. This plant has been generally called *microsporon furfur*. Its relations to the other parasitic fungi will be spoken of in another place.

The disease is of not unfrequent occurrence here, although\* its presence is frequently overlooked by its host, and is only discovered by the physician when\*examining the naked chest for other reasons. It is on this account that it has been said to affect consumptive patients especially. There is no other ground, however, for such an opinion. Its growth is entirely independent of, and unconnected with, the general condition of the person it affects, nor does it exert any injurious influence upon the same, save the itching it occasions. It is positively contagious,—husbands giving it to their wives, as above stated, and as also proved by direct experiment. The spread of the disease from one portion of the body to another is likewise affected by the transplanting of the spores in the furrows ploughed up in the healthy epidermis by the nails while scratching. Still it is not by any means so easily communicated to new hosts as the *trichophyton tonsurans*, nor is it so easy to trace the source of contagion in any particular case. The color it imparts to the skin is a property of the fungus, as much as the yellowness of the *favus* crust belongs to the *achorion*.

Thus far in our subject there has been either no doubt as to the cryptogamic nature of the affections considered, or, if difference of opinion upon this point does exist with regard to some of them, the weight of evidence is such as to overrule such difference in the direction already stated. But we now have to refer to an affection, which is still one of undecided position, and concerning the nature of which dermatologists differ widely in opinion.

#### ALOPECIA AREATA.

*Alopecia circumscripta. Area celsi. Porrigo decalvans. Tinea decalvans.*

These are the names given by different writers to this singular affection, which is characterized by the existence of circular, bald spots, of a smooth and shaven appearance upon the scalp, apparently whiter than the surrounding skin. Before it is discovered the disease has generally attained considerable headway, and one or several bald spots, the size of a dime or larger, first attract the attention of the patient or of other members of the family. These increase more or less rapidly and may coalesce, forming large bald patches many inches in diameter, or even in time spread over the whole scalp. The eyelashes may be lost in the same way, and in rare cases all the hairs upon the body are destroyed. The baldness thus produced is not always permanent, and the hair may be reproduced spontaneously even in part, but generally the new growth becomes affected in the same way and falls again. If we examine the surface of one of the patches in its early stage, we shall find no vestige of the hair upon it, and its limits sharply defined by apparently sound hairs. Sometimes the scalp feels thickened or œdematous over the bald spot and somewhat beyond and around it, and occasionally with this is associated a slight erythematous blush. In later stages there is often a partial restoration of the activity of the hair follicles, and in place of the normal growth of the part, lanugo, or short and colorless, downy hairs are produced. When the disease has existed for a long time, years it may be, these in turn may disappear, and the scalp may present over its whole surface that bald and shining, alabaster whiteness and smoothness, so characteristic of senile atrophy of the skin, divided off into separate districts, perhaps, by spare lines and tufts of hairs untouched by the disease.

What is the cause of this strange affection? In 1842, Gruby discovered in the hairs of a case a fungus which he called *microsporon audouini*; and as the clinical history of the affection favored this view, and as the plant was seen and figured by other competent observers, it was generally accepted by dermatologists that it was of a parasitic nature. Inasmuch, however, as observation since then, and especially of late, has failed to detect the presence of the fungus in all or in a large proportion of the cases examined microscopically, doubts have arisen as to its parasitic nature, and the recent German writers deny it altogether. They base their opinions upon their failure to find in cases recently examined any such plant as Gruby described, or as Bazin and other dermatologists have figured; but inasmuch as their testimony is wholly of a negative character, how is it that they offer it as an offset to the positive observations of other and equally competent investigators? They attempt to sustain the validity of their position by denying the competency of those who hold the opposite opinion. They say that in the case where the supposed fungus has been seen, either fat globules have been mistaken for spores, or, if the appearances seen were really due to the presence of parasitic elements, the case must have been one of ringworm. In other words, that the authorities in question were not sufficiently good microscopists to distinguish the cells of a fungus from sebaceous matter, or sufficiently careful clinical observers to know *tinea tonsurans* from alopecia areata. Now when this style of argument is applied to such men as Bazin and Fox on the one hand, who have seen and figured the plant, and to Hardy, McCall Anderson and many others, who believe in its parasitic and contagious nature, its absurdity becomes apparent.\*

\* Is it to be supposed that one who gives such precautions as the following would himself fall into the errors he is warning against? "The greatest care must be taken on every occasion to distinguish between fatty cells and spores. \* \* \* \* If we suspect the presence of much fat, it is advisable to allow the hair or other object to *soak for some time* in ether if any doubt exists as to the nature of any particles, cells or granules. The fat cells always exhibit a wide variation as regards size, and have a duller aspect; the cells of the fungus, on the other hand, are uniform in size in any particular case, refract the light very perfectly, and their outline is more defined and contoured; they are not affected by ether. In old standing cases of tinea, the epithelial cells take on a kind of fatty degeneration, and look very like cells invaded by sporules. When the *mycelium* is well developed no mistake can well arise, but there are one or two foreign matters and modifications of normal structure that offer appearances similar in aspect to some of the less flourishing examples of mycelial threads. I have known the fibres from handkerchiefs or

If we pull out the hairs bordering upon the bald patch in the early stages, we shall find scarcely any root present, the ends tapering to a slender point from atrophy. The spores or conidia, which occur both in the substance of the hairs and on their exterior, vary considerably in size, and the scanty myceloid growth which accompanies them is very small. According to Fox the hairs contain also a large quantity of the minute stromal form of the plant which generally escapes detection, and from which the distinct sporular form may be artificially developed.

To the list of those who have been fortunate enough to see the fungus in cases of Alopecia areata, I may add myself. In two young gentlemen, aged seventeen and twenty-four, companions, and presenting all the striking and unmistakable characteristics of the disease, all the parasitic elements were found to be abundantly present. The relationship existing between them, points to the support afforded to the questioned parasitic nature of the affection by its clinical history in general, as above stated. It is as fair to suppose the one case to have been taken from the other, as if they had both been cases of ordinary ringworm. The evidence in favor of its contagiousness as furnished by many dermatologists, is conclusive, although it is by no means eminently so. Compared with the other parasitic affections in this respect, it should be ranked as follows in a descending scale: *Tinea tonsurans*, *T. favosa*, *T. versicolor*, *T. decalvans*.

If then we accept as established the parasitic nature of the disease, how shall we on the other hand account for the opposite view held by German and other authorities, who fail to discover grounds for such belief, and at the same time not be open to the charge of tacitly accusing them also of incompe-

towels which have been used to cleanse the object-glass to be recognized as mycelial filaments. Sometimes some of the fibres of the hair will be stripped off the shaft and curl back like mycelium. The safeguard is to get the mycelium free from surroundings, and then no error can arise. The imbrication of the epithelium is sometimes irregular, and the edges of the scales present exactly the appearance of mycelium running transversely through and across the shaft of the hair, and it is really difficult to imagine that filaments are not present, more especially if there happen to be a few sporules scattered throughout the interior of the hair." This extract is from Dr. Tilbury Fox's recent work on Skin Diseases, and it is given here at length to show the errors to be avoided in the study of the parasitic affections, and that he at least may not be considered capable of the mistakes in question.

tency? Were there no other solution of such entire discrepancy in the views of equally competent observers, than which were most likely to be right or least likely to be wrong, it would still be easy to decide upon which side of the question to range ourselves, for in such cases the negative evidence of twenty good observers cannot be set against the weight of one good positive observation. But it is not necessary to resort to such an invidious method of solution. The evidence of both parties may be received with credence, and is consistent, when properly interpreted. There is a parasitic and a non-parasitic form of alopecia areata, just as there is a parasitic and a non-parasitic sycosis. In other words, the hair may fall in circumscribed patches from the growth of a parasite in its tissues, and it may fall apparently in the same way from atrophy of the bulb due to other causes. There may be hereafter material difference observed in the clinical history of the two forms, possibly in their gross appearances also, so that they may be distinguished the one from the other, without the aid of the microscope; but at present this is impossible. When we recall the history of sycosis and of eczema marginatum, we need not fear that authority, however eminent, can prevent the elucidation of truth by any amount of dogmatic assertion. Such matters are to be settled by the quiet researches of a Köbner, not by international controversies. Positive and reliable evidence has demonstrated the existence of a parasitic alopecia. Negative evidence on the other hand has as fully shown that a large proportion of the cases so called are not of the parasitic form. It may be that the former is much more common in England and France than in Germany, just as parasitic sycosis is more prevalent in the former countries, and this may help explain the discrepancy in the views of the authorities in different parts of Europe. Amongst ourselves, the parasitic form is, according to my own observations, rare, whereas cases of the disease collectively, are not very uncommon. That there are very marked differences in the course and appearances of the various cases that occur here, there can be no question; their ætiological significance remains to be determined by future observation.

## MYRINGOMYCOSIS.

This is a term applied to an affection of the ear, caused by the growth within the outer cavity of one or more species of a fungus. The symptoms, according to Wreden, from whose work on the subject the following account is mostly taken, are a more or less complete deafness, generally sudden in its onset, accompanied by ringing sounds and pulsation, with sensations of pain and pressure varying in intensity, in the ear affected. On washing out the organ with a jet of water, in such cases there comes away a flocculent sort of membrane or mass, varying in color from white to dark brown, the microscopic appearances of which will be described below. With its removal disappear the pain, and temporarily the other symptoms more or less, to return as the fungus grows again. The tympanum will be found of a dark red color, swollen and deprived of its epithelium, and this hyperæmia and swelling of the parts, together with the mechanical pressure exerted by the vegetable growth upon the tympanum, will account for the symptoms. Examined in the early stages the tympanum and parts adjoining are found to be covered with a fine, white, powdery substance (the leptothrix and mycelium stage), which cannot be washed away, and which soon develops into the thick and velvety mass of the perfect plant. The course of the disease may be acute or chronic. It may attain its fullest development in a few days, but left to itself or improperly treated, it may last months. After the removal of the mass by mechanical means, it may be completely renewed in a week.

Examined by the microscope this mass, large enough perhaps to cover the nail of the little finger, will be found to present some elements with which we are already familiar, but others also which we have not yet met with in the examination of the parasitic fungi thus far considered. The mycelium, which is much larger than in the fungi found in the other parasitic affections of the skin, is colorless, divided by cross partitions into joints, and at its ends filled with granular matter. Branching off at right angles from these filaments or rootlets, are the hyphens or stems, which bear at their summits the receptacles or fruit-heads. They are also transparent and colorless, more or less bulging, jointed and branched, and of considerably greater diameter than the mycelium from which they spring. At their

upper and free extremities they dilate into oval or spherical heads, sporangia, from the top of which at first a few elongated, hairlike cells shoot out, which increase in number and length rapidly, and cover the whole surface in the form of a head, like the pappus or down of the dandelion when expanded. Finally, minute round cells are seen to be developed upon the ends of these slender filaments, or basides, which are pushed perpendicularly outwards in turn by the formation or budding of new spores beneath them, one after the other, until each little stem bears a chain of perhaps twenty spores united in this way, and the whole forms a head of spore-chains or conidia, composed of countless spores. The diameter of the largest receptacles varies from 0.024 to 0.03 Mm., and of the spores from 0.002 to 0.003 Mm. The spores are round, and finally, when fully mature, fall off, either singly or in chains of various lengths, and form dense groups, more or less mixed with mycelium and the hyphens, and undergo farther development. In color they are yellowish brown or black, and this difference in shade, with a corresponding difference in the shape of the sporangia, has given rise to the opinion that the fungus, which the above characteristics show to be an aspergillus, presents two species, *A. flavescens* and *A. nigricans*, in the cases observed. Wreden, however, has shown by cultivation that both forms, although preserving their distinctly individual peculiarities when growing in the ear, are only varieties of the common aspergillus glaucus, the spores of which may be found almost omnipresent, and that such variation in growth is due solely to the differences in the soil upon which they grow.

That the fungus found in myringomycosis is the cause of the disease, that is, that it is not merely an accidental occurrence in certain morbid conditions of the ear, there can be no doubt, but whether the spores can take root within an ear quite healthy at the time, is a matter of uncertainty. Wreden is inclined to the hypothesis that some diseased state of the epithelium of the tympanum is requisite for their permanent attachment and development. That aspergillus is one of our most common moulds, so that its spores are ever ready to enter the ears, and on the other hand that the disease they produce there is comparatively rare, would seem to favor this view. With regard to the relations of aspergillus to penicillium, and the occur-

rence of other fungi in the ear, it may be said in this connection that Wreden has never detected the latter in the ear, nor has he been able to produce it from the former by cultivation, although Karsten and others believe in their botanical identity. Other forms of fungus growth have been occasionally found associated with aspergillus in the ear, but their presence is generally looked upon as an accidental occurrence.

### 3. *Pseudo-Parasites.*

As already stated various affections of the skin and its appendages have at times been considered to be of a parasitic nature, which closer observation has shown to be erroneous, while in certain of them fungi have been from time to time discovered, their presence at such times being only accidental. Among the instances of parasitic growth more intimately connected with our subject than such, is the so-called *Chignon-fungus*. Some degree of alarm was not long ago created among ladies by stories of the occurrence of various sorts of parasitic growths upon the false hair so generally worn by them, and the writer has seen not a few cases of disease of the scalp supposed by the patients to have been "caught" from some impurity attached to the chignon worn. Such fears are groundless. There have been often observed little globular masses upon the shafts of the hairs before cleansing, and, in cases where such cleansing is not properly done, also upon the hairs after being manufactured into shapes for wear. These masses are composed of the elements of a fungus, which has received the name *Pleurococcus Beigeli*; Dr. Beigel being among the first to investigate their nature. Hallier considers it a sclerotium, another stage of penicillium, but this opinion, like many of those advanced by him, needs confirmation. There is no reason to suppose it capable of attaching itself to living tissue or of creating any disease of the parts with which it might be brought in contact.

The possibility of receiving animal parasites through the false hair worn, is a question of course foreign to our subject; but it may be added in this connection that the dried sebaceous concretions, which form at times upon the shafts of the hair, and are popularly called hair-eaters, and supposed to be a cause of loss of hair, are not to be confounded with anything of a parasitic nature.



4. *Parasitic Plants upon Animals.**Favus.*

But it is not upon man alone that the forms we have been considering grow; they are found likewise upon domestic animals, and may be communicated from the latter to persons brought in contact with them. I have before me, while I write, the body of a young mouse, one of a family of several caught in a seed store in this city, all of which presented similar appearances. Its head resembles a kernel of popped corn more than anything else, its form and features being concealed by an exuberant growth of dry, yellow matter. Examined by the microscope this is seen to be composed of fungus elements identical with those of the *achorion schoenleinii* found in *favus* of the human subject. Upon the mouse, too, well marked and characteristic *favus*-shaped crusts are to be detected. Such cases are occasionally met with. Cats catching mice marked in this way have exhibited well-formed *favus* crusts upon their paws, and have communicated the disease to their kittens. Dogs, too, that have caught mice similarly affected have had *favus* crusts developed upon their fore-paws. In the same way the disease may extend from any of these domestic animals to man, cases of which are cited in abundance. Both mice and cats have repeatedly communicated *favus* to children playing with them, and St. Cyr in some recent experiments received it himself from a dog, to which animal he had transferred it from a cat. Artificially it has been again and again cultivated upon rabbits with material from the human subject, and even upon the heads of hens it has been observed in two instances. Upon all these animals, either about the hairs or feathers, the unmistakable form of the *favus* crust was developed, preceded in the carefully watched cases of artificial inoculation by the herpetic or ring-worm-like earlier manifestations, precisely as on the skin of man. The presence of *favus*, therefore, upon such animals may be easily recognized, and by proper precautions its farther transmission may be prevented. As it occurs upon mice more commonly than upon other animals, and upon such others mainly as come in contact with them, it is possible that they are to be regarded as the original or favorite host of this parasite, through which it has been introduced upon man.

*Tinea tonsurans.*

Ringworm, too, has been observed upon some of the domestic animals, presenting the same characteristic appearances, the circular patches with elevated and advancing borders, the scaly central portion, and the stumps of hair projecting from the parts long affected, as upon the skin of man; and in the epidermal scales and the hairs removed from them precisely the same parasitic elements are detected by the microscope as in the various forms of ringworm upon man. The animals most commonly affected in this way are the cow and the horse, and Gerlach has succeeded in transplanting it from oxen to calves and horses, and from these to his own arm and to the skin of his pupils. In these, and in similar cases of inoculation conducted by other observers, the transfer of parasitic matter from the animal to man has in every instance given rise to true ringworm. Upon the sheep and the pig the plant has not yet been made to grow. But artificial inoculation is by no means essential to the communication of the disease from the animal to the human subject. Numerous cases are on record of cow-keepers and milkmaids taking it from their four-footed charge, of children from calves, and of grooms and cavalry soldiers from their horses. I have myself seen three children with well-marked ringworm of the hands and face taken from the family cat, which was similarly affected. Upon these animals it constitutes one of several affections called mange.

*Tinea versicolor.*

With regard to this affection no instance of its natural occurrence upon animals, so far as I am aware, has been observed, although Köbner has succeeded in producing upon the rabbit by inoculation a well defined scaliness of the skin lasting from five to seven weeks, in which abundant conidia and slender fungoid threads were found.

5. *On the supposed identity of the Vegetable Parasites, and their relations to the Common Moulds.*

To those not familiar with the recent literature of this branch of dermatology it may seem surprising that very contradictory opinions prevail among authorities upon the subject with regard to the mutual relations of the vegetable parasites we have been

considering. As we have described the various affections to which they give rise, it will have been observed that they differ from each other in external appearance manifestly, and that the fungus elements belonging to each have their individuality marked with equal distinctness when examined by the microscope. How then could the question of the possible identity of all these forms have arisen, and have become one of the most interesting subjects for the investigation of dermatologists and mycologists of the present day? How can it be that such men as Hebra and Pick, Fox and Hutchinson, as examples, upon the one side, should believe that Favus, Ringworm, and Pityriasis versicolor are all forms of disease caused by one and the same fungus, exhibiting its variations in growth and external manifestations according to its stage of development, soil, etc., while on the other hand Bärensprung and Köbner, Anderson and all the French authorities, observers equally well known and trusted, should maintain as positive a belief in their non-identity? The same difference of opinion exists among the mycologists who have investigated the subject from their special point of view. It is evident, therefore, that no absolutely positive answer can be given to this important question in our present state of knowledge. The data upon which any probable conclusion in the matter can be based must be the result of three methods of investigation: first, clinical observation; second, artificial inoculation; third, study of the full development of the fungi in question by cultivation.

*First.* It was clinical observation which first led Hebra to believe in the identity of the parasites found in favus and ringworm. He noticed the occasional development of favus crusts in cases of ringworm, and the production of both, alone or in combination, upon parts to which poultices were applied. He concludes, therefore, that *Tinea tonsurans* is an earlier stage of *Tinea favosa*, while *Tinea versicolor* is a still younger phase of development of the same plant.

With regard to the latter affection, it may as well be removed from our consideration of the question at once. No good clinical ground (the opinions of Hebra and Hutchinson to the contrary, notwithstanding), and certainly no sufficient experimental data, have ever been presented to show its connection with either favus or ringworm. Clinically, *Tinea versicolor*

must be considered a distinct affection, as heretofore by most dermatologists. Its mycological relations are yet to be discovered.

The question turns, therefore, mainly upon the relationship of the two other affections. Fox believes that favus can be directly produced from bad cases of ringworm by keeping up a proper amount of irritation. There can be no doubt of the occurrence at times of favus in cases of ringworm, also none of the occasional development of both affections (in Germany, at least,) upon portions of the skin covered with damp cloths or poultices. Such occurrences are rare, however, and by themselves are of little weight in the question of identity, when we consider that in one hundred cases of chronic ringworm favus may not be developed a single time, and that favus may, and generally does, exist for years without any association with any of the varieties of true ringworm. The exceptional cases of the development of favus upon the latter may well be wholly coincidences, and should be fairly so considered when balanced against the clinical proofs of the non-identity of the two. In connection with the other class of cases, in which herpes tonsurans is said to be more or less frequently observed accompanying favus, it must be remembered, as already stated, that the early stage of the latter very closely resembles ringworm, and has been called by Köbner, who has made the subject a special matter of investigation, the early herpetic stage (*das herpetisches Vorstadium*). That such appearances are often mistaken for ringworm, and have largely contributed to the belief in the frequent association or identity of the two affections, there can be little doubt. Peyritsch, in the most recent investigations upon the inoculation of favus, and St. Cyr, in his late experiments upon the transmissibility of the affection to animals, and from them to man, both speak of the occurrence of this ringworm-like stage of favus, and of its liability to be confounded with *Tinea tonsurans*. The latter says that both Rollet and Tripier recognized, in the appearances upon his own arm, produced by inoculation from his dogs affected with favus, appearances which offered "*tous les caractères d'un bel' herpès circiné,*" "*non un herpès circiné legitime, mais bien une forme de la teigne faveuse véritable.*"

Peyritsch concludes, as the result of his experiments, that

“herpetic eruptions often occur as a vorstadium after inoculation with favus, but also not infrequently after the development of the cup-shaped crusts, and often not at all; that these appearances are the result of irritation, and are not identical with *Herpes tonsurans circinatus*.” Kœbner recognizes and describes in the external appearances characteristic differences by which the true ringworm and the herpetic stage of favus may be distinguished from each other, which need not be given here in detail, but another means of differential diagnosis is afforded by the microscope, by which the fungus elements present in the latter are shown to be those belonging to favus, the achorion and not trycophyton. Now, without attaching much significance to minute differences in the microscopic appearances of parasitic fungi, so far as this bears upon their botanical identity, for clinical purposes they are of some degree of importance, and when these differences are constant and consistent only with the theory of the non-identity of these affections, their significance must not be disregarded. When, therefore, a case occurs in which favus and herpes tonsurans appear to be combined, and in which fungus elements apparently identical with those of the latter are found in the outlying circles, as in the case reported by Kohn in the 3d Heft of the *Archiv für Dermatologie* of the present year, we cannot regard it in any other light than exceptional, and as an instance of the chance, coincident occurrence of the two distinct diseases.

The clinical proofs of their non-identity, as shown by the history of thousands of cases of pure tinea tonsurans without any development of favus in connection with them; in the highly exceptional simultaneous or subsequent appearance of true ringworm in cases of favus; the frequency of the former, the rarity of the latter, in communities, and the varying relations of their comparative frequency both in different countries and in cities and rural districts; the prevalence of ringworm of the scalp for years continuously in orphan asylums without the production or transmission of any other parasitic affection than itself among the inmates; the ease with which the one, the difficulty with which the other, is communicated; the spontaneous transmissibility of both forms from man to the domestic animals and back again through several hosts to the human subject, their individual identity being without exception pre-

served the meanwhile,—these and other facts, which might be mentioned, would seem to be conclusive.

*Second.* The results of inoculation, as practised especially to determine this question, point almost without exception to the same conclusion. Favus, when transplanted from man to man, from man to domestic animals, or from animal to animal, produces always favus and nothing but favus, according to the experiments of Köbner, St. Cyr, and Peyritsch, above referred to, and the same unvarying preservation of individuality has been observed with tinea tonsurans. On the other hand, Pick believes that he has obtained indifferently both affections by inoculation of the parasitic elements of either one. His results, therefore, are directly at variance with those of former observers, and as they are of a positive character, while those of the others are merely negative, they might seem entitled to the greater weight in the question. When we consider, however, that all the other observers have obtained results seemingly pointing to the same conclusions, but which have been otherwise interpreted by them, we think that, in connection with the recognized fact of the herpetic stage of favus, Pick's views may be fairly set aside until they are confirmed by other investigations and by general clinical observation.

*Third.* Another method of studying the question, and one which would seem to promise an easy and positive settlement, is that by cultivation. That none of the parasitic fungi we have been considering attain their normal and perfect forms under the conditions of their growth upon the skin, and that therefore their true botanical position is to be learned by observation of them under circumstances better fitted for their complete development, is universally recognized. In accomplishing this, however, it is evident that we should also settle definitely this question of their mutual relations, for if the fungus of *Tinea tonsurans* and of *T. favosa* are in reality identical and so seemingly unlike in their microscopic appearances, external manifestations, and clinical history from differences in soil, in stage, or from any other of the various causes assigned to account for their apparent non-identity, it is evident that if removed from the skin to conditions favorable to their normal growth, we should have a return to their one common parent form, and thus have before us the long-sought solution of this

mysterious question. This method of study has therefore been eagerly adopted within the last few years, but the results obtained unfortunately are far more contradictory, and unsatisfactory even, than those derived from clinical observation and from inoculation. The difficulty has not been in making the fungi taken from these cutaneous diseases to grow apparently when transferred to other soils, but to convert them always into the same fungi, when they have attained their perfect development. Not only do different observers obtain different results, but various results at different times. Thus by transplanting favus elements to various substances, such as glycerin, albumen, milk-sugar, starch, paste, the surface of fresh fruits, etc., or to solutions of certain salts, matters upon which fungi are known to thrive, all sorts of moulds are obtained after a while, among which of most frequent occurrence are *penicillium glaucum*, *mucor mucedo*, *aspergillus glaucus* and *torula*.

Hoffman obtained in this way *penicillium* and *mucor*, but looks upon the former as an accidental occurrence, and upon the latter as the real cause of favus, while other mycologists regard both as botanically identical. Hallier states that he has seen the parasite in favus develop into *penicillium*; Baumgarten also obtained *penicillium* from its cultivation; and Lowe, *aspergillus*. Pick, too, has obtained from *tinea favosa*, *penicillium*. With regard to the fungus of herpes tonsurans in particular, Hallier at first looked upon the trichophyton as *penicillium*, but later makes it out to be *aspergillus*. Pick cultivates it into *penicillium*, while Neumann sees it developed into *penicillium* and *trichothecium*. The fungus of pityriasis versicolor, too, Hallier finds no difficulty in tracing back to its parent stock, making it out to be *stemphylium*, the achorion form of *aspergillus*. With regard to the ear fungus, both forms, the *aspergillus flavescens* and *A. nigricans*, have been seen by Wreden to return under cultivation to *aspergillus glaucus*, while Karsten, from his experiments, is inclined to the opinion that *penicillium* is the original source from which they spring.

On the other hand, Köbner, Peyritsch, Karsten and de Barry, in their recent investigations in the same field, while finding no difficulty in obtaining *penicillium* and the like in their cultivations of favus matter, regard its presence in their experiments as

merely accidental. The elements of penicillium, aspergillus, etc., are omnipresent, awaiting only the proper conditions of soil, temperature and moisture for development, so that unless their germs are primarily excluded by the most rigorous measures from the materials and atmosphere used in these experiments, their constant appearance under circumstances best adapted to their growth, is not surprising, though their absence would be. Now such exclusion has been found to be almost an impossibility in all the methods of experimental cultivation hitherto employed by different observers, but the greater the precautions used to keep them out, the less frequent their occurrence. Thus Peyritsch in his experiments with the favus plant, generally got penicillium or mucor, but when he used extraordinary care no farther fungus development was observed.

This, with the results of his other experiments, which have been, and remain to be mentioned, leads him to the conclusion that "the specific individuality of achorion schoenleinii must, in our present state of knowledge, be preserved." De Barry also concludes from his investigations that the plant in favus, as well as the other cutaneous fungi, are specific parasites. Köbner failed to produce any mature form from the favus plant. Karsten in his recent work (*Chemismus der Pflanzenzelle*), states his belief that the achorion from its resemblance to the milk fungus may be derived from some common fungus, but has been unable to obtain any advanced growth by which its connection with such could be established. Neumann, too, in his latest published observations (*Zur Entwicklungsgeschichte des Achorion*), withdraws his former statement, that he had traced the parentage of favus to penicillium, and as the result of more careful methods of cultivation, says that he has been unable to obtain the perfect development of the achorion, and that the data for determining its connection with any known fungus are still wanting.

Still another method of gaining light upon this supposed connection between some of these common moulds and the vegetable parasitic growths of the skin has been tried. It is evident that if favus, and ringworm, and pityriasis versicolor were really caused by the attachment to, and subsequent growth upon, the skin of some of the elements of penicillium,



aspergillus and the like, to which the fungi found in these affections are referred by some of the observers above mentioned, it might be possible to produce these diseases *de novo*, by transplanting such common moulds to the human skin, and thus settle the matter. Attempts of this kind have frequently been made, and the results are as apparently conflicting as the evidence derived from the methods already considered. While Hallier asserts that he has produced true favus by transplanting penicillium to the skin, and Pick thinks that he has seen it give rise to the herpetic stage of favus, Peyritsch, and Köbner, and many other investigators have repeatedly tried to produce some parasitic affection by transplanting this and many of the most common moulds to the skin, but always without success; although they have found no difficulty in producing the diseases we have been considering by the same methods of transferring parasitic matter directly from them to other subjects, as already described.

If we accept as reliable the statements of those of the above observers who claim to have been thus exceptionally successful in these experiments, it must be only after due consideration of the possible fallacies attending them. The necessary application, for considerable periods, of bandages to protect the parts experimented upon, for instance, is one of the conditions most apt of itself to favor the accidental development of the diseases in question. The irritation of the skin, provoked by the dressings or lesions made, or by the foreign matter placed in contact with it, might readily be mistaken for the early stages of ringworm or favus. There should be no mistake, however, in the results obtained. Let there be one trustworthy production of well-marked favus by the transference, with necessary precautions, of any of the common moulds to the skin, and we should then have a piece of evidence about the character of which there could be no question, which could be preserved indefinitely for inspection, and which would go far to settle the matter in dispute. As it stands, however, this method of investigation, taking the negative and the so-called positive results together at their worth, has furnished no unquestionable proof of a direct connection between the well-known moulds and any of the parasitic affections. Indeed,

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every day chance is offering to the success of such experiment the most favorable opportunity in the omnipresence of seed and abundance of cutaneous soil, harrowed and fertilized by nail and dirt, if these conditions be thought essential to the development of the former. In addition, every possible variation in the chemical and physical nature of the skin is offered in its multifarious changes in disease. That these diseases are not of this every-day production, is sufficient to show that the right seed is not at hand for development. That no peculiarity in the nature of the soil is requisite, the ease with which ring-worm is transferred from one skin to another, even in the healthiest state, is a sufficient demonstration.

With regard to the identity, then, of the fungi found in these affections, we must still maintain their specific individuality, because clinically they are distinct, notwithstanding the deceptive inferences drawn from accidental coincidences, and because neither the results of transplanting nor of artificial cultivation have been such as to counterbalance even the negative evidence drawn from the same sources. With regard to their identity with any of the common moulds, the evidence presented is still more questionable.

Too much can scarcely be said in condemnation of the way in which experiments have been conducted by certain so-called observers to determine the supposed relations of moulds, not only to these affections, but to all sorts of internal and constitutional diseases. One might suppose, from the conclusions drawn by them from such investigations, that the cause of all diseases had been already determined. The most charitable opinion to express concerning much of what has been done or written in this country and in Europe, at least of such part of it as has claimed most positive results and the easy solution of some of the most mysterious questions concerning the causation of disease, is to call it boy's play. Unscientific work and hasty conclusions of this sort serve only to throw discredit upon one of the most important fields of research open to the pathologist, and to turn aside the true student from labor in it. The whole study of mycology is as yet in its infancy, and a master-mind is needed to clear away the mist and error thrown around it by such dabblers. In its present state it is to be feared that it can do little to settle even the questions we have been considering,

with reference to the affections universally acknowledged to be of a parasitic origin.\*

### 6. *Precautions against Vegetable Parasites.*

Regarding, then, the vegetable parasites of the skin as specifically distinct and without established relations to any of the well-known and common moulds, (as a due regard to their clinical characteristics compels us in the present chaotic state of mycological knowledge respecting the mutual relations of the latter), what positive knowledge have we of their distribution and occurrence, by which the danger of acquiring the diseases they occasion may be prevented? That the minute elements of fungi may be conveyed by the atmosphere, their universal presence, as shown by the microscope upon a glass slide left for any time "undusted," and their unfailing development when suitable soil is provided, are sufficient proof. In the experiments conducted so extensively of late in connection with the question of spontaneous generation, and in those of artificial cultivation above alluded to, it has been found almost impossible to exclude such germs from the substances employed in them; and in this lies the fallacy of most of the conclusions drawn from such investigations. Pasteur found that the air admitted to substances previously freed from such germs gave rise to new growths of the same in accordance with the nature of the surroundings. Thus, of the flasks deprived of air and opened at the foot of the Jura, at a remote distance from human habitations, 12 out of 20 remained free from organisms subsequently; at a height of 850 metres, 15 out of 20 remained free; and at a height of 2,000 metres only 1 of 20 showed signs of their growth; while of 13 opened at the inn only 3 failed

\* Those who are especially interested in the question of the relations of low organisms to disease, will find in the articles below mentioned criticisms upon the imperfect methods of investigation employed, and upon the hasty conclusions drawn therefrom, by some of the recent observers and writers in this field of inquiry.

1. Ueber die pathogenetische Bedeutung der kleinsten Organismen bei Infections-krankheiten. Von Dr. August E. Vogl.—*Archiv für Dermatol. und Syph.*, 1870, p. 393.

2. Les Vegetaux parasites et les nouvelles Recherches sur les Maladies virulentes et contagieuses. Par Lortet.—*Annales de Dermatol. et de Syph. Deuxième Année*, p. 29.

3. A Review of Dr. Salesbury's Microscopic Examinations of Blood; and Vegetations found in Variola, Vaccina, and Typhoid Fever.—*Boston Medical and Surgical Journal*, 1868, Oct. 1.

4. Der gegenwärtige Standpunkt der Mycologie mit Rücksicht auf die Lehre von den Infections-krankheiten. Von Dr. Eduard Eidam. Berlin, 1871.

to exhibit their development. These and similar experiments, repeated under varying conditions of locality, although they shed no light upon the occurrence or distribution of the particular fungi we have been considering, so far as we know, do illustrate the universality of similar elements near the habitations of men, and the ease with which they must be conveyed from place to place. Knowing nothing, therefore, of the parasitic fungi beyond that phase of their existence upon the skin of man and the domestic animals we have been considering, we must fall back upon the clinical history of each of these affections for our knowledge of the proper safeguard against them.

*Tinea favosa.*

We have already seen that this disease is observed much more frequently in the country than in the city, and among poor children than upon those who are kept clean. How infrequent its occurrence is in comparison with other cutaneous diseases may be judged by the following data. In three successive years out of some 10,000 affections of the skin in the Vienna clinic, only thirty-six cases were noticed. These were of course representatives of disease among the poorer classes. How much less frequently it occurs among the higher classes and a cleaner race, may be seen by examining Mr. Wilson's "statistics of cutaneous disease among the wealthier classes" in England. In 10,000 consecutive cases it occurred but three times. My own experience in this vicinity shows similar results. In 1,000 consecutive tabulated cases of skin disease among private patients, but a single case was seen; whereas in the same number of cases among out-patients of the skin department of the Massachusetts General Hospital, representing a poorer class of persons, there were four cases of the disease. My own observation teaches me that favus affects perfectly healthy skins belonging to perfectly healthy bodies; that no predisposition or cutaneous idiosyncrasy is essential to its development; that a dirty or a wounded epidermis is favorable to the attachment of the achorion, but not absolutely requisite; that although by no means so contagious as some of the other parasitic affections, yet almost every case is connected with others in the same family or among the playmates of the patient first affected, in the course of its long history; that nearly every case may be

traced back to its source of infection; that direct contact therefore with parties affected, either human or animal, is generally the cause of the spread of favus; and that without such communication there is little danger of acquiring it.

The following cases will illustrate the contagious nature of the disease, and the long time which sometimes elapses between inoculation and the development of the characteristic appearances. A few years ago I saw a poor girl, fifteen years old, of a consumptive family, who had had the disease seven years. She had always kept her head well wrapped up, and washed the bandages herself. She subsequently died of consumption, without having pursued any proper course of treatment for the favus. Three years before I first saw her, her little cousin, eight years old, had put on her bonnet, while the disease was in a very active condition. About a month afterwards a little pimple was observed on the crown of her head, which disappeared for a week or two at a time after washing it, but always returned. It appeared white and scaly. One year after the death of her cousin, the child was brought to me with a well-marked and large mass of favus situated upon this spot.

\* \* \* Some time since I was called to see two strong and healthy children at the western end of the city, upon whose heads were well developed masses of favus. There were two other children in the family, and on examination the disease was found also upon one of these. It had appeared successively in all these cases. On going into the street I discovered a boy, a playmate of these children, with his head almost completely deprived of hair by a favus of long standing. From him the former had taken it.

*Tinea tonsurans.*

This, as already stated, is a much more contagious and therefore a much more common affection than favus, and is relatively of more frequent occurrence in cities than in the country. The greater ease with which it may be transferred from one host to another is best seen in large asylums. A case of favus may be admitted, and months may pass without transference to another child with ordinary care, and when entirely uncared for but few other cases will appear; whereas, if a single child with ringworm be admitted, the disease will spread rapidly among

the inmates, even before the original case may be detected. The same eminent contagiousness marks the spread of the affection in the community at large, and no age, no condition, no amount of cleanliness will prevent infection. In Mr. Wilson's statistics of 10,000 cases of cutaneous disease among the wealthy, 252 cases are noted, although in this number are not included cases of sycosis and eczema marginatum, which are varieties of the disease. Among the 1,000 cases of the same class in my own practice above quoted, eighty-one instances of all kinds are recorded, whereas in the other thousand from the out-patients of the Massachusetts General Hospital, only thirty-seven cases of all varieties occurred. It will be seen by these figures, first, how much more widely prevalent is herpes tonsurans than favus amongst all classes; and second, how much more frequent in comparison with the latter is its occurrence among the wealthy and cleanly than among the poorer classes.

I have several times been able to trace the transmission of the affection through the different members of several families in succession, all of whom were accustomed to the daily use of the bath, and the descendants of what was possibly a single spore at the time of its transference to the first case, may thus be kept in view for months and years, oftentimes upon successive hosts. The boy may bring home from school a ringworm of the face or hands, which may give rise to other ringworms upon any one or many members of the family, young and old, and from these may arise upon the former herpes tonsurans of the scalp, upon the latter sycosis or eczema marginatum. One of the most common starting-points of such occurrences in our community, however, is the *barber's shop*. A large proportion of the cases above enumerated, and many more might be added, since recorded, were of such origin. The patients were young gentlemen, and the barber's shops frequented by them were the best in Boston. From this it follows that the habits of the former in point of cleanliness were unquestionable, and the customs of the "establishments" such as are least likely to foster and communicate contagion. The danger of catching barber's itch, so called, or other horror usually associated with public shaving, is so universally and strongly prevalent among gentlemen, that extra precautions against such infection are generally taken by them. Such was the case in



most of the instances here referred to. The patients had nearly all had their own mug, soap, brushes and razors, yet with all these trusted safeguards, they had acquired the disease. It follows, therefore, that with all possible precautions on their part, gentlemen who are shaved in public places may there get simple ringworm or its later stage, sycosis.

How this may happen is very easily explained. To these shops, (or saloons as they claim to be called,) in addition to the regular customers who are not shaved elsewhere, there resort an irregular set of residents, who are shaved sometimes in one place, sometimes in another, and also a large and ever changing multitude of travellers. It is evident that opportunity for the entrance to a shop of cases of so common an affection as ringworm, or of one so chronic as sycosis, in all this shifting multitude, will not be wanting. Were there any doubt upon this point it would vanish with the statement of the fact that many of the patients here spoken of had continued to be shaved at the place where they took the disease after it was fully developed. The question is, how it may be communicated from one customer to another, both of whom have their own equipments, which we will accept as reserved for their individual use? The operator uses not only the brush, but his hands also, in lathering a face thus affected. These are not always washed before they are applied to the face or apparatus of another; the razor is first stropped, without thorough cleansing perhaps, upon the common strop, even while the act of shaving is only half finished, it may be; the towel used in wiping the face of the first goes not upon a few afterwards; the comb, used upon parts of the face not shaven but yet similarly affected, goes directly to the beard of the next comer. These are the channels of communication by which these parasitic cells, so small as to be invisible, and incapable of destruction by the soap, water or washes used during the process of shaving, may gain passage from one face to another, even when all possible precautions are observed by the regular patrons; when the common property and apparatus of the shop are employed, the danger of conveyance is of course largely increased. There are, however, other ways in which the disease may be transferred. The danger of infection is not only for the person shaved; the operator himself may take the disease. I have treated in several instances ring-

worm upon the hands and fingers of barbers. To how many of their customers may they in turn not have given it?

It will be seen, therefore, how important a part the barber's shop may play in the maintenance and transmission of *Tinea tonsurans*. From it as a starting-point the disease is carried home and given to other member family, or even, ands of the not unfrequently, taken by young gentlemen into other families. There can be no doubt, too, that herpes tonsurans of the scalp may be conveyed from one boy's head to another in a similar way by the hair-cutter; but this is a danger far less to be feared than that of the barber's shop, for the affection of the scalp among cleanly children is comparatively rare, while that of the face in gentlemen who resort to the latter place, on the contrary, is by no means rare.

The following, among many instances which might be cited, will illustrate the contagious and persistent character of some of the forms of *Tinea tonsurans*:—

In an asylum for orphans in this city, containing about two hundred inmates, ringworm of the scalp had been long prevalent, and the affected children had been allowed to mingle at will with the others. The thirty thus affected were subsequently kept in a separate portion of the building, entirely shut off from all communication with the other inmates, and subjected to treatment. The spread of the affection ceased, and no new cases occurred, except among the newly-received children who brought it with them, and who were at once placed in quarantine. It was hardly possible that so many heads could be properly attended to, and consequently the cure was prolonged in some instances for more than a year, and in a few the affection reappeared after apparent recovery. Among the latter class was one who was put out to service before the disease was completely eradicated, and upon whose head it returned after entering her new home. In this household were three children, all below the age of ten. Several months after her arrival, I was called to examine the heads of the two oldest, and found upon them well-marked herpes tonsurans. In several weeks the youngest also showed unmistakable signs of the same affection, although its progress was at once checked. In the course of a few months a little cousin from the country came to reside in the family, and in six weeks the disease had also

communicated itself to him. In two of these cases, in addition to the affection of the scalp, there were well-marked ringworms upon the face and neck. In the asylum, from which the disease was brought, it should also be stated, in two of the nurses, who had long had charge of the cases there, the nails were greatly disorganized by the growth in their substance of the fungus.

Some time ago I was consulted by a young lady, Miss X., who for fifteen months had been treated for ringworm upon the face and neck. The disease rapidly yielded to remedies where properly applied, but certain portions of the skin, difficult of access and hidden from view, were never quite thoroughly attended to, so that fresh growths of the plant were constantly springing up on the arms, neck, shoulders, and other parts, which might have been easily and permanently killed by thorough attention. \* \* \* \* A month after Miss X. was first seen by me, a lad, Master Y., five years old, who had been much with her at the sea-shore, exhibited a circular patch of herpes tonsurans upon the scalp some two inches in diameter, which soon yielded to treatment, and did not return. In the spring of the following year, the mother of Miss X. brought to me a younger daughter with a well-defined ringworm as large as a silver dollar upon the arm, which at once disappeared under treatment. \* \* \* \* Again, in October of the same year, I was called to see Miss Y., the sister of Master Y., just mentioned, and the intimate friend of Miss X., the original and constant patient, whom she had been lately visiting. In her case there were four distinct rings of the disease upon the left cheek, which were shortly destroyed by the remedies applied. \* \* \* \* Here, then, were three persons affected in succession by the same patient, all of whom might likewise have served as centres for the spread of the disease had they not received prompt treatment.

The following cases are briefly described in illustration of the dangers of public shaving, not only to the persons immediately exposed, but to those with whom they associate:—

A year ago Mr. K. acquired a ringworm of the beard at a barber's shop in a town near this city, which persisted for several months under the domestic remedies at first used. During the past summer his sister consulted me for a ringworm of the face, contracted beyond question from her brother.

Mr. G. consulted me last spring for sycosis of the beard of many months' duration, the sequel of a ringworm of the face coming on after being shaved, contrary to his usual custom, at a barber's shop. On learning the nature of the affection and its contagious character, he informed me that his wife and child were possibly affected by the same disease. I subsequently saw them, and found several well-marked ringworms on the face and arms of the former, and one large ring upon the face of her infant.

Mr. F., after being shaved in Washington, in 1870, brought home a ringworm upon his face. In spite of the use of several domestic remedies, it lingered and continued to spread. He came to see me with his wife. At that time the disease was largely scattered through his beard, as well as upon the chin. His wife had acquired it also, and presented well-developed ringworms of the face.

Mr. S. acquired a ringworm at a barber's shop two years ago in an adjoining city, in which shop four other gentlemen whom I saw, and not a few others, also, according to their statement, were similarly infected. Mr. S. had not been affected but a few weeks, during which several new rings appeared, before the young lady to whom he was engaged to be married applied to me also for relief, having a well-defined ringworm upon her cheek. The possibility of contact with the face of Mr. S. was not denied.

In these cases, sister, wife, child, and *fiancée* were secondarily infected by the barber's shop. They represent a multitude of similar instances within my own experience, but will serve as well as many the purpose for which they are here introduced.

*Tinea tonsurans* is to be guarded against, therefore, in the school, whenever a child in attendance is known to be affected by it in any form; in the barber's shop, always; at home, when brought into it by any one member of the family; and at times upon the skins of the domestic animals.

*Tinea versicolor.*

Pityriasis versicolor is less frequently brought to the notice of the dermatologist than herpes tonsurans, but its real prevalence cannot be estimated. In the first place, its nature keeps it from the light, and therefore out of sight; and secondly, it causes

the patient comparatively little trouble, so that he seldom consults his physician until it has existed for a long time and spread over an extensive surface. It is, in fact, often first discovered by the latter when the patient's person is inspected for other purposes, as already mentioned. In Mr. Wilson's 10,000 cases it occurred 131 times; in my own observation of private patients, 13 times in 1,000. Among hospital patients, 14 times in 1,000. The ratio it bears to other cutaneous diseases seems to be remarkably constant, therefore, in the two countries and among all classes of society, although these figures cannot be relied upon as to its absolute occurrence, as in the two former parasitic affections. It is contagious, but in a low degree, and its direct transference from one individual to another is seldom observed except among those living upon the closest terms of personal intimacy; even under these conditions it often fails to be communicated. How else than in this way it originates upon a person, we have no means of knowing.

*Tinea decalvans.*

With regard to the prevention of the parasitic form of Alopecia areata we have hardly a word to say, except that it is evidently a very rare affection, and therefore but little danger from it is to be feared. How freely it may be communicated, our insufficient data will not allow us to determine. An instance of its spread from a single child to some thirty inmates of an English school, and the fact that my own two cases occurred upon intimate companions, suggest that it may be readily transferred from one host to another.

*Myringomycosis.*

As to the prevalence of this disease our knowledge is scanty and of recent date. Dr. J. O. Green, aurist of the city hospital, and Dr. C. J. Blake, of the Eye and Ear Infirmary, have kindly furnished me with the following information, by which it appears that it is by no means a common affection here.

Dr. Green writes: "In 755 consecutive cases in private practice, I have found only four cases of parasitic growth where the parasite seemed to me to cause any symptoms. These cases included two of so-called aspergillus glaucus, one of *A. nigricans*, and one of the simplest form, viz., round or oval single cells. In

addition to these, in thirty-three microscopic examinations of various masses removed from ears, some in private practice and some at the hospital, I found in three undoubted vegetable growth, which I classified at the time as penicillium."

Dr. Blake says: "I have had, I think, but five cases of myringomycosis, and of these four occurred in private practice."

Several of the other aural surgeons of the city, of whom I made similar inquiries, state that they have seen but one or two cases each.

Our knowledge of means of preventing infection is likewise very scanty. Of Wreden's ten cases, the fungus was found in both ears in four, and one case narrated by him seems highly suggestive. The affection in this patient was obstinate, and the relapses were unusually frequent. On examining his sleeping-chamber, the window near the head of his bed was found covered with the growth of aspergillus.

There remains to be mentioned only a single rule applicable to the management of all these affections before professional advice is obtained.

All articles of clothing which have been worn in contact with parts upon which the parasite grows should be purified by immersion in boiling water, or, where the nature of the material does not permit this, by baking. All bed-linen, bandages, brushes, combs, and towels, or other articles suspected of similar contact, should be treated in the same way, and, of course, should be used by no other person until thus purified. The patient, if a child, should be kept by itself as far as possible, and those having charge of the case should thoroughly wash themselves after handling the parts affected. With such precautions there is but little danger that the disease will be transferred to others, and when proper treatment has been once put in operation such danger of infection is far less.









