

was affirmed to be very liable to fits; but, as none occurred while she was under my observation, and scarce any during her stay in the hospital on a former occasion, it is not very clear what their character was. Probably they were more hysterical than epileptic, yet not without some affinity to the latter. The occurrence of spasmodic paraplegia as the sequel of a fit is more after the manner of epilepsy than of hysteria, or it may be compared to the occurrence of chorea from a fright. The spasm in all but one—viz., IV—was continuous; in the latter, the attacks were paroxysmal, and of brief duration. The cause of the disorder in the cases with rheumatoid affection was probably the unknown virus or *materies morbi* which usually excites articular inflammation, but may, as is well known, specially affect the brain or some other nerve-centre. In these, then, the derangement was toxic. In Case v, it seems to have resulted simply from the instability of the nervous system, without any special excitant. Just as the weak brain occasionally fell into paroxysms of excitement—loss of control—so it was, but more persistently, with the spinal motor centre of the psoas and iliacus muscles.

The essential morbid state in all these, and in a multitude of similar instances, is *superexcitability*—a condition which, I have often stated, depends, not on excess in the force-generating faculty of the motor cells, but in impairment of the faculty whereby the evolution of force, the liberation of energy, is regulated. It is clear that motor centres must possess these two faculties; otherwise, as long as the cells were supplied with fresh blood, they would go on sending forth impulses, and muscular repose would be impossible. The condition of spasm is, therefore, a mode of paralysis; and the affinity between the two states has long been recognised. In some of these states, both faculties may be impaired, and force continuously evolved, but in small quantity. This occurs in senile and alcohol tremor, and in many cases of chorea. In other conditions, the generation of force may be very active, as well as its liberation; and it may be quite impossible to arrest the movements by any ordinary exertion of strength. When this is the case, the therapy may need to be modified correspondingly.

The remedies likely to avail in such cases as those above narrated seem to depend rather on the severity and persistence of the spasm, and on the state of the general system, than on the nature of the exciting cause. The spasm ceased under the continued administration of iron, quinine, nux vomica, in Case IV; under full doses of assafoetida in Case II; under valerian, cinchona, with iron, in Case III; and under simple non-stimulating sedatives, nitro-glycerine, and conium, in Case I and Case v. The varying *quality* of spasm is not easy to appreciate accurately; but it is very important to do so, for on this the treatment very largely depends. One case of tetanus may require poisonous doses of aconite or tobacco; another will yield to chloral; and a third, perhaps, to alcohol.

I have scarcely touched the question whether the disorder in Case I was hysterical, meaning thereby that it was not purely physical. Probably, it was so to a certain extent, yet not so much as to render physical agents useless. I can hardly doubt that the nitro-glycerine acted beneficially, and I advise you to try it when you meet with similar instances. As it relaxes vaso-motor nerve-organs, it may similarly affect musculo-motor.

WORCESTER.—For the past year, Dr. Strange has to report a lower death-rate (20.0 per 1,000) than has been recorded in Worcester since the "present sanitary conditions" have been in force. Of the total number of deaths (712), diarrhoea was credited with 74, consumption with 69, other diseases of the lungs with 110, and heart-disease with 49. The ratio of infantile deaths was about 170 per 1,000 births. A large proportion of these deaths were of infants who died before attaining the age of even three months. More than a half (112) so died last year. This number is excessive, and to be deplored; but it is some small satisfaction to find that it is now much less than in former years. The work of the removal of nuisances continues with satisfactory speed, and improvements are noted in the water-supply and in house-drainage. The condition of cottage property, however, should still receive the attention of the medical officer. The hospital for infectious diseases received eight patients during the year—all of them cases that could not have been treated at home without danger to the rest of the inmates. The public mortuary and *post mortem* room attached are reported as being also of great use in the same direction. Dr. Strange adds to his report an interesting retrospect of the past seven years, showing a very large amount of good work accomplished by the authority. Six years ago, there were 441 houses containing more than one family in each; this overcrowding has been removed. There were then 108 houses without any supply of town's water; now every house in the city has a proper supply of good water. At least two-thirds of the open privies have been abolished, and an average of about 750 nuisances have been removed every year.

## ON THE FUNGOID ORIGIN OF DIPHTHERIA.

By MICHAEL W. TAYLOR, M.D. Edin., Penrith.

THERE is no part of the history of diphtheria more undefined, and on which conclusions are more at variance, than its etiology, and a knowledge of the conditions which favour its origin and dissemination. The object of the following paper is to record the particulars of a small isolated outbreak, and to exemplify the influence of dampness in a dwelling as the exciting cause, and to show a probability that the growth of certain fungi, associated with that dampness, may have had some connection with the disease. I may premise that this communication is not the result of any official public sanitary service, but of clinical observation in practice.

CASE I.—A little girl, E., aged 8½, of slight frame, fair delicate skin, and nervo-sanguineous temperament, had never had any illness except a slight attack of measles in 1879. She had been in the habit of attending a day-school with her two sisters, but they had been at home during the vacation for the last ten days. It could not be said that she had manifested any premonitory symptoms.

On August 1st, she was quite well when she rose in the morning; on the afternoon of that day, she complained of headache, giddiness, lassitude; and at night she was sleepless, and calling out in a delirious manner. I saw her on the morning of August 2nd, and found her feverish and excited, complaining of headache and sore-throat. Pulse 120; temperature 103°, with quick respiration; nothing particular in the chest-sounds. The tonsils, the faucial arches, and the velum palati presented a diffused redness of a deep tint. The tongue was coated white, soft, and moist. A suspicion of commencing scarlatina was excited, but no rash was visible on the skin. At 9 P.M., the pulse was 112, temperature 102°. There were some mental unconsciousness, and somewhat drowsy aspect; increased vascularity of the throat and pharynx, and decided swelling of the right tonsil; and also considerable tumidity and tenderness of the lymphatic glands under the maxilla on the same side of the neck.

August 3rd, at 10 A.M. Pulse 100; temperature 99°. She had had rather a better night, and answered questions sensibly. There was no rash on the skin, but, on examining the throat, it was seen that the portion which yesterday was red, was now covered with a film of semi-transparent whitish membrane, with branching filaments, involving the surface of the right tonsil and uvula, and extending across the velum partially on the left tonsil. Thus exudation was coherent to the surface of the mucous membrane, but it was easily detached. Pain of the throat was not much complained of, but some difficulty was experienced in swallowing. At 10 P.M., there was abatement of the feverish symptoms, but some anxiety depicted on the face.

August 4th, 10 A.M. Pulse 96; temperature 98.5°. White patches had become more opaque and thicker, but might be brushed off in shreds, leaving a red, tender, but smooth, non-ulcerated surface. There were infiltration and swelling of the mucous structure. Both tonsils were now implicated, but the left side least so. The glands above and under the jaw were engorged and painful on both sides. Breathing was noisy and rather snoring, but not of a hissing character. 9 P.M. Pulse 94; temperature 98°. There was no extension of membranous exudation to the larynx, and the chest-sounds were free from *râles*, but the breathing was noisy from the swelling of the throat, and the affection of the arches and velum. The countenance was rather turgid, and the eyes were watery and suffused; there was some degree of torpor and somnolence.

August 5th. Pulse 94; temperature 98.4°. She swallowed rather better, and the breathing was rather less noisy. The whole membrane, which had extended continuously over each tonsil and the pillars of the fauces, was seen to be breaking away, and becoming detached here and there; this process was assisted by brushing. The uvula, which had been clothed with a thin white pellicle, was observed to be nearly clear of this material, leaving the surface rosy red, and the whole organ oedematous and pendulous.

August 7th. Pulse 84. The uvula was still long, and infiltrated with puffy swelling. The white patches had all worn off, except on the left side, where there were two or three specks; the rest was clear of membrane. There was a little pain in swallowing; none at other times.

August 8th. This morning there appeared on the surface of the skin of the left forearm and left thigh, three or four deep purplish crimson stripes, like vibices, four or five inches long and two inches in breadth. The patient was hot and restless all night, with some fever and delirium, and frequent complaints of feeling a lump in the throat. The

pulse was now 96. The throat was not affected with any fresh outbreak beyond the appearance of puffiness, but the gums were somewhat red and swollen. The glands of the neck were still tender.

August 10th. The red stripes had disappeared, though the stain could be discerned under the skin. The general symptoms were much better. Pallor and debility continued for some time. Recovery was very slow. There was no albuminuria nor paralysis.

CASE II.—A sister of the above, C., aged  $9\frac{3}{4}$ , with light hair, fair complexion, and thin delicate skin, had had measles, but never any throat-ailment. For two days, in consequence of the illness of her sister, her health had been particularly inquired into, and during that time she had been placed in a different part of the house.

August 3rd, 10 P.M. She had shown no premonitory disturbance until this afternoon. There had been no rigor, but she became affected with headache, lassitude, loss of appetite, and thirst. I found her in bed, with temperature 99°, pulse 112, flushed, breathing rather quickened, but no cough nor dyspnoea. She had a suffused aspect, and drowsiness and headache; no appearance of rash. Her throat was carefully inspected; no pain was complained of, but the velum and pillars of the fauces and uvula were brightly reddened throughout, as if a brush dipped in carmine had been passed over them. The surface so reddened was in a less degree smooth and glistening than the natural mucous membrane, but no film nor white spots had yet appeared.

August 4th, 10 A.M. I found that she had passed a restless, bad night, with some excitement and wandering. Pulse 116; temperature 100°. I found three separate patches of diphtheritic exudation developed on the right tonsil, white, oval in contour, tenacious and adherent; the glands under the maxilla on the same side were enlarged and tender. 9 P.M. Pulse 104; temperature 98.75°. She had pain under the lower jaw; deglutition was rather difficult; the neck was more swollen; there was some extension of one of the white patches towards the uvula.

August 5th, 10 A.M. She passed a much more comfortable night. Pulse 88; temperature 98.4°. The white membrane over the right tonsil was separating; no extension elsewhere. She was able to swallow with less discomfort.

August 6th. The mucous surface, from which the white pellicle had been brushed, appeared reddish and granular, and slightly raised. The arch of the palate, the uvula, and surrounding parts, were cedematous with serum.

August 8th. The throat was clear of membrane, but rather puffy. Pulse 72; temperature natural. She was considered convalescent.

Return of strength came very slowly. She and her sister were sent to the seaside on September 5th. They had no albuminuria nor paralysis.

CASE III.—The youngest sister, M., aged  $7\frac{1}{2}$  years, thin, pale, with dark hair and fine delicate skin, had an attack of pneumonia in February last from an exposure; no other illness. This was a milder case than the others; the daily record need not be given. She began a week after her sisters; commencing in the same manner, with slight pyrexia and headache. A thin white filmy exudation covered both tonsils, which cleared away insensibly in two or three days. The peculiarity was the amount of cedema and relaxation of the parts, which continued for a week afterwards. These were the only children in the house; the other inmates numbered four adults, none of whom took the disease.

As is common with many diseases of the zymotic group, diphtheria presents gradations of aspect, from a local affection of comparative mildness to one of withering malignity—from a condition exhibiting here and there on the fauces a transparent exudation of a mere pellucid film, to one with thick and speedily reproduced masses of coriaceous membrane: in constitutional effects, from an initiatory pyrexia of the mildest character, to a blood-poisoning of a most acute, and sometimes persistent and intractable, kind. As in scarlatina, typhoid, small-pox, and other morbid infections, so in diphtheria, may there be two factors which govern or modify the intensity of the symptoms; first, the conditions intrinsic to the individual, such as age, temperament, constitution, and present fitness for receptivity of the virus; second, the conditions extrinsic to the body, amongst which, I conceive, the most potential are the states of concentration, activity, and ripeness of the *materies morbi*. There is no doubt that the cases now related were cases of true diphtheria, as contradistinguished from such affections as muguet and follicular tonsillitis; but they were of the mild type of diphtheria.

This part of the country cannot be denominated a pre-eminently diphtheritic district. On the advent of the disease in an epidemic form twenty years ago, cases of great intensity and fatality were frequent, but of late years the malady has only appeared in a sporadic or endemic form, often showing a remarkable tendency in persistently clinging to certain dwellings and neighbourhoods; and the large

majority of the cases of late years have been of the mild type of which I have just given examples. A few cases have been observed in the town during this year, but no deaths.

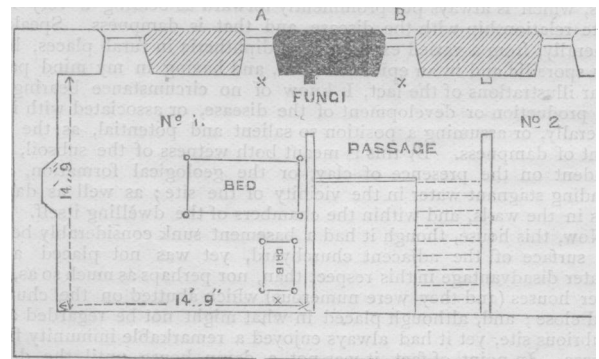
Let us revert now to the circumstances concerning the outbreak in this dwelling. The house is a large old-fashioned town residence, of the date of the beginning of last century; it closely adjoins the ancient, now disused, parish churchyard, from which it is separated by twelve feet only. Its elevation presents two stories, and a basement partially sunk below the surface of the ground. The thick stone walls are composed of rough loose rubble, originally probably rough-cast, but now covered with cement. The sleeping apartments are on the highest floor, or second story. The bedroom occupied by these little girls is an apartment 14 feet 9 inches square, and 9 feet 7 inches high, hence affording a cubic space of 2,067 feet. It faces the north, and is lighted by two windows on this aspect, and it overlooks the churchyard. The sleeping arrangements consist of a large iron bedstead, which accommodates two of the little girls and their aunt, their guardian, and a crib in which the third child sleeps. There is an alternation sometimes as to the individual child who shall occupy the crib; but, for this year or two, such has been the general disposition of the family at night. After Sunday night, August 1st, when the nature of E.'s illness became apparent, the two other children were removed to bedroom No. 2, on the other side of the passage; and the first case was treated in bedroom No. 1, and the other two children, as they were successively taken ill, were moved into the apartment.

Now, up to a certain period, it could not be said that the conditions of this apartment were ever such as might affect its salubrity; it was cleanly, airy, ample in space, well lighted and ventilated. This room had been occupied by these children during most of their childhood, and they had enjoyed a fair share of health; and, except two of them having contracted measles last year, no disease of a zymotic character had ever been in the house during a very considerable period I had known it.

However, this immunity from offending causes of disease was interrupted by an accidental occurrence. The water-spouting of the roof of the house immediately above the window lighting the passage between the two bedrooms of which I have spoken, had got out of order. A great rainfall commenced on Monday, July 12th, and continued throughout the week (which was well remembered as being the week of the Royal Agricultural Show at Carlisle). The outside wall of bedroom No. 1 adjoining the passage became saturated with wet; water dripped fast from the soffit of the window in the passage, and tubs were placed underneath to catch it. The paper on the wall became quite sodden with moisture, and separated from the thick pulpy layer of paste and plaster underneath. On Monday, July 19th, the roof was repaired, and the leaden spouting was found to be much decayed and broken.

On July 22nd, it was first noticed that a peculiar eruption of fungi were sprouting from this wall in the passage, and that there was a cluster of ten or twelve, which had partially opened into the toadstool form; and that others in earlier stages of growth studded the surface of the wall in considerable numbers. These at this time were removed and brushed off the wall; they grew again, and were swept away a second time, during the succeeding ten days.

In casting about for the probable infective sources of this outbreak of diphtheria, an inquiry into the question of dampness in the house or surroundings naturally occurred, and my attention was immediately called to the condition of this wall. I examined it on the morning of August 3rd; the accompanying plan will assist the description.



The portion of wall most invaded by the downpour of water was that lying between the windows A and B, occupying a space 4 feet

9 inches wide, and  $9\frac{1}{2}$  feet high; a lath and plaster partition containing the doorway of the bedroom abutted on the external wall. The interspace between these two windows was then thoroughly dripping with moisture. Here the inside aspect of the wall had been covered with Roman cement, over which had been pasted, years before, a marbled paper, varnished on the surface. This paper, and the paste, and the superficial layer of cement, were so saturated with wet, as to be reduced to a creamy pulvaceous consistence, forming a semi-liquid pulp, capable of being detached from the wall with great readiness. A sour, fusty, putrescent effluvia was exhaled from the wall, and had been felt for some days.

The surface, both in the bedroom and outside, was covered with a fine filamentous pellucid glaucous mould, which was particularly exuberant in the recess behind the shutter in the bedroom. Besides this lower form of mildew growth, a higher species of fungus was vegetating freely. Spread over the surface of the wall were numerous clusters of buttony excrescences, ranging in size from a split pea up to a thimble; and in some places near the cornice, specimens were seen with the stalk and umbrella-formed pileus in various stages of advancement, maturity, and decay. I may state here, that so inveterably had this fungus obtained possession of this feeding-ground on the plaster, that, notwithstanding several scrubbings, clean scrapings, and washings with carbolic water, and when nothing else was left but the apparently clean-polished coating of cement, yet, for months after, did this fungus crop out from the wall—not from cracks or crevices, but firmly attached to the bare and continuous plaster. In fact, during the months of November and December, cultivation of the fungus was purposely permitted, so as to allow a study of its nature and form, and the determination of its botanical character.

Here, then, at the very first step of the inquiry as to the origin of this invasion of diphtheria, the fact is obtruded upon us, that these children, for twenty days previous to the attack, had been subjected during their sleeping hours to conditions arising from dampness and its results. But, leaving for a moment the consideration of this particular cause, it would be in accordance with the legitimate rules of investigation to extend the inquiry to all possible causes, and then to eliminate such as can be proved to have had no substantive relation with the origin of the disease.

Amongst the sources of danger, polluted water has been described as the occasional birthplace of diphtheritic poison. In my experience, I cannot say that I have ever observed any facts which favour this assertion; nor yet have I ever seen reason to suppose that this virus, like those of typhoid and scarlet fevers, is capable of being disseminated by milk, or by anything taken into the stomach. Here, on this occasion, no suspicion could attach to the milk-supply, nor to the water, which was derived direct from the main at constant pressure, and it consisted of the water of Ullswater Lake, from which the town is served. The soil-pipes, drains, and water-closets on the premises were all in a serviceable state, and nothing had been complained of in reference to these arrangements. No ostensible sources could be discovered, through which infection could have been contracted; it was not a diphtheritic season; there had been no prevalence of the disease in the town for a considerable period; and, above all, it was not a diphtheritic house. No stranger had visited it for residence; the children had not been visiting elsewhere for months. They attended a day-school with half a dozen other little girls, no one of whom had lately suffered from any sickness. All these elements of mischief may be excluded in determining the allotment of the source of evil.

There remains, however, for assessment one condition of surroundings, which is always put prominently forward as bearing a very intimate relationship with the disease, and that is dampness. Speaking generally, from a varied experience of diphtheria in rural places, both in a sporadic and in an epidemic form, and having in my mind particular illustrations of the fact, I know of no circumstance bearing on the production or development of the disease, or associated with it so generally, or assuming a position so salient and potential, as the element of dampness. By this is meant both wetness of the subsoil, dependent on the presence of clay, or the geological formation, and standing stagnant water in the vicinity of the site; as well as dampness in the walls, and within the chambers of the dwelling itself.

Now, this house, though it had a basement sunk considerably below the surface of the adjacent churchyard, yet was not placed at a greater disadvantage in this respect than, nor perhaps as much so as, the other houses (and they were numerous) which abutted on the churchyard close; and, although placed in what might not be regarded as a salubrious site, yet it had always enjoyed a remarkable immunity from disease. In point of fact, it was not a damp house, until the decay and breaking of the eaves-spout, and the rainfall on the second week of July, caused a deluge into the wall, and made it so.

The question of the origin of the disease may thus be regarded as reduced to a finite quantity; and the answer may be stated in the form of such a syllogism as this: If all other known causes have been proved to have been inoperative, and if dampness is the only other known cause, the effect in this particular case was caused by damp.

But, although we are justified in regarding dampness as the predisposing cause, yet in a disease like diphtheria, of a specific nature, we can hardly accept it as the final cause—or, in other words, as the disease itself. Was this seizure amongst the children due simply to the fact of their sleeping-room wall being wet, and to their being exposed to the moist vapour and cold, produced by evaporation therefrom; or may it not rather have been from some development subsequently, in this moist feeding-ground, of some particular form of specific virus, the germs of which were either bred on the surface of the wall, or may have been carried from without by the rainwash on the roof and spouting?

It was on the 13th, 14th, and 15th of July that the heavy rainfall occurred, and when the wall became soaked; yet it was not until seventeen and twenty days later, that the first two cases of diphtheria commenced. Now, the consequences of exposure to dampness and cold, in the manner alluded to, might determine a throat-ailment of a non-specific character, such as an ordinary angina or tonsillitis, which, we would naturally expect, would have supervened in a briefer period after the exposure. But this illness was not a simple cynanche, but diphtheria, which we all believe to be specific in its nature, and dependent on a special *materies morbi*. Then, there is no one fact relating to diphtheria more satisfactorily demonstrated than that the period of incubation, compared to that of other zymotic affections, is of brief duration—four, three, or two days, or under; it does not take fifteen days to develop; and if dampness had been the sole cause, the probability would have been that the affection would have occurred at an earlier date. If, on the contrary, the elements of the disease resided in some of the products of putrescence, it would not be until a week or ten days after the accident happened to the wall that the specific agency, or virus, or disease-producing particles, were properly ripe, or sufficiently numerous, or diffused through the atmosphere, to determine their noxious influence; so that we may suppose that, for about a week preceding August 1st, the air in this apartment contained some occult specific agent, apart from simple moisture, which possessed the power of implanting on the throats of these children a contagion which initiated the pathological process of diphtheria.

So far, our deduction has rested on pretty positive general suppositions; but, in attempting the solution of the only question which remains—*i.e.*, what was the nature of this infective agent?—any advance is in the direction of hypothesis, or of reasoning by analogy.

The results of the investigations of scientific pathologists, during the last fifteen years, all tend to further the broad theory, that "all contagia are probably particulate", and that the infective particles enjoy endowments not known to exist otherwise than in association with life and organisation; and moreover, microscopy and experimental inoculation have incontestably demonstrated the presence of distinct specific vegetative forms in the contagious liquids of at least four contagious diseases. These are small-pox, sheep-pox, splenic fever, and relapsing fever. It has been shewn—first, that the minute organisms discovered infiltrating the tissues and blood in these diseases, which have been described, according to their form and structure, as the micrococcus, bacillus, spirilla, etc., are not congeneric with the animal body in which they are found, but are apparently of the lowest vegetable kind; and secondly, that they constitute the essence, or an inseparable part of the essence, of the contagia of these diseases.

It has been proved, so late as the present year, by Toussaint of Toulouse, that the very infectious disease amongst poultry, called the *cholera des poules*, consists of a minute bacterium, which is capable of cultivation out of the body, in chicken-broth; and it has been long known that the epizootic parasite which infests the silk-worm, and the house-fly, is a mould with fungal threads and mycelium, which is almost identical with oidium, or peronospora, so well known in connection with the potato and vine plagues.

Thus we see that the progress of modern research justifies the conclusion, that the vastly multiplied minute organisms and vegetable spores, inducing and produced by the ordinary processes of fermentation and putrefaction going on in nature, may be absorbed into the blood of animals, or be engrafted on their tissues, so as to assume an intimate relationship with many of the diseases most fatal to human life. Hence there is really nothing startling nor singular in the proposition I enunciate, that the diphtheria in this particular instance had its origin in some of the fungoid spores which infested this chamber.

In the year 1858, Professor Laycock of Edinburgh put forth the

theory, that diphtheritic exudation depended on "oidium albicans", or potato fungus;\* the same conjecture was supported by Dr. Wilks and others;† long before which—in 1844—Gruby of Paris, and afterwards Ch. Robin, had shown, by the microscope, that in the pseudo-diphtherite, or muguet, and in thrush, the buccal pellicles displayed the tubular filaments and mycelium of a vegetable form analogous to the oidium. This hypothesis, however, in regard to true diphtheria did not receive acceptance, in consequence of the general failure at that time of sufficient microscopic evidence, in the false membrane itself, of the presence of vegetable growths.‡ The more recent researches, however, of Nassiloff and Oertel in Germany, Leloir in France, Burdon Sanderson, and other workers in scientific pathology, show that pharyngeal diphtheria is a true mycosis, or infiltration of living tissue with micrococci, and that the development of these minute spheroids is intimately associated with the morbid process. It has been found that the pseudo-membrane consists of layers of stratified epithelium, more or less mingled with products of exudation from blood-plasma and some micrococci, but that, in the mucous and submucous tissues, the channels communicating with the lymphatics are filled with granular matter, which is mainly micrococci, or masses of vegetation; so that observation has tended to establish a certain analogy in the morbid processes of diphtheria with those in the respective diseases I have mentioned—splenic fever, or woolsorters' disease, for example, which we know to be produced by vegetable sporules existing outside of the body.

As was well shown by Sir James Paget, in his masterly address at the Cambridge meeting of the Association, some of the obscure processes of human pathology are capable of receiving much elucidation from a comparative study of diseases in plants, and of the action of parasites on the vegetable kingdom. We have described to us, by the practical mycologist, an infinite multitude of distinct structural forms of fungi, each of which has its own habitat, and affects certain sites of decaying vegetable or animal matters, or preys on certain living species or natural orders of plants; each has its own feeding-ground. We cannot advance far in this study without being struck with the marked parallelism which exists between the action of the parasitic spore in producing local and general morbid changes in the plant, and the action of a bacillus, or oidium, affecting animal tissues. The resting spore, let us say, of the peronospora infestans, capable of resisting the hardest winter frosts, and the greatest heats of summer, lies dormant underneath the ground, until the time of germination arrives; its habitat, or feeding-ground, is the potato; at the proper season it meets with a tuber; it attaches itself to the skin by its little lash-like appendage; it germinates there; it starts out its rootlets into the parenchyma of the tuber—this is its mycelium; it branches and penetrates in all directions; it poisons the tissues; the plant looks sickly; the stalk withers, and the leaves blacken; it has fulfilled its end, the reproduction of its kind. So, when the leaves of phanerogamous plants are attacked, the zoospores of the fungus gain entrance by the stomata, throw out their mycelium through the cellular tissue of the leaf; the thread-like filaments burrow underneath in search of food; whilst the epidermis is raised like a blister, and perishes and exfoliates, just as does the epithelial false membrane from a diphtheritic throat. No theory in regard to the essential cause of diphtheria explains so well many known facts in its history as that of its fungoid origin. For example, the persistence of vitality in the so-called resting-spores of fungi lying dormant in drains, or amid heaps of putrescible matter, for an indefinite time after an outbreak, affords a ready explanation why the disease so often inveterably clings to certain dwellings and localities.

I must now close my argument, which I have propounded with an enforced compression, which the exigency of space in the pages of this valuable JOURNAL necessitates, and will refer briefly to the botanical characters of these fungi.

For the determination of their species, I am indebted to the kind offices of Dr. Buchanan White, editor of the *Scottish Naturalist*, and to the genial aid of the Rev. M. J. Berkeley, the highest living authority on cryptogams. Mr. Berkeley tells me, concerning the pileate fungus, "I have no doubt it is a state of Coprinus domesticus, the base being unusually thickened for the necessity for spreading, for firm attachment on the plaster. C. radians grows in similar positions, and the mycelium spreads over the wall. It is curious, when I was at Lille in

1838, at which time influenza was very fatal, it was supposed to arise from the spores of some Coprinus". Coprinus is a genus of the natural order of Agaricina, and contains about twenty-eight species. On reference to Fries's *Hymenomyces Europæi*, I find the habitat given as—"In pagis, plateis urbiolum locisque similibus"; while in Cook's *Handbook* it is said to grow "on damp carpets, etc.". In neither case is there any reference to the fungus in question growing on plaster; but as plaster is not an unfavourable locality for some other fungi, there is nothing remarkable in that. In regard to the mould which was associated with the Coprinus, it was either a form of *Aspergillus*, or, as Mr. Berkeley suggests, it may have been what Sowerby calls a *Fibrillaria*.

I have thus endeavoured to fix, from a positive observation, a certain kind of relation in the origin of this outbreak of diphtheria with the development of these two species of fungi; I will not at present attempt to discuss whether of these generated the spores which constituted the throat irritant. It is very possible that in our search for the essential cause of diphtheria, it will be found to depend, not on one structural form or species exclusively, but probably on a multiplicity of analogous vegetable sporules, more or less baneful to animal life; for fungologists have found that there is an alternation of development—a discontinuity of form amongst these minute organisms of the natural family of Mucedines—a variableness of generic character, induced by differences of food and habitat, although they may really be identical in origin. Thus the genus *oidium* is regarded as the elementary state of a higher fungus; the torula, or yeast-plant, can be got both from the *aspergillus* and *penicillium*; the *empusina* or microphyton *Schönleinii* to which so many house-flies fall victims, alters its whole character when immersed in water, and forms the *achlya*, the coniferoid tufts which infest the gold-fish; and further, the *achlya* itself is but another form of *Botrytis bassiana*—the "muscardinæ", which consumes the intestines of silkworms.

I have every confidence that the growth of fungi, in coincidence with diphtheria, will be corroborated—what is once observed is bound to occur again; and I hope to receive confirmatory evidence from others of this observation.

ABSTRACT OF TWO THOUSAND FIVE HUNDRED CONSECUTIVE CASES IN MIDWIFERY PRACTICE.\*

By D. M. WILLIAMS, M.R.C.S.ENG., L.K.Q.C.P.I.

AMONG the 2,500 cases there were: premature confinements among primiparæ, 11 cases; among pluriparæ, 10; in all, 21 (excluding cases of placenta prævia). Of these, one mother died of phthisis the day after her confinement, which was but an incident in her illness. Of the 2,479 to be further accounted for, there were—

Primiparæ whose cases terminated in 12 hours or less ...	271
Primiparæ whose cases terminated in over 12 and within 24 hours ...	317
Primiparæ whose cases were longer than 24 hours ...	83
	<hr/>
	671
	<hr/>
Pluriparæ whose cases terminated in 12 hours or less ...	1,461
Pluriparæ whose cases terminated in over 12 and within 24 hours ...	315
Pluriparæ whose cases were longer than 24 hours ...	32
	<hr/>
	1,808

Twin cases occurred in primiparæ, 9 times; in pluriparæ, 17 times; in all, 26 times. The forceps was used in primiparæ 125 times; in pluriparæ, 92; in all, 217 times, or nearly 9 per cent. Of craniotomy, there was one case only, in a primipara. Breech or footling presentations occurred in 22 primiparæ, and in 31 pluriparæ. There were one face-presentation and three (?) shoulder-presentations. Of complicated labours, there were 10; viz., head and funis 5; foot and funis 3; breech, hand, and funis 1; shoulder and funis 1. These occurred in 3 primiparæ, and 7 in pluriparæ. Dangerous hæmorrhage occurred in 8 primiparæ, and in 51 pluriparæ; in all, 59. Convulsions occurred in primiparæ five times; in pluriparæ twice; in all, seven times. There were two cases of monsters, two of hare-lip, two of spina bifida, and two of talipes varus. Amongst the primiparæ, there were 25 dead children:

In labours of 12 hours or less ...	8
In labours of 24 hours or less ...	8
In labours of over 24 hours ...	9

\* Read before the Liverpool Medical Institution.

\* *Lancet*, 1858.—Laycock, Lecture on Diphtheria.

† *Medical Times and Gazette*, vol. xxxviii.—On Diphtheria and its connection with a Parasitic Vegetable Fungus.

‡ Since I have been engaged with this paper, I find from a communication kindly forwarded by the Rev. John E. Vize, M.A., Fordon Vicarage, and published in 1880, that this able fungologist has strongly maintained the dependence of diphtheria on an oidium.