to be the starting-point, then perversion of the normal function of the nerve at its periphery in the stomach (and also sometimes elsewhere) is its natural expression. But supposing the nervous centres to be only in the usual condition belonging to epileptics—not healthy, but in a morbidly irritable state,—then a temporary disorder, produced by undigested or indigestible food, in its peripheral branches, will increase centric disturbance, cause reflex contraction of cerebral bloodvessels governed by vaso-motor nerves, and an explosion in the shape of a fit.

The same argument applies to disorder of the small intestines, the splanchnic nerves furnishing the medium of communication between the mucous membrane and the reflex centres. The fit in that case is usually followed by diarrhoea, and not by vomiting. Such cases as these are not best treated by bromide of potassium alone. One of the bad effects of this drug, perhaps the only one caused by the bromide even in moderate doses, is what we call the bromide dyspepsia. The objective symptoms are foul breath, a white tongue, involving the edges as well as the dorsum, and not necessarily furred, with great languor and sleepiness. Anorexia must be added to the list. It will be found that when such a condition exists there will be an accession of fits, although up to the time of the stomachal disorder the attacks may have completely ceased.

Under such circumstances your best proceeding will be to use any ordinary alterative aperient with effervescing salines, and when the colour of the tongue has returned—and by that time the other symptoms I have mentioned will have disappeared also—then to recommence the bromide treatment in conjunction with lactate of soda, in a dose of from five to fifteen grains, in some bitter infusion, the best of which is the infusion of chiretta. I prefer chiretta because it acts as a cholagogue, and the only objection is that it occasionally produces diarrhoea. You may give the bromide for a long period in this combination without having to suspend it on account of the “bromide dyspepsia.”

Now a suspension of epileptic attacks is, for many reasons, always desirable. Yet suspension is not cure; and, for the most part, when you cease to give bromide of potassium, the attacks return. Can we prevent these? I think we can often do so by building up the patient, by using means to improve the nutrition of the tissues, of the nervous masses, and of the ganglionic nerves especially; for I hold that a convulsion is an impossibility in a perfectly healthy brain and nervous system; and I think these views should form the basis of all treatment. Is there any tonic remedy of value for this purpose? I think so; and I have found the best in brucine,—beyond many of recognised value. Mr. Tyrrell (of Malvern) has published some cases treated successfully by strychnine. I have used this drug extensively, and when the patient can remain under close observation, or if he be attended by intelligent friends, I should not hesitate in proper cases to recommend its use. But there are cases of idiosyncrasy, and small doses will sometimes evoke disagreeable toxic symptoms. I have not been annoyed in this respect with brucine, perhaps because it is a weaker alkaloid, and the patient gets more easily accustomed to its use. Its physiological effects, however, so closely resemble those of strychnia, that it may be taken for granted their therapeutical virtues are the same. I usually order it in a solution made of the same strength as the liquor strychniæ of the Pharmacopœia, and commence with a dose of ten minims, to be taken twice daily; every third day an addition should be made of five minims to the dose, until from a third to half a grain is reached. If any stiffness of jaws or other toxic symptom appear, the dose is to be diminished by five minims, and continued until any new objectionable symptom is manifest; then it is again lessened. You will not find any benefit from either brucine or strychnine till a full dose is reached; often the reverse effect. As a rule, patients will take twice as much brucine as strychnine, without any necessity for diminishing the dose. After the continuous administration of brucine for a month, I think it well to suspend its use for some days, and then again resume it. I may remind you that Dr. Marshall Hall used strychnine in epilepsy, but he gave it in very small doses, and without success. Given in large doses, and with the precautions already mentioned, I have not met with any case suggesting

cumulative action, or suddenly poisonous effect, from the administration of either alkaloid. You will find great satisfaction in giving bromide in large doses at bedtime, at the same time ordering brucine twice daily; thereby you ensure the sedative action of the bromide, and the tonic effect of brucine on the whole nervous system.

SCIENTIFIC INVESTIGATION INTO THE CAUSES OF CHOLERA.

(Concluded from p. 41.)

III. REPORT OF INTERVIEWS WITH PROFESSOR ERNST HALLIER, AT JENA, Oct. 1863.

BY

DR. D. DOUGLAS CUNNINGHAM

AND

DR. TIMOTHY LEWIS,

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PROFESSOR HALLIER received us with the greatest kindness, and endeavoured to show us his preparations and to explain his views as completely as possible; but he considered there was no time to do full justice to his plan of investigation or to the proofs of his opinions. It would require, he thought, at least two months' work for this.

I. *Apparatus which Professor Hallier employs.*—These are generally rather complex, as Professor Hallier's method of observation depends for the value of its results on the supposition that isolation is as perfectly secured as possible.

1. The large apparatus, as described in his “Gährungs-Erscheinungen,” p. 14: It consists of a glass flask, fitted with two tubes, one of which is connected with the isolating media, whilst the other enters the receiver of a small air-pump, by means of which any amount of air can be drawn through the whole apparatus. He thinks that, if it were possible (i.e., if a sufficient number were at hand), only this kind should be used. He considers its great advantages to lie: 1st. In its being as perfect an isolator as is possible to be obtained without resorting to great expense. 2nd. In its affording means for the supply of as much air as may be thought necessary. 3rd. In enabling the material cultivated to be used in considerable amount, which he considers almost essential for good results. Of course it has the disadvantage of not providing any means for the continuous observation of progressive development, as the results of the cultivation in it can only be examined on breaking open the flask.

2. The small apparatus: This consists of a small bell-glass, communicating with the air by a bent tube, and standing in a basin of permanganate of potash. In this, as described in the “Gährungs-Erscheinungen,” the substance to be cultivated is made to rest on a small glass or earthenware dish, so as to keep it out of the permanganate solution. (See Fig. 2, a.)

II. *The substrata which Professor Hallier employs.*

1. The freshly exposed pulp of a lemon, “which, as freshly exposed, may be presumed to be free from spores or fungal elements.”

2. Thick starch paste, containing some salt of ammonia.

3. Solution of grape sugar.

4. Cork which has been previously soaked in alcohol. This is carefully dried, and “when employed as a substratum is kept so, but surrounded by moist air.”

5. Fresh potato.

In making a series of observations on development, he employs the large apparatus for getting fully developed results, and several of the small ones for results which may be frequently examined, and so show the steps of development.

In making any series of observations, two pieces of lemon, cork, &c., should be employed, on one of which spores are sown, and on the other they are not, so as to be able to compare the one piece with the other.

III. *A summary of Professor Hallier's views as gathered from explanatory statements made whilst demonstrating his preparations of cholera stools, &c.*—Professor Hallier stated that the fundamental idea of the whole theory is that “moulds

are mere unripe forms of ustilaginee." This is a view of his own, and is not generally recognised. He believes that any fungus of this series may appear under various forms; these forms depending on the nature of the substratum, and on the degree to which ripening goes on. If the spores of an ustilago be cultivated, two forms always appear—viz., the schizosporangic and the cladosporic forms; if the soil on which any of these forms appear alters or ferments, the forms produced are different. He states that each species of ustilago has three ripe forms of fructification, and that each of these has a corresponding unripe representative, the use of the unripe form being probably, according to Professor Hallier, to prepare a more nitrogenised soil on which the higher forms may be developed. "If tilletia caries be cultivated on weak, poor soil, we get only unripe forms—i.e., moulds make their appearance."

These ripe and unripe forms may be thus tabulated, taking as an example the fungus associated with cholera:—

Unripe.	Ripe.
1. Macroconidia.	1. Tilletia caries.
2. Penicillium crustaceum.	2. Cladosporium.
3. Mucor racemosus.	3. Schizosporangium (cholera cyst).

The ripe forms are distinguished from the unripe ones by having a cuticula developed, which makes them much more resistant.

"Macroconidia" is the term which Professor Hallier applies to dilatations such as occur in mucor racemosus. He believes that they are unripe forms of fructification, and are capable by a ripening process of becoming tilletia caries spores; but in place of ripening they may, unlike the ripe spores, germinate at once. If the soil on which this germination takes place be sour and poor in nitrogen, penicillous forms result—i.e., the unripe representative of the cladosporium. If, on the other hand, the soil be rich in nitrogen, mucor forms appear—i.e., the unripe representative of the schizosporangium. A schizosporangium is precisely the same as a mucor sporangium, save that it has a cuticula developed on its exterior, and that the contained spores are each provided with a sheath.

The mode of germination in the two forms is quite distinct. Each spore on a schizosporangium on germinating gives origin to a filament, which pierces both the sheath peculiar to the spore and the wall of the containing capsule, without rupture having taken place. In the mucor sporangium, on the contrary, rupture or disappearance of the capsule always takes place before germination, as it, being destitute of a cuticula, is not strong enough to resist the pressure of the swelling spores. (See Fig., and compare with Fig. 4 in the Halle report.) In Fig. 11, however, the schizosporangium had ruptured (a). The only form of the series asso-

FIG. 11.

a. Schizosporangium.
b. Macroconidia.

c. in "process of developing into tilletia spores." (Hallier.)
(From Dr. Hallier's Preparations of Cholera Stools.)

ciated with cholera which is peculiar to the disease is the

schizosporangium or the cholera cyst; but they may probably on investigation be found to occur on the rice plant in India. The schizosporangia of the cholera series are in this climate peculiar to the disease only. They can only be developed on a nitrogenous basis, and under a high temperature. Cholera originates under the same conditions in which true cysts can be produced. This may possibly cause the difference between Asiatic and European cholera—the first being due to the micrococci of the schizosporangia; and the second to the micrococci of their unripe representatives, mucor sporangia, as well as to the indigenous ripe form, tilletia spores.

Professor Hallier does not state positively that cholera is due to the fungus, and he does not believe that any infectious disease can be caused by spores *per se*. It is only micrococci that are efficient agents in producing disease. This may account for the fact that tilletia spores can be and constantly are swallowed in large quantities without producing any bad effects. They are not retained long enough in the intestinal canal to produce micrococcus, and therefore pass through quite passively.

The question of "micrococcus" being thus introduced, Professor Hallier stated his views on the subject. He defines micrococcus as "particles of plasma without any cell-wall." When these particles acquire such a wall they become either "cryptococcus" or "arthrococcus," according to the nature of the medium in which they are contained. Micrococcus, on being introduced into a fluid capable of alcoholic fermentation, becomes cryptococcus, corresponding with the bodies which are generally included under the vague term "yeast cells." If, on the other hand, micrococcus be introduced into a fluid capable of sour fermentation, they become arthrococcus—i.e., they assume an elongated form, and become one form of what are commonly termed bacteria. The term "bacteria," as usually applied, includes both arthrococcus and micrococcus, but no idea of their nature and relations had been attained until Professor Hallier discovered that they were merely the ultimate elements of fungi.

Micrococcus and arthrococcus are multiplied by fission; cryptococcus cannot be so multiplied, "from the strength of its walls and hollowness of its centre," and it is therefore multiplied by gemmation. Micrococcus may be developed into higher forms in two ways:—

1. It may acquire a cell-wall, and pass on through the arthrocoecal or cryptococcal stage to the formation of a fully-developed fungus.

2. It may under favourable conditions germinate at once, and give rise to mycelium.

In these views, as well as in those referred to above, Professor Hallier stands quite alone.

IV. Preparations.

1. Micrococcus. Professor Hallier exhibited numerous preparations, some of which he considered proved the development of micrococcus, and others its direct germination. In those showing development the field presented bodies like yeast cells mingled with granular matter; but of course no preparations could show that they were mere modifications of one another. In those showing germination there were also granules present, but in this case mingled with fine filaments; but one could not see definitely that these were organically connected. And, as generally, fully-developed fungi existed in the same preparations, but one could not feel certain that the filaments were not mere detached portions of these, associated by mere juxtaposition with the granular matter.

Professor Hallier instituted a culture of scarlatina blood in our presence, in order, if possible, to demonstrate this development and germination of micrococcus. The small apparatus already described was used for the purpose. A drop of the blood being placed on a glass slide (the blood having been preserved for about three weeks in a closed test-tube), a little grape-sugar solution was added as a substratum, and a covering glass placed over it, the latter being separated from the slide by a perforated piece of thin cardboard, which had been soaked in alcohol. This preparation exhibited under the microscope numerous more or less disintegrated blood-corpuscles, associated with granular matter and numerous minute circular bodies, which Dr. Hallier described as being various stages of micrococcus. (See Fig. 12, c.) However, owing to the short period of our stay with him, no result whatever was attained.

FIG. 12.

- a, Small cultivating apparatus.
b, Glass slide, with perforated cardboard between it and the covering glass.
c, Blood from scarlatina patient, with micrococcus, cryptococcus, and arthrocoecus.

2. Illustrative of the relation of moulds and ustilagines. Professor Hallier showed some preparations which, he considered, demonstrated the tendency on the part of mucor dilatations (i. e., macroconidia) to ripen into tilletia spores. These macroconidia (see Fig. 11) presented a double contour, which he ascribed to a tendency to the formation of a cuticula. This condition was quite indistinguishable from the same appearance produced by the mere shrinking of the protoplasm, as noted at Halle. (See Fig. 5 in that Report.) In several of these preparations some tilletia spores undoubtedly existed, but they were always merely lying among the other materials of the preparations, and their existence in such preparation might have been due to mere accidental entrance into the cultivation. The preparations were chiefly derived from cultivations in the large apparatus; therefore, of course, the separate steps in the development were not seen to take place.

3. Preparations illustrative of the tendency of penicillium to form dilatations resembling macroconidia. A great number of these preparations were exhibited, as, in Professor Hallier's opinion, they prove the identity of mucor and penicillium. (See Figs. 13 & 14.)

FIG. 13.

4. Rice-plant cultivations. Professor Hallier also showed his preparations illustrative of the condition of the rice

plants which he cultivated at Jena, watering the soil on which they grew with a solution of cholera evacuations. In order to develop the fungi affecting them, a portion of the leaf had been placed for some time on the surface of a mixture of starch paste with phosphate of ammonia, and small portions of the tissue of the leaf detached for observation. On examination, the tissue presented more or less globular

FIG. 14.

Illustrating tendency of penicillium to form macroconidia.

FIG. 15.

bodies, apparently an aggregation of spores, as figured in his work termed "Phytopathology." In this work Dr. Hallier speaks of the relation existing between these bodies and urocystis, judging from their form and method of germination. He seems now, however, to have abandoned this view of the relation of these bodies to urocystis; nevertheless he maintains that they are analogous to cysts found in cholera evacuations.

BRIEF REMARKS ON

SOME OF THE FORMS OF DISEASE OBSERVED DURING AND SINCE THE LAST UNUSUALLY FINE SUMMER.

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THE summer which has just passed has been very remarkable for its extreme warmth and dryness, and it might naturally be expected that so unusual a season should exercise an obvious influence on the forms of disease prevalent during its continuance, and since it has been succeeded by cold and wet weather. In this paper I propose to offer brief notes of some of the affections which have fallen under my own observation, prefacing them by some account of the weather, and of the amount and causes of mortality, derived from the Registrar-General's weekly and quarterly returns.

Mr. Glaisher's reports very decidedly show the exceptional character of the season. He states that the first eleven days of the year were cold, but after that the temperature rose above the average, and continued so throughout the winter, spring, and summer. In the quarter terminating March 31st the exceptions to the excess of heat were few in number and small in amount. Altogether the