methods of study which are really of more value. Various specific methods of treatment have been advocated from time to time, but, from our present knowledge of the disease, such methods can be of no scientific value.

When we become acquainted with the nature and habits of the typhoid germ, then we will have a foundation upon which to build a specific treatment. Many of the advocates of some so-called specific treatment claim excellent results, and it will be seen that many remedies are of much use. But it will also be seen that most of those drugs which seem to favorably modify the course of the disease belong to one class, namely, antiseptics. A treatment originated in Germany in which mercury and iodine were the specific remedies. Excellent results were obtained from the use of these drugs, the temperature range and condition of the bowels being favorably affected.

I believe this good result was produced by the antiseptic action of the mercury and iodine. As I have said before, the primary lesion is in the intestinal canal. Here is where the typhoid germ is first deposited, and from the ulcerative process here developed is derived the secondary or pyæmic fever characteristic of typhoid. Now, the treatment which will act as directly as possible upon the ulcerating Peyer's patches, is as near an approach to anything "specific" as our present knowledge will permit.

It now becomes easy for me to say that my method of treatment, after supporting the patient with the properly applied milk diet, and stimulants when indicated, is by antiseptics. By this I mean that the alimentary canal should be kept in an aseptic condition from the mouth to the termination of the intestine. Of this, the attention to the mouth is not the least in importance. Many remedies are suitable, and this gateway to the alimentary canal should be securely guarded, so that no septic matter can find its way into the circulation through this channel.

That part of the intestinal tract beyond the ilio-cæcal valve can be reached by antiseptic enemata, which should be used at least twice a day.

Of the medicines to be administered internally, the mercurials are in the first rank. Tablet triturates of calomel, or bichloride, in very small doses, are the form used. The combination of carbolic acid with bismuth or iodine is valuable, especially where there are marked bowel symptoms. Pepsin is an excellent antiseptic, and, where the digestive powers are weak, aids in the elaboration of the food.

In speaking of the necessity for thoroughness in our treatment, I would say that our antiseptics should be continued until the dejections from the bowels are safely deposited where infection from them is impossible.

The results obtained by this method of treatment in a fairly large number of cases are these: the diarrhoea is much less, seldom requiring the use of opiates; the temperature range is not so high, and the tendency to complications is not so great. I do not believe any method of treatment now known will cut short the course of typhoid fever, but this method seems to me more rational than to savagely attack one of the many symptoms which are, in most cases, the necessary accompaniment of the disease.

In regard to treatment, then, I have only attempted to show that a conservative method, based upon what little real knowledge we have of the fever, is of more

value than the uncertain use of potent drugs which, while they for the time being seem to relieve one symptom may do the patient positive harm.

It may be said that I have simply done the work of a vandal, and have destroyed the idols which have been so long worshipped, having substituted but little in their place. But I firmly believe that, not only in this, but in all diseases, the time has come when thoughtful physicians say that we must use less, much less, medicine, and when administered, it should be with a definite purpose in view and in the smallest possible dose.

Although we are standing on the verge of marvellous revelations as to the cause of disease, and in a quarter of a century from now this labored essay would not be worthy of your consideration, yet, at the present time, our best results will be obtained by making use of the first steps which have been taken in our knowledge of this disease, and being extremely conservative in instituting uncertain and unscientific measures.

And I believe that the greatest step that has been taken within the last decade is in learning what not to do; in learning to place less confidence in the curative power of drugs, and watching more closely the indications of nature, standing ready to render all needed aid.

Our typhoid patients' surroundings should lack nothing to render their sanitary condition perfect, and the supporting and absolutely antiseptic treatment should be untiringly pursued.

I can close this paper with no better words than those of the immortal Jenner. He says: "My experience has impressed on me the conviction that the man will be the most successful in treating typhoid fever, who watches its progress, not only with the most skilled and intelligent, but also with most constant care, and giving *unceasing attention to little things*, and who, when prescribing an active remedy, weighs with the greatest accuracy the good intended to be effected against the evil the prescription may inflict, and then, if the possible evil be death, and the probable good short of the saving of life, holds his hand."

THE BACILLUS OF TYPHOID FEVER: ITS OCCURRENCE AND SIGNIFICANCE.¹

BY JOHN A. JEFFRIES, M.D., OF BOSTON.

In 1882 Eberth announced that certain groups or colonies of short bacilli could be found in the Peyer's patches, lymph glands of the mesentery, spleen and other organs of those dead of typhoid fever. Meyer reported shortly after on the subject, and added much weight by showing that such groups of bacteria existed in nearly all cases of typhoid fever. This was before the general use of aniline dyes and solid culture media.

Next Gaffkey showed that these groups of bacteria could be stained by long immersion of sections in solutions of methylene blue and washing in acidulated water. He also showed that the plant could easily be grown at room temperature, and that the cultures were quite different from any known at that time. The plant grew as a bacillus with rounded ends, was endowed with the power of motion, and apparently formed spores. Gelatine was never dissolved; the deeper parts of the shaft were beaded and slightly brown in color. The growth on potato was regarded

¹ Read before the Massachusetts Medical Society, June 9, 1891, and recommended for publication by the Society.

as a diagnostic character, the peculiarity being extensive growth as shown by the microscope, yet nothing to be seen by the naked eye except a slight shimmer or difference in texture when looked at in a favorable light.

Koch and others soon demonstrated not only that the bacillus occurred regularly in all active cases of typhoid, but also that it could not be found in those dead of other diseases. This put the subject in such a position that a few years ago one spoke of the typhoid bacillus as quite a settled matter. To-day we do not know half as much as then. The very individuality of the plant has been questioned. The difficulty has come from the discovery that a large number of bacteria exist which grow on potato just like the typhoid bacillus, and that some plants identical in all the culture characteristics given by Gaffkey are not so very rare, and occur in the stools of people with intestinal disease. As a result, the Eberth bacillus has been cultured in a great variety of ways, and subjected to a very close scrutiny, in the hope of discovering some character or group of characters by which it could be positively recognized. So far all efforts have been futile. If Babes is correct in his observations, there are a host of other bacteria, either closely allied species or varieties, which occur in man and chiefly in man with typhoid fever.

Even yet the difficulties of the case are only half related; the Eberth bacillus is a protean form, and varies much in its shape, form and manner of growth, with minute changes in its surroundings,—as temperature, degree of chemical reaction, and composition of the media. Therefore, to-day, to demonstrate that a bacillus is identical with Eberth's, it is necessary to compare it step by step, culture for culture, under precisely the same conditions with an undoubted culture, and to have derived the original supply from a case of typhoid.

The above conditions can be fulfilled in practically every case of typhoid fever which has died before the disease has passed off, and the original microscopic findings can be verified in the same way. Those conditions have never been fulfilled in a single case of other disease. We are, therefore, justified in claiming the existence of a peculiar bacillus or bacillus group in every case of typhoid. This is the ground on which the claim of the typhoid bacillus depends. It rests on the same evidence as the spirillum of relapsing fever, the plasmodium of malaria; both are always to be found in their respective diseases, never in health or other diseases. It is, therefore, clear that the typhoid bacillus and typhoid fever stand in some sort of causative relation; things which vary together, are connected causatively. From analogy and the improbability that the bacilli are the result of a secondary invasion, the bacillus is commonly accepted as the cause of the disease. No careful student claims this as proved, neither is the law of gravitation.

A few authors have attacked the integrity of the bacillus, and argued that typhoid fever is a condition, and the bacillus in reality a variety of species, as in the summer diarrhoea of infants. Others hold that the plant is simply a modification of a common denizen of the intestine. But epidemiology and clinical study point so clearly to a specific disease transmitted from case to case that I do not think these views need be entertained, at least until their supporters produce some substantial evidence.

The distribution of the plant in the body bears a close relation to the nature of the disease. First, it occurs in the substance of the swollen Peyer's patches, before these have sloughed, not simply in the mucosa, but in the round-cell aggregations. After the surface has become eroded and an ulcer is formed, the surface becomes literally coated with all sorts of bacteria, cocci, streptococci and bacilli; among the latter there is often a rather long bacillus, which Klebs at one time held to be the cause of the disease. Evidence, however, points to its being distinct from the typhoid bacillus. It only occurs on and in the surface of the erosions, not deep in the tissue. Nearly if not quite simultaneously with the appearance of the bacillus in the follicles, the lymphatics of the mesentery swell and show nests of the same bacillus. The nests contain from fifteen or twenty bacilli to hundreds, and form a mass varying in size from that of a nucleus to one very much larger. The centre is apt to appear almost homogeneous or finely granular; but the circumference clearly shows short, straight, irregular looking bacilli. The irregular appearance is due to parts of the bacilli staining less than the rest.

The spleen shows precisely the same state of affairs. According to the duration of the disease and other factors, the number of colonies vary greatly. In advanced cases, even two hundred sections may be examined before a colony is found. From this their prevalence runs up to as many as fifteen or twenty in a single section.

So far the colonies have been described as being in the tissue, between the cells, not as bearing any particular relation to the blood-vessels or other parts. To this the liver offers a contrast. Here the plant is apt to occur in the form of distinct thrombi, which have grown from minute emboli.

In the kidneys the colonies occur chiefly in the cortical portion; are often present, at times abundant, but apparently are not present with the same regularity as in the spleen.

Besides the above organs, the typhoid bacillus may be found in most any part of the body. Thus it is apt to occur in those cases of lobular pneumonia which so often complicate cases of typhoid. It has also been reported as existing in the meninges in cases of complicating meningitis, and in abscesses in such different parts of the body as the parotid glands and the tibiae. At times the bacillus is found alone, but mostly in company with some accepted pus-producing bacterium.

Numerous examinations of the blood in all stages of the disease have been made, and observers have reported positive results, especially from material procured by opening a rose spot. Others have failed. That the plant can occur in the blood, the emboli in the liver demonstrate; nevertheless, none of the observations are above question; many simply depend on the microscope and are absolutely worthless; others are supported by cultures, but in no cases have these been carried to that degree of fineness and accuracy necessary to establish, even a probable diagnosis. Examination of the blood in doubtful cases for purposes of diagnosis is therefore a failure, and until our knowledge is greatly improved must remain so. Provided the typhoid bacillus was found, its positive recognition would require so much time that the practitioner would take but little interest in the result.

All the above remarks apply to the search for the bacillus in typhoid stools; it may be there or it may

not. Many claim to have found it, many have failed. The difficulties are enhanced by the enormous number of bacteria in faeces, and the occurrence of many typhoid-like bacteria in the intestines of typhoid patients. All sorts of ready methods of isolation have been recommended, but none have stood the test of time. The only feasible method is to make plate cultures from the stools and then search for the desired colonies. These have nothing characteristic about them, are variable, so that in searching for the typhoid bacillus plates of pure cultures of the typhoid plants must be made to serve as a control and comparison in each case. Even then the amount of error is large. Lately word has come that a regal road to the typhoid bacillus was found. All that is necessary is to use agar and put the plates in the thermostat and presto! the next day, thanks to the warmth, the typhoid (pathogenic) bacteria have developed finely, while the others, not liking heat, are retarded in development. Beautiful, but mistaken. All or nearly all the germs in the intestines thrive better at 98° than at 68°. There is nothing new about the method except the theory; by it we hasten development, and avoid liquefaction: on the other hand we lose the signs of the only absolute fixed character, non-liquefaction of gelatine, and run a considerable risk of killing the plants we want to study.

Considerable attention has been paid to the urine in cases of typhoid, and the weight of evidence seems to indicate that the bacillus is quite liable to appear in the urine when it contains albumen, that is, quite early in the course of the disease. As yet, however, the universal doubt which hangs over most everything relating to the typhoid bacillus weighs heavily. More evidence and closer work is needed before positive statements are justified. Reasoning from analogy, and the presence of the bacillus in the kidneys, their occurrence in the urine seems most probable.

The only other method of utilizing the bacillus for diagnostic purposes is that of tapping the spleen. This has been done on several occasions and the method is spoken of as a success. Probably none of us, however, would be willing to have our own spleens tapped for the sake of a diagnosis.

So far only the distribution of the bacillus in the body has been considered. There yet remain the relations of the plant to the cell changes and the result of animal inoculation. As to the latter the weight of evidence is that the plant is not pathogenic in any of our experiment animals, certainly is not capable of producing any disease similar to typhoid fever. The inoculation of large amounts kill a certain proportion of the smaller experiment animals, but this is evidently the result of various poisonous principles introduced, and not due to the multiplication of the bacillus in the body.

In man there are certain focal or localized cell changes, over and above the diffuse changes which are more or less characteristic of the disease. Thus we have certain small round-cell accumulations in the parenchyma of the various organs,—the so-called typhoid lymphomata, and also certain other patches characterized by the loss of the staining qualities of the cells, their partial atrophy and the splitting up of the nuclei into two or more strongly staining bodies. The final result is an almost homogeneous mass, in which close study may reveal the ghosts of the cells, through which are interspersed a number of deeply stained

highly refractive small bodies, the remains of the nuclei and some connective tissue cells. These two processes, though presenting similar optical appearances, and until recently grouped together, are in reality distinct. The first is a demonstration of life, the other of death. The same or a similar process is to be recognized in various parasitic diseases. At the present time no direct or rather topographical relation has been made out between either processes and the colonies of the typhoid bacillus. The tissue directly surrounding a colony may appear precisely like the body of the organ, or it may be altered in either of the above ways.

Again, either alteration may take place without any recognizable bacilli, so that allowing the pathogenic qualities of the plant we must attribute these changes to the general state of the body, as secondary manifestations rather than primary.

Wherever the bacillus is found it is not in the cells but between them. This shows very clearly about the borders of the colonies; at times a cell can be recognized in the thick of the bacteria. What becomes of the cells which occupied the places of the colonies I do not know; they must be either pushed to one side, digested, or simply obscured—very likely all three.

If the reported cases of the detection of the typhoid bacillus in stools and urine are correct—probably some are and some are not—we have an ocular demonstration of their mode of dispersion preparatory to reinfection. In my own mind there is no doubt but that the germ escapes from the body in one of, or both, these ways. With this point in mind, much work has been done calculated to show how long the typhoid bacillus can exist in dejecta, the ground, and water. Most experimenters have concluded that the time was rather short, the typhoid plant being crowded out by the other germs. This sort of work, however, is not productive of much good; our experiments will never equal those of nature. The answer to this problem is best found by a study of the numerous local epidemics of typhoid where the source is known, not in the bacteriological laboratory. Though no spore is produced, the time will be found quite long,—longer than might be expected of a plant which apparently is incapable of a prolonged independent existence.

What we want to know is how to sterilize the dejecta. The urine is easily cared for. A moderate amount of carbolic acid and time will do it. It is my custom in all cases of parasitic disease to have some antiseptic as carbolic acid always kept in the receptacle for the urine. When dissolved, corrosive sublimate is very effective, but where much albumen is present I have been afraid to rely upon it. The stools are not so easily dealt with; corrosive is not at all reliable. Carbolic acid in strong solution, so as to produce a three per cent. solution when intimately mixed with the dejecta, is safe. Just pouring some carbolic on and poking the mass with a stick will not suffice. Faeces are very difficult to sterilize. Some simple sort of oven or stove in which dejecta could be dried and burned is a great desideratum. Our large cities are supposed to see that the sewer waste is not dangerous; in smaller places out-door space for such an apparatus is most always at hand.

A word as to the examination of drinking-water. The epidemiologist attributed a prominent rôle in the spread of typhoid to water contaminated with dejecta long before the bacillus was found. Time has only strengthened this position. Of course, therefore,

many searches have been made for the bacillus in water—and what could be more natural than to find it? Yet Koch recently said that all reported discoveries of the typhoid bacillus in water must be accepted with reserve. It may have been found, but as yet the requisites of a demonstration have not been produced. Very much the same may be said of milk. Outbreaks of typhoid are occasionally apparently due to the consumption of milk contaminated with infected water.

In closing we have good reason to believe that Eberth's bacillus is a species and the cause of typhoid fever; that it escapes with the dejecta and after spending a variable amount of time at large is liable to gain entrance to another individual and reproduce the disease. Lastly that a large number of unjustified conclusions as to the finding of the bacillus in nature have been given to the profession under the guise of bacteriology. Some of the records may be correct, none are beyond doubt, and few are really worthy of consideration.

MENTAL DISTURBANCES OF INFLUENZA.¹

BY J. B. AYER, M.D., OF BOSTON.

INFLUENZA, in my experience, became epidemic December 20, 1889, though I feel that I saw one case of influenza-pneumonia which was fatal, November 9, 1889.

At the end of seven weeks fewer patients were seen, but sporadic cases of influenza continued to appear throughout the year and up to midwinter, when the presence of the epidemic again became very marked, and has continued till the present time.

During the last four months of this "relapse" the *pandemic character* of the previous year was absent, the disease this time seeking out one neighborhood after another and exhausting its force more leisurely.

Dr. Rush's description of influenza as it appeared in Philadelphia in the autumn of 1789 (lasting six weeks), relapsing in April, 1790 (remaining till the early part of June), and ending with a mild relapse the following winter, is of value and of great interest now, as the epidemic which occurred just one century ago resembled ours with this exception, that the *nervous and mental symptoms did not have the prominence in the affection which they hold to-day*.

Probably, however, some recent authorities have overrated the importance of these symptoms. It does not seem to me possible to prove the claim that the disease is *essentially* an epidemic *Nervenkrankung*, observation showing that the influenza-germ seeks out the weak part of the human system, and that to-day the nervous system is obliged to bear the brunt of the attack more than it did a century ago, for the same reason that so many diseases have in that time tended to assume an asthenic, nervous type.

Dr. Clouston, in summing up an investigation of 140 cases of influenza among patients and attendants at the Royal Asylum, Morningside, concludes that "any sharp division of the symptom is artificial, and by no means accurate."

He found the patients complained as follows:

With Neuro-Muscular symptoms	. . . 97.1 per cent.
With Respiratory symptoms	. . . 77.1 per cent.
With Alimentary symptoms	. . . 55.7 per cent.

¹ Abstract of a paper read before the Medico-Psychological Society, May 21, 1891.

I found this table very similar in results to an analysis made at the Home for Aged Colored Women in this city.

The 21 inmates (aged from sixty-one to ninety-three years), including the matron, escaped (with two exceptions) last year's epidemic, but were attacked this year—one on February 22d, the others between March 7th and 20th.

Thirteen inmates were severely attacked (one died).
Five inmates were moderately ill.
Three inmates were not confined to the bed.

The prominent symptoms, expressed concisely and in order of importance, were those of

Depression (6):	
Depression (feared insanity)	 1
Depression and irritability of temper	 1
Depression and cephalalgia	 4
Pain (4):	
Cephalalgia	 1
Cephalalgia and cough	 1
Cephalalgia and "grip-like" pain in chest,	 1
Pleurodynia and prostration	 1
Cough (4):	
Cough	 2
Cough and depression of spirits	 1
Cough, weakness and pleurodynia	 1
Vomiting and gastralgia	 1
"Dizzy head" and gastralgia	 1
Prostration and depression	 1
Prostration connected with pneumonia or pleurisy	 4

In two cases of partial dementia there was no increase of brain disturbance. One case died from pneumonia and co-existing phthisis.

Two months have elapsed, but, as yet, only two of the inmates are in as good general condition as before the attack. A diabetic patient, who has been growing infirm for many months, a fortnight after the disappearance of marked symptoms of influenza developed choreiform movements of left side, principally confined to left arm: symptoms now disappearing.²

I was forcibly struck with the fact that a large proportion (6 out of 21) of these patients remembered most vividly, and with the greatest dread, the symptom of mental depression in connection with their attack. Adding to this number those who complained principally of pain and prostration, we find that with many patients the nervous system bears the brunt of an attack of epidemic influenza.

I have seen several cases this season in practice, many more than last year, illustrating different degrees of mental disturbance in influenza, and I will refer to them briefly.

Insanity requiring Hospital Treatment.—I have met with one case of transitory mania where recovery occurred in four weeks. This was the third attack, but recovery was more rapid and satisfactory than before. The mental symptoms appeared early in the course of well-marked influenza, and were prominent on the seventh day. Influenza began suddenly at the supper-table with sharp pleurodynia.

Most hospital cases of influenza-insanity have the melancholic-hypochondriacal form, with favorable prognosis. The duration is often unusually short—even for post-febrile insanity.

Psychoses not requiring Hospital Care.—I attended a young lady who showed decided mental instability for twelve days, in connection with an influenza relapse where cephalalgia and fever were the prominent symp-

² At the end of a few weeks the left-sided choreiform movements, which had subsided, again became marked and still continue. They are of organic cerebral origin undoubtedly.