disappears, the cell-count, from being very high, becomes markedly reduced to nearly normal, and the Wassermann reaction usually becomes negative in the cerebro-spinal fluid and may also become negative in the serum.

As a consequence of the discovery of these new reactions and signs we have attained to an accuracy in the diagnosis of general paralysis unapproached in the past, and not excelled in the case of any other disease as important. There are few departments of clinical medicine in which, during the last ten years, more valuable additions to our knowledge have been made.

Vaccine Treatment in Asylums. By W. FORD ROBERTSON, M.D., Pathologist to the Scottish Asylums.

THE treatment of bacterial diseases by means of specific vaccines is a branch of therapeutics that has been steadily growing in importance in recent years. It is now being applied to every bacterial infective malady, from acne to acute septicæmia. Nevertheless, it is admittedly only at an early stage in its development. Every worker at the subject is still endeavouring by observation and experiment to improve its methods, to understand better its mode of operation, and to determine the extent of its useful application. It has already had brilliant triumphs, although, in common with other forms of medical treatment, it has to admit many failures. While it is now being extensively employed both in general and in hospital practice, it has not yet been utilised in our asylums as it deserves to be. The chief purpose of this paper is to endeavour to show some of the useful applications vaccine therapy may have in such institutions, and to encourage its employment.

It must be admitted that as a direct means of combating the known causes of insanity vaccine therapy has as yet a very limited utility. Its present importance in relation to the inmates of asylums lies mainly in the fact that these patients, in common with others, not infrequently suffer from chronic bacterial infections of a kind now being successfully treated by means of vaccines. At the same time, I think experience has already proved that in asylum cases the successful treatment of these maladies of bacterial origin by vaccine methods often

results in surprising amelioration of the patient's mental condition. The time has certainly come when asylum physicians should be making and comparing observations. I am well aware that a number have already been made. The subject is not polemical, but one in regard to which we may all benefit by hearing of the experience of others.

The first requisite in specific vaccine treatment is an accurate bacteriological diagnosis. This requires on the part of the worker a thorough knowledge of practical bacteriology, and much experience in the investigation of cases. To arrive at a correct bacteriological diagnosis is in some instances a comparatively easy matter, as, for example, when the case is one of boils from which a pure growth of the *Staphylococcus pyogenes aureus* happens to be obtained. Other cases present special difficulties, and it may be necessary to apply delicate laboratory tests to the patient's blood before evidence can be obtained that justifies therapeutic immunisation against a particular bacterium that has been isolated. Having arrived at a satisfactory bacteriological diagnosis, and having determined that the patient is a suitable subject for vaccine treatment, we have next to prepare the vaccine. In some instance we can resort to the use of stock vaccines, of which there are now several makers. It is, however, very clearly proved that vaccines prepared from the micro-organisms isolated from the patient, or autogenous vaccines, are more effective. In many instances the preparation of an autogenous vaccine is essential, as stock vaccines of the required kind are not obtainable.

Various ways of preparing vaccines have been recommended, differing chiefly with regard to the method of estimating the dose and the means used to secure sterilisation of the cultures. Until lately it was the almost universal custom to estimate the dose in millions of bacteria contained in the vaccine emulsion. Gravimetric methods are, however, now being advocated by several workers. They certainly present great advantages and I would strongly advise their adoption. I shall describe the gravimetric method I have used for more than a year, as well as other details of technique I have worked out, which differ from those commonly employed.

Any form of culture may be used, but I always endeavour to grow the bacteria either on human blood agar, prepared by Allen's method, or in a lactose broth containing human blood-

serum. The blood-serum should, if possible, be that of the patient, but it is rarely practicable to obtain it. After incubation for a sufficient time the culture is centrifuged for ten minutes, or for as long as may be required to throw all of the solid particles to the bottom of the glass tube. The clear fluid is then thrown away, and the tube is allowed to drain for a few minutes over a piece of filter-paper that has been sterilised by heat. The glass tube containing the bacterial deposit is next loosely covered with a sterilised paper cap, and placed in the ordinary bacteriological incubator. On the following morning, when the deposit is dry, the tube is placed on the pan of a chemical balance, and exactly counterpoised with sand. The tube is then removed, and 2 c.c. of ½ or 1 *per cent.* carbolic acid in normal salt solution are poured into it. By means of a sterile glass rod with rounded end the deposit is ground up until a fine emulsion is formed. This emulsion is next poured into a sterilised test-tube, which must have a cotton-wool plug. The centrifuge tube is then carefully dried, either over the flame of a Bunsen burner or, better, over a hot metal plate ; it must not be washed out or cleaned in any way. When the tube is perfectly dry it is again placed in the pan of the chemical balance, to which milligramme weights are added until the indicator rests at zero. The number of milligrammes required gives the weight of solid vaccine contained in the emulsion. The figure is at once written on a label affixed to the test-tube. The emulsion contained in this is now diluted to a convenient strength with carbolic acid solution. Thus, if a streptococcus vaccine is being prepared, and the weight has been found to be 20 mg., 8 c.c. of carbolic acid solution should be added, giving an emulsion of the strength 1 c.c. = 2 mg. The emulsion is now put aside for 24 hours, and then tested for sterility. When found to be sterile the strong emulsion is diluted with ¼ *per cent.* carbolic acid in normal salt solution to the exact strength required. Thus, in the example given, two successive 1 in 10 dilutions will give a vaccine of the strength 1 c.c. = ·02 mg., which represents the maximum dose of a vaccine of this kind. In other instances suitable dilutions must be calculated out and made according to the requirements of the case. It is a good rule to have the maximum dose of the solid vaccine contained in 1 c.c. of emulsion. The first emulsion

should be made of a strength exactly 100, or ten times greater than that of the required vaccine. The process of dilution is thus rendered uniform and simple. The vaccine is next decanted into special tubes. These are ordinary specimen tubes of capacity of from 1·5 to 2 c.c. They must be carefully cleaned and sterilised. The most convenient plan is to place the clean specimen-tubes, with open ends down, in large test-tubes of the size "1 × 6," which will generally hold three tiers of them, or from 12 to 15. These large tubes, filled with the small specimen-tubes, are plugged with cotton-wool, and placed in the dry steriliser for three quarters of an hour, at a temperature of 150° C. Supplies of specimen-tubes thus prepared are kept ready for use. A porcelain dish of about 50 c.c. capacity is half filled with hard paraffin and placed in the ring of a retort stand. By means of a Bunsen flame the paraffin is heated until vapours rise. It has then a temperature of from 110° to 120° C. Care must be taken not to allow the temperature to rise very much higher, as a point is soon reached at which the paraffin may take fire. There is also required a small block of wood in which there have been bored a row of twelve shallow holes that will admit and hold the lower ends of the test-tubes. A number of corks of suitable size are placed in the smoking paraffin in order to render them sterile. Twelve sterilised specimen-tubes are carefully removed from the large test-tubes in which they are stored, and without their open ends being handled, are placed, open end up, in the holes in the block of wood. A little more than 1 c.c. of the vaccine is then decanted into each tube. With a pair of small forceps, previously sterilised in the Bunsen flame, a cork is taken from the paraffin, and, after the adherent drop has been shaken from it, inserted firmly into the mouth of one of the tubes. This process is continued until all of the tubes are corked. The stoppered end of each tube is then dipped momentarily in the hot paraffin. The set of vaccines is packed in cotton-wool in a suitable box. On the label should be written the direction, "Shake the tube immediately before opening it," the name of the patient, the number of tubes contained in the set, the nature of the vaccine, its strength, and the range of doses. A scale of doses should also be written out. For example, in the case of a streptococcus vaccine of the strength of 1 c.c. = ·02 mg., this might be, arranged in

https://doi.org/10.1192/bjp.60.248.17 Published online by Cambridge University Press

column,—·2 c.c. = ·004 mg., ·4 c.c. = ·008 mg., ·5 c.c. = ·01 mg., ·6 c.c. = ·012 mg., ·8 c.c. = ·016 mg., 1 c.c. = ·02 mg. The person who administers the vaccine, who is rarely the one who has prepared it, then has clearly before him the exact necessary data as to the amount of fluid that must be injected in order to give a particular weight of vaccine. I think it is also a good plan to leave a space on the label for a record of the doses given. The tube containing the strong vaccine emulsion should be sealed with paraffin, carefully labelled and stored, in case more vaccines are required. I would add one hint with regard to the technique of injection. I have found a 5 *per cent.* solution of carbolic acid in equal parts of alcohol and ether a very convenient antiseptic for the sterilisation both of the skin and of the syringe. It is rapid in its action, and produces a distinct degree of local anæsthesia. A small amount of the vaccine emulsion serves to wash the antiseptic out of the syringe before the requisite dose is drawn into it.

The range of suitable doses of vaccines prepared from the most commonly occurring pathogenic bacteria, has now been fairly well determined. It is best to begin with a small dose, and, if necessary, gradually to increase it. The first three or four injections should produce a distinct focal reaction, that is to say, signs of an active congestion at the seat of the infection from twelve to twenty-four hours after the vaccine has been given. To this rule there are, however, important exceptions. The degree of malaise produced and the amount of temperature disturbance, both of which should be very slight and transient, are also important guides to dosage. It is now generally considered unnecessary to control the injections by determination of changes in the opsonic index. It is well that it is so, for otherwise vaccine therapy would be much restricted in its usefulness. Some of its greatest triumphs have been obtained by observers who were far too busy to carry out a method that entails so large an expenditure of time.

Vaccine Doses of Common Pathogenic Organisms.

Streptococci Pneumococci	·002 mg. to ·02 mg.
Staphylococci Coli-typhoid group *B. influenzæ*	·005 mg. to ·05 mg.

https://doi.org/10.1192/bjp.60.248.17 Published online by Cambridge University Press

M. catarrhalis *B. septus* *M. paratetragenus* *Diplococcus crassus* Diphtheroid bacilli	·02 to ·2 mg.

The bacteriologist naturally prefers to group the maladies in which vaccine treatment is applicable from his own point of view, which is that of the infection. It will, however, be more convenient, I think, to deal with the matter here from the standpoint of the clinician. I shall attempt only the merest summary which has no pretensions to being exhaustive.

Diseases of the integumentary system offer a large field for vaccine treatment. Boils, carbuncles, acne, sycosis, impetigo, chronic ulcers, eczema, scleroderma, and erysipelas are among the maladies that have been attacked by its means. Infections by staphylococci and streptococci are chiefly responsible for the conditions named. Among these organisms are included many distinct species, which can now be differentiated by tests. Acne is believed to be dependent upon the action of two organisms, the *Bacillus acnes* and a staphylococcus. On account of the special difficulty there is in isolating the bacillus it is probably best to use a stock vaccine of this organism and to prepare an autogenous staphylococcus vaccine.

Diseases of the respiratory system present a still wider field for the application of vaccine methods of treatment. There first arises here the question of the use of tuberculin and its modifications in cases of pulmonary phthisis. It is remarkable how much difference of opinion still exists regarding this matter. At the present day tuberculin has both its enthusiastic advocates and its convinced opponents. I have no experience of my own from which to form a judgment, but some of the facts and arguments that have lately been adduced seem to me to inculcate the necessity for great caution in the use of this remedy, as, for example, those so clearly stated by Dr. R. W. Allen in a recent paper(1). On the other hand, there can be little doubt as to the value of treating by vaccine methods the secondary infections that are almost constantly associated with pulmonary phthisis. It is to Dr. Allen (2) that we are chiefly indebted for our knowledge of this matter. He has thoroughly investigated these secondary or "mixed" infections, as he prefers to call them, of the respiratory tract, and given much excellent guidance

for their specific vaccine treatment. Streptococci, pneumococci, *Micrococcus catarrhalis*, the bacillus of influenza, and *Micrococcus paratetragenus* are the most common infecting agents that occur in association with the tubercle bacillus, but there are also numerous others. A thorough bacteriological examination is necessary in each case, and mixed vaccines are generally required.

The common cold in its several forms is a condition that is eminently suitable for vaccine treatment. As Allen and others have shown, the chief infecting agents are five or six in number, namely, *Micrococcus catarrhalis*, *Bacillus septus*, *Micrococcus paratetragenus*, the bacillus of Friedländer, and the pneumococcus. To these we may add the bacillus of influenza, if the manifestations of its attack are to be included in this category. Streptococci are also important, but it is doubtful if they can be regarded as primary agents in the causation of epidemic respiratory catarrhs. In this class of infections vaccine treatment should be commenced as early as possible, with the object of cutting short the attack. Many practitioners are now using a mixed stock vaccine, prepared from cultures of four or five of the species I have named, and the results appear in most cases to be fairly good. The type of infection can generally be determined in a few minutes by the examination of a suitably stained film of the nasal mucus, or of the sputum, and a better plan is to make such an examination and to treat the case with polyvalent stock vaccines of what appear to be the causal organisms.

Chronic bronchitis and asthma have also been found in many instances to yield to autogenous vaccines. Streptococci, pneumococci and *Micrococcus catarrhalis* are the chief offenders. Even acute pneumonias are now being treated by similar methods. The causal organism may be the pneumococcus, Friedländer's bacillus, the bacillus of influenza, or a streptococcus.

Infective diseases of the genito-urinary tract present another important field for vaccine work. There is, for example, cystitis in its acute and chronic forms. In these a colon bacillus is the most common infecting agent, and as it may belong to one or other of several distinct species, an autogenous vaccine is required. Chronic infections of the urinary tract by coliform organisms can rarely be eradicated, but, nevertheless, great benefit results from persistent vaccine treatment. A

suitable dose of autogenous vaccine should be given every ten days. Among other infections of this region, those by the gonococcus, the Gram-positive diplococci, and diphtheroid bacilli all lend themselves to vaccine treatment. Post-partum and post-abortive infections of the uterus have also been successfully treated by autogenous vaccines. These have special importance for us because of their occasional association with puerperal insanity.

Diseases of the alimentary system likewise present many opportunities for successful vaccine treatment. The very common morbid condition generally referred to as *pyorrhœa alveolaris*, which entails chronic bacterial poisoning, and which may, therefore, be a cause of various forms of serious ill-health, can at least be benefited by autogenous vaccines, although other measures are almost always necessary in order to eradicate the mischief. The bacterial flora of the ulcerated alveolar margins is usually very complex. As a rule streptococci predominate, and autogenous streptococcus vaccines seem in general to be the most beneficial. Among other organisms to which importance is attached are the pneumococcus and *Micrococcus catarrhalis*. Mixed autogenous vaccines are often required. It may be observed here that many cases of chronic rheumatism are greatly benefited by autogenous streptococcus vaccines when *pyorrhœa alveolaris* is present.

Chronic bacterial infections of the alimentary tract, though certainly very common, are extremely difficult to investigate. In some instances the infecting organism can be isolated from the urine, having passed through the blood-stream and been excreted by the kidneys. There are good grounds for believing that this is the source of some of the diphtheroid organisms that occasionally appear in small numbers in otherwise normal urine. Any bacterium which there are good grounds for believing has thus passed through the blood-stream must be exercising a pathogenic action, and the use of a vaccine prepared from it is fully justified. More information might, I think, be obtained from systematic bacteriological investigation of the stools. A distinct abnormality of the flora, in conjunction with certain clinical symptoms, may occasionally justify special vaccine treatment.

Lastly, I come to the subject of the treatment of *diseases of the nervous system* by means of specific vaccines. In the present

https://doi.org/10.1192/bjp.60.248.17 Published online by Cambridge University Press

position of knowledge the number of morbid conditions belonging to this category that are capable of being so treated is somewhat limited. They include cerebro-spinal meningitis, some cases of toxic neuritis which have been found to yield to autogenous streptococcus vaccines when there was an accompanying condition of severe pyorrhœa alveolaris, and cases of puerperal insanity in which there is uterine infection by pyogenic organisms. This brief list, however, by no means exhausts the subject. We have in some cases to anticipate and prevent bacterial infections and intoxications of the central nervous system. For example, chronic otitis media always threatens the brain and too often terminates by spread of the infection to the meninges. There is, in such cases, therefore, an important place for autogenous vaccine treatment. Much can certainly be done by such means to control the local infection.

Certain infections of the genito-urinary tract have a very similar relation to diseases of the spinal cord. It has been proved that such infections may spread to the spinal lymphatic system, and that bacterial toxins absorbed from the genito-urinary tract may specially injure the cord. Nevertheless, owing to the almost universal prejudice that leads to the uncritical acceptance of syphilis as the exclusive cause of tabes and general paralysis, in spite of the incompleteness of the evidence, such infections and intoxications are still almost entirely neglected in their relation to chronic diseases of the nervous system. The very existence of their most important forms is generally denied or ignored. I refer especially to the diphtheroid infections that occur so constantly in the genito-urinary tract in cases of tabes and general paralysis, until secondary infections by coliform bacilli or Gram-negative diplococci have displaced the original flora. The organisms in question cannot be included in any of the classifications of diphtheroid bacilli that satisfy eminent authorities at the present day. They differ essentially from *Bacillus xerosis*, *Bacillus Hoffmannii*, and the diphtheria bacillus, as these are usually described. They form a group by themselves, and I have no hesitation in affirming that it is a group as important in pathology as that of the streptococci, the staphylococci, the coliform bacilli, or the Gram-negative diplococci. Like these organisms they are quite common, and like them may occur as harmless saprophytes, or as the agents of fatal infections.

There are probably numerous species, but their identification is at present beset with insuperable obstacles because of their extraordinary polymorphism and variability and the difficulty that there is in growing some of the strains even upon blood media. They have been found in great numbers in the genito-urinary tract under conditions which proved that they were exercising a pathogenic action, not only in general paralysis and tabes, but in exophthalmic goitre, manic-depressive insanity, severe neurasthenia, endometritis, intractable sciatica, and other maladies, and their causal relationship to the illness has been borne out by the success of vaccine treatment in every example I have given, with the exception of general paralysis. The value of such vaccine treatment in early cases of tabes has been proved again and again. It can certainly do what previous anti-syphilitic treatment has failed to accomplish. I am not arguing against the importance of syphilis in general paralysis and tabes, but only against the prejudice that has led to the universal acceptance of syphilis as the sole cause of these diseases, and to the general neglect of the infections to which I refer. It ought to be recognised that there must be other essential factors that are not yet fully understood. Some recent observations tend strongly to support the opinion that these other factors consist in the occurrence of certain bacterial infections at mucous surfaces, which influence the character of the syphilitic malady and determine the occurrence of the paralytic process. Evidence of this kind has recently been brought forward in France, and I have myself observed many otherwise puzzling facts that would be explained by such a relationship. If this view of the part played by bacterial infections in the ætiology of general paralysis and tabes is borne out by future research, then these diseases must be attacked by combined anti-syphilitic and bacterial vaccine treatment. In this connection the almost constant occurrence of diphtheroid organisms of the special kind to which I have alluded in chronic intractable syphilitic ulcers and sinuses is of considerable significance. The bacillary products would appear to be exercising some stimulating or protecting influence upon the spirochætes. Fleet-surgeon Kilroy([3]) has described some lesions of this kind which failed to yield to salvarsan or mercury, but which were speedily cured by subsequent autogenous vaccine treatment. Such results, taken in conjunction

with other well-established facts, seem to me to warrant the trial of a similar combined treatment in general paralysis and tabes.

Dementia præcox with its multiplicity of bacterial infections might be thought to offer a splendid field for vaccine therapeutics. I have tried various autogenous vaccines without the slightest effect upon the course of the malady.

Acute toxic insanities should form an important field for successful vaccine treatment, but the matter still requires investigation. At present puerperal insanity is the chief member of the group that lends itself to such a therapeutic measure.

Cases of manic-depressive insanity are also open for investigation with the object of ascertaining if any infective conditions exist that can be treated by vaccines. From evidence already obtained, I believe that the occurrence of some such infection can be demonstrated in a large proportion of cases. In people with special hereditary predisposition common bacterial infections may serve to disturb the metabolism of the cortical nerve-cells, and therefore vaccine treatment of such infections in manic-depressive cases will generally be well worth undertaking. Apart altogether from cases of insanity, experience has shown that the ætiology of many different forms of obscure illness can be cleared up by a systematic bacteriological investigation. It is very probable that the application of similar methods of investigation to some cases of insanity of obscure ætiology would elicit the fact of a chronic bacterial infection that might be successfully treated by vaccines.

I have, I think, touched upon the main facts that are of moment to those who contemplate the use of vaccines in asylum practice. I maintain that vaccine therapy has now reached a position so secure in its scientific foundations, accurate in its methods, and successful in its results, that it should be systematically employed in our mental hospitals in all cases in which it is applicable.

(1) "Some Thoughts on Tuberculin and Tuberculin Therapy," *Journal of Vaccine Therapy*, August, 1913.—(2) *Journal of Vaccine Therapy*, 1912–13.—(3) *Ibid.*, June, 1913.

DISCUSSION,

At the meeting of the Scottish Division in Edinburgh, October 21st, 1913.

Dr. BRUCE said that he had employed vaccines in the general treatment of his patients at Murthly for several years. His method of preparing the vaccines was, however, different to that described; in his own case he standardised the vaccines

by their opacity. He did not think that assistant medical officers should be told to take up vaccine therapy without being warned of the dangers of such methods of treatment: some very unfortunate results had come to his knowledge through the use of vaccines by ignorant or incompetent persons. Vaccines properly prepared and properly used were, in his opinion, very valuable adjuncts to general treatment in asylums. He had found vaccines useful in chronic boils, impetigo contagiosum, chronic nasal catarrh, cystitis, particularly the cystitis which was met with in the depressed stage of *folie-circulaire*, conjunctivitis with blepharitis and chronic sinuses. It was a noticeable feature that patients treated by vaccines gained weight, and he thought that much benefit accrued to certain cases of insanity as the result of any subcutaneous injection, but this stimulation of nutrition was not in any sense a specific action, as similar results were obtained by the injection of sterile distilled water. He thought Dr. Ford Robertson's paper an excellent one, and the idea which prompted it still more excellent, as it added greatly to the interest of work in asylums if some such study as vaccine therapy was seriously taken up by the staff.

Dr. CHALMERS WATSON, called on by the Chairman, remarked that he had listened with great pleasure and profit to Dr. Ford Robertson's paper. He had come to listen and learn, rather than to take part in the discussion. He had little experience of vaccine therapy in connection with mental diseases, but from a fairly extensive experience of vaccine therapy in general medicine he was a confirmed believer in its value as a therapeutic agent. He had found, more especially in some chronic forms of respiratory trouble, particularly asthma and bronchiectasis, striking and unmistakable good results brought about by vaccine therapy. Further, in quite a number of cases of rheumatoid arthritis in which a pathogenic organism was obtained from the urine, or from a latent focus of septic mischief, he had obtained very striking and successful results. He was in cordial agreement with Dr. Bruce in entering a word of caution against the indiscriminate use of vaccines; undoubtedly such use had brought vaccine therapy into some disrepute. This indiscriminate use largely applied to the use of stock vaccines. He practically never used stock vaccines; unless the case under investigation yielded from the urine or other secretions organisms which were probably pathogenic, he did not regard a case as suitable for vaccine treatment. The interest of the public in this subject was now a factor to be reckoned with. Only recently he had been consulted by an English lady suffering from a chronic illness, who had experienced four courses of vaccine treatment. This lady had a remarkable general knowledge of bacteria. The vaccines which had been used in her case included staphylococci, streptococci, and pneumococci, and she talked glibly of the numbers of millions of the different organisms used in the treatment. From her experience of the various vaccines, she had arrived at the conclusion that the injection of "staphylos" and "streptos" had been beneficial, but the addition of the "pneumos" (note the tone of familiarity) had been prejudicial to her. In this, as a matter of fact, she was probably right. In this case vaccination had failed, largely because vaccine therapy had been used as the only method of treatment, no attention being directed to other simple methods of treatment which a careful examination of the case showed to be called for. Vaccine therapy was to be regarded not so much as a specific form of treatment as complementary to other methods. It was, in his opinion, a mistake to regard vaccine therapy as something apart from other methods in the hands of the physician. Most general diseases were the result of a general toxæmia or bacterial infection, and there was a constant struggle taking place between the offending organisms and the patient's blood and tissues. In a large number of cases this toxæmia or infection could be overcome by means which either reduced the pathogenic power of the bacteria at their source, or raised the resisting power of the blood and the various glands which were specially concerned in resistance to infection, and it was only in cases where success could not be obtained in one or other of these directions that it was essential to have recourse to the more specific form of treatment, the use of autogenous vaccines. It could not be too clearly emphasised that in these cases—whether a vaccine was used or not—it was Nature that brought about the cure, the vaccine being merely a more specialised form of stimulating Nature to overcome the toxæmia or infection. There were two further points of general interest that occurred to him in connection with Dr. Robertson's paper. One was the importance, in the speaker's view,

of a chronic auto-intoxication or infection as a primary cause of mental disorders. He had been much impressed by some cases of mental disorder in which the examination of the patient showed clear evidence of physical disorder, such as a dilated condition of the stomach and cæcum, often associated with bacteriuria which had previously been unsuspected, and there was no doubt in his mind that in the cases in question these physical disorders had *preceded* the development of the mental symptoms. Dr. Robertson had referred to the frequency of intestinal infection. The speaker was in entire agreement with this view. There were many cases of bacteriuria in which the bacillary or coccal forms of organisms found in the urine undoubtedly came from the digestive tract. In dealing with these cases one had, first of all, to seek to determine whether these organisms had a causal or merely a casual relationship to the patient's disorder, and one had then to determine the presence or absence of any lesion of the digestive tract calling for medical treatment of a more general nature. In some cases of this kind he had found an associated marked dilatation of the cæcum, proptosis of the cæcum into the pelvis, and other indications of disease in the right lower quadrant of the abdomen, the correction of which by medical and sometimes by surgical means brought about recovery without recourse to vaccine therapy. Before he sat down perhaps he might be allowed to refer to one extremely interesting mental case which had been under his observation in the past year. The patient was a lady whom he had first seen in consultation with Dr. Bedford Pierce, the case being a very severe one of acute toxic insanity developing within three weeks after the birth of a child. Some idea of the severity of the case may be gauged from the fact that for several months the nursing involved the services of six nurses and a charge nurse. In the bacteriological investigation of the case they had the valuable assistance of Dr. Ford Robertson, who found diphtheroid organisms in the urine in scanty amount. The bowel was found to be loaded, and the contents showed clear evidence of chronic excessive putrefaction. The blood was in a condition of marked leucopenia, the white cells numbering 2,100 per cubic millimetre, the thyroid gland was appreciably enlarged, and there was occasional distinct exophthalmos. The conclusion arrived at from investigation of the case was that the mental disturbance was the result of an acute infection arising from the diphtheroid organisms found in the urine, the prognosis being guarded on account of the manifest lowered resistance of the patient, revealed by the condition of the blood and of the thyroid glandular system. The patient for many months subsequently was under the speaker's constant observation, daily observations being made by a skilled resident physician on the state of the blood, urine, and stools, the curves of the urine and blood being compared with the curves of sleep, excitement, etc. The recurring effects of carefully administered vaccine injection on the blood, urine, and mental symptoms were of the most striking character, and the critical consideration of the facts observed left no room for doubt as to the valuable and specific effects which vaccine injections exerted in the gradual recovery of the patient. Unfortunately the slow rate of recovery is admittedly a complicating factor in putting forward the case as an object-lesson in therapeutics. He had no hesitation, however, in saying that the severity of the bacterial infection was such that the natural recovery of the patient without the assistance of a specific vaccine was extremely improbable. After each vaccine administration there was an appreciable aggravation of all the mental symptoms, this being associated with a leucocytosis and a very remarkable increase in the discharge of bacteria in the urine; in a few days the increase in the symptoms passed off, leaving the patient invariably on a higher level than before the vaccine administration. The chairman had an opportunity of seeing this patient on one occasion forty-eight hours after the administration of the vaccine, the patient being then under the influence of the vaccine with its temporary exacerbation of the symptoms; and one had then been able as usual to foretell that in forty-eight hours subsequently the mental condition of the patient would be remarkably improved, and would not relapse to the same level as prior to the vaccine administration. It gave the speaker great pleasure to refer to the valuable nature of the work which Dr. Ford Robertson had done in calling attention to the great importance of the part played by the diphtheroid group of organisms in general infections.

Dr. FORD ROBERTSON, in reply, said he was glad that Dr. Bruce had spoken so strongly about the possible dangers of the use of vaccines. He was himself well

aware of these dangers, but they were of the very same kind as those that attended treatment by toxic drugs. Both were perfectly safe if administered intelligently by those who understood the action of the substances they were using. He strongly deprecated the use of living vaccines. He recognised with Dr. Chalmers Watson and Dr. McRae that vaccine treatment was an adjunct to other treatment. It rarely interfered with the carrying out of ordinary medical treatment. It was, however, often capable of effecting a cure after all other measures had failed. It was not sufficient to say that asthma and bronchitis could commonly be cured by drugs without vaccines. Very many cases would not yield to ordinary therapeutic measures, and it had been precisely in chronic infective conditions of this intractable nature that vaccine therapy had won some of its greatest triumphs.

The Villa or Colony System for the Care and Treatment of Cases of Mental Disease. By T. E. KNOWLES STANSFIELD.

WHEN, towards the end of August, your Secretary wrote and asked me to give you a paper to-day on villa asylums, I was just arranging to start on my holidays, and I hesitated at first to accept his invitation, as I saw little or no prospect of being able to give the time necessary for the preparation of a paper worthy of the occasion. But, on the other hand, feeling more or less the responsibilities of a parent, seeing that this institution was in a great measure the outcome of my advocacy of the villa system, I felt compelled to make a special effort and try and give you something which would at any rate form a basis for what I hope may form a useful and interesting discussion.

Patients in asylums may be roughly divided into two distinct groups, namely, those who have a prospect of recovery, forming about 10 *per cent.*, and the hopeless chronic cases who make up the remaining 90 *per cent.*

For the first group we want acute hospitals, where we can concentrate our most experienced and most skilled medical and nursing staff, and which can be so arranged that each case will receive individual study, special care, and the full benefit of all the therapeutic methods available to facilitate and expedite recovery.

The detached hospital villa system which we have had in operation at Bexley Asylum since its inception, and which affords all these facilities, has proved eminently successful in every way, and has been reproduced at Horton and Long Grove, so that those of you who have not seen the system in