then they carry no special liability to heart disease. They are not related to rheumatic fever or to its subacute form. It will be well at present to assume that they do not even predispose to rheumatism or to chorea.

SOME RECENT WORK ON ACUTE INFECTIOUS DISEASES.

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THE subject which I have chosen for this afternoon, "Some recent work on acute infectious diseases," naturally covers a very wide field, and in the time at my disposal I shall be able to discuss only a few aspects of the question, and these mainly from the clinical standpoint.

I propose therefore to deal with the following diseases which I have ranged in alphabetical order, not in the order of their importance, viz., chicken-pox, diphtheria, measles, scarlet fever and vaccinia.

CHICKEN-POX.

The causal connection between herpes zoster and varicella, which since the first communication of von Bokay, professor of children's diseases at Budapest in 1892, has formed the subject of an extensive literature, is still a matter of dispute. Is the virus of herpes zoster the same as that of varicella, as von Bokay, Le Feuvre (of Buluwayo) and Netter (of Paris) seem to think, or are zoster and varicella quite distinct diseases, as we had hitherto been accustomed to regard them?

Three varieties of the association have been described. In the first and much the

commonest, an attack of zoster in one member of a family or other community is followed within a period of three weeks—usually twelve to fourteen days, corresponding to the incubation period of varicella—by an attack of chicken-pox in another member of the community. A much rarer association of zoster and varicella is the occurrence of chicken-pox in one individual followed by the appearance of zoster in another with whom he has been in contact, of which only ten cases were collected by Netter in 1920 and twenty-one by his son in 1921. Intermediate in frequency is the group of cases of which I recently saw and published an example, consisting in the concurrence of herpes zoster and varicella in the same individual (*Brit. Journ. Child. Dis.*, 1926, xxiii, 270). In such cases the unicist school maintains that the concurrence of the two eruptions is due to dissemination of a virus which is at first localized to the posterior ganglia, whereas the dualists hold that the concurrence of the eruptions is a pure coincidence.

Until recently I was inclined to side with Comby, the principal representative of the dualists, who regard the association of the two diseases as a mere coincidence; but I must confess that my belief was somewhat rudely shaken by the following case. Some months ago I was asked to see a young woman who had had an attack of chicken-pox followed by facial paralysis, and on inquiry into the source of infection was told that her younger sister had had a few spots some weeks before. On examining the child I found the characteristic pigmented scars of chicken-pox on the trunk. I finally asked the father if he had had shingles lately, and much to my surprise and, I must confess, gratification, he at once replied in the affirmative, and showed me the typical pigmented scars of a cervical herpes zoster which had appeared about a fortnight before his little girl's eruption. The moral of this story is that one should always make an inquiry as to the occurrence of a previous

case of shingles in the family when one is called in to see a patient suffering from chicken-pox.

Varicella is very rarely a dangerous disease. I suppose my experience must be very exceptional, as, unlike Trousseau, who said that no physician had ever seen a patient die of the disease, in the course of twenty-eight years' fever hospital practice I have met with four fatal cases. Two were examples of the bullous and one of the gangrenous type, while the fourth was complicated by pneumonia in a publican aged 62, an excellent illustration of the feeble resistance offered to the mildest infection by an alcoholic subject.

An outbreak of chicken-pox is likely to be severe when it occurs in a patient whose skin is hypersensitized by a recent eruption, especially scarlet fever. A case of confluent chicken-pox with secondary fever and another of palpebral gangrene which I have recorded, both occurred in convalescents from scarlet fever.

Prophylaxis has been attempted by several clinicians with injection of convalescent serum or inoculation of the contents of the vesicles, but the results have not been attended with the brilliant success which has followed injection of convalescent serum in the prophylaxis of measles, to which I shall refer later.

DIPHTHERIA.

A study of the recent foreign literature which you will find summarized in the forthcoming *Medical Annual*, as well as in that of 1928, indicates the prevalence of a malignant type of diphtheria in various European countries, including different parts of Germany, particularly Berlin, the Rhine district and Breslau, Budapest, Padua and Barcelona. The malignancy of the Berlin cases is best illustrated by the fact that the case mortality among the diphtheria patients admitted to the Rudolf Virchow Hospital at Berlin on the first day of disease was as high as 17 per cent., and that 77 per

cent. of the fatal cases occurred during the first three days of disease. I take this opportunity of saying that among the many thousand cases of diphtheria that I have seen in the course of my career I have never met with a death or even severe paralysis in a patient who had received antitoxin within twenty-four hours of the onset.

In striking contrast with the malignant character of diphtheria prevalent in Berlin and elsewhere on the Continent is the generally benign type occurring at present in London. The mortality from the disease during 1927 in the M.A.B. hospitals was only 4.0 per cent., the lowest hitherto recorded in the history of the Board; and at my own hospital, which had the lowest death-rate for the year of all the hospitals, 3.01 per cent., while in 1928 it was lower still—2.78 per cent.

As regards symptomatology, I will first say a few words about aberrant localizations of diphtheria, of which several examples have been recorded lately. Of these the commonest and most important is diphtheria of the skin. Although diphtheria of the skin has been known for over a hundred years, for as long indeed as the disease has had its name, as it was not uncommon in the early days as the result of leeching and blistering of the neck, yet comparatively little attention had been paid to it recently until the war, when numerous cases of wound diphtheria followed by paralysis were recorded, particularly in the Egyptian Expeditionary Force. It is important to bear in mind that diphtheria of the skin is often not manifested by the appearance of a characteristic membrane, but may simulate any banal skin infection, such as herpes, eczema or pyoderma. In peace time one of the most important forms of cutaneous diphtheria is diphtheritic whitlow. An obstinate whitlow occurring on the finger of a nurse or hospital resident, that does not yield to ordinary treatment, should suggest the possibility of diphtheritic infection and should be cultivated. Such lesions heal up with gratifying rapidity after

a small dose of antitoxin. Vulvar and vaginal diphtheria is much less common than it used to be and is usually only found in association with a malignant faucial attack. A few cases have recently been reported of diphtheritic endometritis, but I have never seen an example.

A unique case of diphtheritic urethritis recently reported by Imianitoff (*Bruxelles méd.*, 1926, vi, 1575), may be quoted here as one of the curiosities of medicine.

The patient, an English student aged 24, six days after coitus per os developed inflammation of the urethral meatus. A yellowish discharge appeared on the ninth day and was mistaken for gonorrhœa. In spite of ordinary anti-gonorrhœal treatment the condition grew worse and the patient was unable to micturate until he took a hot bath, when he expelled a piece of membrane per urethram. Virulent K.L.B. were found in the discharge. Two doses of 3,000 units of antitoxin were given, and the discharge completely ceased. Subsequent inquiry showed that the patient's partner had been suffering from a sore throat which was probably diphtheritic.

Several papers have been published lately on the occurrence of diphtheria following tonsillectomy or, as it might be called surgical diphtheria. Zingher has suggested that preliminary nose and throat cultures should be taken as a routine before the removal of tonsils and adenoids. If the cultures are positive, a prophylactic dose of 1,500 units of antitoxin should be given, unless the Schick reaction is negative. Infection, however, with diphtheria bacilli and development of the disease may occur a week after tonsillectomy, in which case of course, preliminary throat cultures would be negative. The best safeguard, therefore, according to Zingher, is active immunization of all young children against diphtheria.

An unusual form of diphtheritic paralysis, of which several cases have been reported lately, is hemiplegia. Since I saw and recorded my first cases over twenty-three

years ago, I have met with about a dozen examples, and there are over a hundred recorded in the literature. They are probably mostly of embolic origin secondary to cardiac thrombosis. In view of the frequency of cardiac involvement in severe diphtheria, it is surprising that embolic manifestations of this kind as well as of occlusion of the arteries of the limbs giving rise to gangrene, of which I have published a case, are not more common.

Passing on now to the subject of prophylaxis, I may say at once that no uniformly successful method has been invented for dealing with the carrier. The most efficacious method, viz., tonsillectomy and treatment of sinus infections, is not always practicable, nor, indeed, invariably successful. The practice of insisting on one or two negative faucial and nasal cultures before discharging a patient is merely illusory, as owing to the frequent intermittency in the carrier state a false sense of security may arise from obtaining such cultures. In their recent investigation (*Proc. Roy. Soc. Med.*, 1928, xxi, Epidem. Sect., 27), McCartney and Harvey did not consider a carrier as free from bacilli until six consecutive examinations spread over a period of six weeks produced negative results. As the return case-rate in those hospitals which have abandoned the practice is no higher than in those in which it is carried out, in the absence of an obvious morbid condition of the nose and throat I have discontinued routine nose and throat swabbing before discharge since my appointment as medical superintendent three years ago, without finding that this discontinuance has been followed by a rise in the return case-rate.

At the present time there is rather a tendency to give up attempts at sterilizing the carrier in favour of protecting the individuals most susceptible to infection, viz., children and young nurses engaged in fever work by active immunization with toxin-antitoxin or similar preparations. In carrying out active immunization, which confers

a more durable immunity than passive protection with antitoxin, it has become the practice—especially in public health work in dealing with children under 6 years of age—to dispense with the preliminary Schick test, as the great majority of them are susceptible to diphtheria, and an extra prick against which the parents as well as the children are liable to kick is thus avoided. In adults, on the other hand, of whom only a minority are susceptible, especially if they are dwellers in towns where diphtheria is endemic, a preliminary Schick test should be performed.

In a large number of fever hospitals, including my own, it is now the rule to carry out active immunization of the staff on joining. It is true that attacks of diphtheria occasionally do occur in nurses whose Schick reaction is negative, either spontaneously or as the result of active immunization, this being probably due to their being exposed to massive doses of virulent infection, whereas other negative Schick persons who are exposed to only slight infection escape.

The rarity of diphtheria in Schick-negative persons and its habitually mild character when it does occur have recently been illustrated by Dr. R. A. O'Brien and his colleagues (*Lancet*, 1929, i, 149), who in the course of six years found only eighteen cases of undoubted diphtheria, all but one of which were mild, in a Schick-negative group of over 20,000 persons.

Although no fatal accidents following active immunization have taken place in this country, the local reaction and constitutional disturbance are occasionally sufficiently severe to incapacitate a nurse for one or more days. The fatal accidents to which I refer, though extraordinarily rare in comparison with the vast number of prophylactic injections given, have of late acquired an undue prominence. Most of the deaths have been due to diphtheritic toxæmia caused by injection either of diphtheria toxin in mistake for toxin-antitoxin or by a

spontaneous separation of the toxin from the antitoxin, but in one instance reported by Chinese observers streptococcal contamination was responsible, while the Bundaberg disaster, in which twelve children lost their lives, was proved to be due to staphylococcal contamination of the toxin-antitoxin mixture.

I am sometimes asked by my medical friends if it would be advisable to have their children actively immunized against diphtheria. In view of the fact that a doctor's children are or should be under constant medical supervision, and that an attack of incipient diphtheria can at once be jugulated by injection of antitoxin, I do not think that such a procedure is necessary, particularly in the cases of children in larger towns where diphtheria is endemic, and as Dudley in this country and Lereboullet and Joannon in Paris have shown, a process of spontaneous occult immunization is constantly taking place. I may add that though I have of course vaccinated my own children against smallpox, in which there is no treatment, however early it is applied, that will invariably modify the course of the disease, I have not immunized them against diphtheria, and have little doubt that after three years' residence in the grounds of a fever hospital they have become mithridatised against diphtheria and probably the toxins of other acute infections as well.

Bacteriology, as Mark Pattison said of religion, is a good servant but a bad mistress, and although it is one of the first principles of the treatment of diphtheria to be guided by the clinical appearances rather than the results of the culture, I still too often see children who have been treated at home for septic tonsillitis owing to a single negative swab, sent to hospital only to die when the clinical signs of diphtheria become too glaringly obvious.

There is much to be said for the late Dr. Ker's advice to give a small dose of antitoxin whenever it is considered necessary to take a culture. If this rule were universally

applied, the death rate from diphtheria would be considerably reduced.

While fully convinced of the importance of the early administration of antitoxin, I cannot too strongly denounce the damnable doctrine—many have been burnt at the stake for much less pernicious teaching—that antitoxin is of no value after the fifth day of disease. If this doctrine were consistently acted upon and no patient given antitoxin after the disease had been in existence for five days, the mortality from diphtheria would be much higher than it is at present.

The chief advance in recent times in the treatment of diphtheria is the use of a refined serum whereby the incidence of rashes and other unpleasant sequels has been reduced to a minimum. Almost the only serum phenomenon seen nowadays is urticaria, which is often limited to the site of injection, and is rarely accompanied by rise of temperature or constitutional disturbance. The introduction of this refined serum is a great boon to the patient, as formerly it not infrequently happened that patients, especially adults, suffered more from serum sickness than the actual attack of diphtheria.

Possibly some of my audience may be aware of my views on the use of alcohol in the treatment of acute infectious diseases, and of diphtheria in particular, especially as I have aired them on several occasions before medical gatherings in the vain hope of meeting with some serious opposition. When last July I was invited by Sir Thomas Barlow to deliver the annual address of the National Temperance League at the British Medical Association meeting at Cardiff, I remarked that there were no specialists in any department of medicine, in this country at least, who as a body appeared to be so firmly convinced of the therapeutical value of alcohol as those who had devoted their lives to the study of acute infectious diseases.

Although like the other students of my day I was brought up in the belief that

alcohol was a valuable cardiac stimulant in the acute stage and a useful tonic in convalescence, about two years after qualification I lost my simple faith in brandy, champagne, port wine, stout and other alcoholic preparations, and for more than twenty-five years have entirely abstained from the therapeutic use of alcohol, though it was only within the last eighteen months that I have substituted rigid personal abstinence for very moderate drinking.

Although, as I have said, my past experience of a quarter of a century has convinced me that alcohol is unnecessary in the treatment of acute infectious diseases, it is only since March 8, 1926, when I was appointed Medical Superintendent of the Western Hospital, that I was able to induce my junior colleagues to follow my example, though of course I did not take advantage of my position to forbid the use of alcohol when medical officers were convinced that its use was indicated.

The results of the experiment were as follows: In 1927, when the annual consumption of brandy at the Western Hospital was only 25½ oz., as compared with 991½ oz. in 1926, and 2,589 oz. in 1925, no alcohol whatever was used in the treatment of 1,610 cases of diphtheria, the mortality of which—3·01 per cent.—was the lowest recorded in any of the Board's acute fever hospitals in that year. During 1928 when the reduction of alcohol was greater still, and less than a total of 1½ oz. was used in the whole year among a total of 4,797 cases under treatment, the mortality was lower still, viz., 2·78 per cent. for diphtheria, 0·69 per cent. for scarlet fever, 5·68 per cent. for measles, 4·67 per cent. for whooping-cough, and *nil* for 48 cases of enteric fever, which though mainly paratyphoid included many severe attacks.

The control which I have exercised over the use of alcohol in the wards was also extended, as I have shown on previous occasions, to its administration by the nurses in the ambulance service connected with my

hospital, who now appear to be so convinced of its being unnecessary that only 3 oz. and 2 drm. have been used since January 1, 1927, during which period thousands of patients have been conveyed to and from the hospitals and many thousand of miles traversed.

The figures which I have brought forward indisputably prove that alcohol is by no means so indispensable a drug in the treatment of acute infections as some pyretologists maintain, but are rather an indication of its low therapeutic value.

In any case my view corresponds with that of the majority of our colleagues in the United States, where barely 30 per cent. of the medical profession have applied for a license to use alcohol in their practice, and of this 30 per cent. a large proportion do not scruple to use it for convivial and other extra-medical purposes.

MEASLES.

A good deal of work has been done recently in connection with measles, especially its bacteriology and prophylaxis. According to competent bacteriologists, the organism most likely to be the cause of the disease is a small round Gram-positive diplococcus described by Ruth Tunnicliff, of Chicago, which she has cultivated from the throat secretion under strict anaerobic conditions and occasionally from the ocular and nasal secretion taken in the eruptive and pre-eruptive stage. It has not been found in patients with a fading measles eruption nor in other diseases than measles.

On blood agar it produces small green colonies. With an extra-cellular toxin prepared from this organism Tunnicliff has invented a skin reaction analogous to the Dick test for scarlet fever. Goats and horses have been immunized with cultures of the diplococcus, and the serum of these animals has been used to prevent the occurrence of measles in children exposed to infection. The results obtained have been described as encouraging.

Prevention or attenuation of measles by the injection of serum of convalescents is one of the most important and successful prophylactic methods in medicine. The serum is taken between the seventh and ninth days after the temperature has become normal from donors who have been proved by the appropriate tests to be free from tuberculosis, syphilis and malaria, tested for sterility, pooled with the serum of at least two other subjects and placed in ampoules of 2 to 5 c.c. ready for use. If the injection is given during the first five days of the incubation period, complete passive immunity will be established for about a month. If the injection is given after that date up to the period of invasion, the individual will probably develop measles but in an attenuated, sometimes even a non-eruptive form (*morbilli sine morbillis*). In the great majority of cases injection of convalescent serum after the onset does not modify the course of the disease.

Owing to the difficulty in obtaining a sufficiently large quantity of convalescent serum, serum centres have been established in some cities such as Paris and New York, and various modifications of the original method have been employed such as the use of serum or whole blood, citrated or otherwise, from adults, especially the parents, who have had measles. The use of sheep serum advocated by Deghwitz has proved unsatisfactory. Not only has it failed to protect, but it has also given rise to very severe reactions. The production of a more permanent immunity than that conferred by passive immunization with convalescent serum is being studied by Debré and Joannon in Paris, who have attempted to produce active immunization by injection of minute quantities of virulent measles blood diluted in saline. The value of this method, however, has not yet been established.

Immunization against measles is specially indicated in circumstances where the disease is likely to be particularly dangerous, especially in ill-nourished rickety children

living in insanitary dwellings, but owing to the mild course which measles usually runs when it is contracted in a hospital with a hygienic environment—I cannot recall a single death from measles so contracted in my long experience of M.A.B. hospitals—I do not think it necessary to employ serum prophylaxis in the case of children exposed to measles in a hospital ward where the hygienic conditions are favourable.

For the same reason I do not advocate serum prophylaxis for healthy children in well-to-do families in which measles is usually of a mild character. When some years ago my own son contracted measles at the age of 4, I did not think it necessary to procure convalescent serum or to inject the serum or whole blood of my wife or myself into his little sister, aged 2. The remarkably abortive character of the attack which the girl developed in due course would undoubtedly have been attributed to the action of convalescent serum had it been employed in her case.

SCARLET FEVER.

Much interesting work has been done in recent years in connection with the ætiology, diagnosis, prophylaxis and treatment of scarlet fever.

A variety of hæmolytic streptococcus called *Streptococcus hæmolyticus scarlatinae* appears to have better claims than any other organism to be the cause of scarlet fever, though the claims made on its behalf have not received universal recognition, rival views being held by various observers in Germany, Austria and Switzerland, with which, however, I need not detain you. Intradermal injection of the toxin of the *S. scarlatinae* is supposed to produce in susceptible subjects and also in the first few days of scarlet fever a reaction similar to the Schick reaction and known as the Dick reaction, and none in those who are not susceptible, including convalescents from scarlet fever, who possess an antitoxin capable of neutralizing the scarlet fever

toxin. There is a fairly general agreement, however, that the Dick test is not quite so reliable a guide in scarlet fever as the Schick test is in diphtheria owing to the varying results yielded by the toxins of different strains of *S. scarlatinae*. As regards its diagnostic value my experience has been that it is too frequently negative in the first few days of the eruption and positive in convalescence to be of much assistance.

Another recent method to which considerable diagnostic value has been attached, especially by those whose clinical experience of scarlet fever is comparatively small, is the Schultz-Charlton or extinction phenomenon, which consists in blanching of the eruption when a small quantity (0.2 c.c.) of anti-scarlatinal serum is injected intradermally. I have but rarely derived any help from the use of this method, as I have found as a rule that the blanching is only well marked when there is no doubt as to the scarlatinal nature of the eruption and faucial condition, and even in such cases blanching does not always take place.

Recent work on the prophylaxis of scarlet fever has mainly been concerned with active immunization by scarlet fever toxin modified or not by sodium ricinoleate which modifies the toxin without impairing its antigenic properties, or with passive immunization by scarlet fever antitoxin. During a recent epidemic in Poland, where the mortality in 1926 was as high as in London fifty years ago, i.e., about 13 per cent., Sparrow and Kaczynski actively immunized 15,000-odd children who were found by the Dick test to be susceptible to scarlet fever, with the result that the incidence of the disease was three times less among the inoculated than among the un-inoculated.

Active immunization with *S. scarlatinae* toxin has also been carried out on a large scale in the United States. Owing to the much lower degree of toxicity of scarlatinal as compared with diphtheria toxin, it is often used by itself without any counter-acting antitoxin, but Larson and his

collaborators, who found that sodium ricinoleate was an effective agent in detoxifying the toxin, have used a soap-toxin mixture which produced a rapid immunity without causing objectionable symptoms.

In the case of nurses active immunization against scarlet fever is not to be urged, as not only is the disease much less serious, but its incidence among them is naturally much lower than that of diphtheria. At my own hospital during the last three years, in spite of the absence of immunization, only 8 nurses have contracted scarlet fever, in each case of a mild character, as compared with 14 who developed diphtheria, most of whom had been given toxin-antitoxin.

In this country the chief work in active immunization against scarlet fever has been done in the cases of the nursing staff of the fever hospitals of Edinburgh, Manchester and Birmingham. At the Edinburgh City Hospital, e.g., Benson and Simpson found that by injection at intervals of five to fourteen days of gradually increasing doses of scarlet fever toxin it was possible to render the majority of Dick-positive reactors Dick-negative. If the dosage was carefully graded, immunization could be accomplished without any unpleasant reaction or permanent ill-effects. While, however, active immunity could be obtained by injection of relatively small doses of toxin, its duration in originally Dick-positive cases was only a few months, and if more lasting immunity was desired in Dick-positive reactors, much larger doses of toxin were required.

The intranasal route, as in active immunization against diphtheria, has been employed in a small number of cases recently by Ramon and Zoeller, who found that instillations of Dick toxin into each nostril made a positive Dick reaction negative.

Before leaving the subject of prophylaxis of scarlet fever a word may be said as to the method called after the late Dr. Robert Milne, Medical Officer to the Dr. Barnardo

Homes. This method, which consists of inunction of the skin with eucalyptus oil and application of 1 : 20 carbolic oil to the tonsils, has been definitely shown to be valueless by Milne's successor, Dr. Gushue Taylor, as it does not prevent the spread of infection or the occurrence of complications and return cases.

Coming now to the treatment of scarlet fever, I may say that the use of a specific antitoxin in the disease forms one of the most interesting and valuable practical results of recent research. Owing to the mild character of the disease prevalent in London my experience of the remedy during the last three years has been rather limited, as I have not followed the example of some enthusiasts who recommend the use of antitoxin in every case of scarlet fever, as is the rule in the treatment of diphtheria. My practice has been to reserve the serum for cases of any degree of severity. Since March, 1926, I have had only 320 cases out of over 3,000 scarlet fever admissions which were given serum. These I have grouped in three classes—(A), (B) and (C), according to the effect of the serum. In Class A were 170 cases in which the benefit appeared to be immediate and well-marked. In Class B were 125 cases in which the benefit though definite was less rapid and pronounced, and in Class C were 25 cases which derived no benefit from the serum and the deaths numbered 6.

A serum rash, usually urticarial in character, occurred in 74 cases (23.1 per cent.), but in only ten there was any pyrexia with some constitutional disturbance, and sometimes there was secondary adenitis and pains in the joints such as are met with in serum sickness due to other sera. Since the employment of refined serum, however, the incidence and severity of serum sickness have been greatly reduced.

I have been much impressed by the action of serum in septic cases in which the tendency to ulceration of the throat is apparently checked by this means. There

is also often a striking improvement in the general condition, though the temperature does not always fall by crisis to normal.

In scarlet fever of any severity it is even more important than in diphtheria that the serum should be given early, as in late cases, contrary to what I have emphasized in diphtheria, it appears to have little if any effect, and my experience like that of the majority of other observers has been that it does not prevent the occurrence of complications.

VACCINATION.

Considerable uneasiness has been aroused among public health officers of recent years by the occurrence of certain nervous symptoms usually assuming the form of encephalitis, but sometimes of meningitis or myelitis, as a sequel of vaccination. The disease, which as a rule develops from nine to fifteen days after vaccination, differs from epidemic (lethargic) encephalitis in the following respects: (1) The greater uniformity of the symptoms compared with those of epidemic encephalitis. (2) The short duration of the acute stage, viz., seven to fifteen days, compared with a month or more in epidemic encephalitis. (3) The absence of paralysis, particularly of the eye muscles. (4) The presence of Babinski's sign, which was found in all the cases. (5) The absence of any residues in cases which recovered. (6) The much higher mortality (41·2 per cent.) than that of epidemic encephalitis (25 per cent.). (7) Certain anatomical differences.

The importance of this post-vaccinal encephalitis, of which until recently a large proportion of the profession appeared to be unaware, is best shown by the fact that it led to the formation of a special committee, appointed by the Ministry of Health in conjunction with the Medical Research Council, under the Chairmanship of Sir H. Rolleston, as well as to one appointed by the League of Nations. The conclusion of the Rolleston Committee was that though vaccination was

not the sole cause it played some part in the causation of the encephalitis and the other nervous sequelæ mentioned. It was pointed out that in post-vaccinal nervous diseases the lesion of the central nervous system was similar to that found in the nervous sequelæ of the acute exanthemata and bore certain resemblances to the lesions of disseminated sclerosis. The Committee recommended that in place of the officially advocated four insertions, trial should be made of vaccination and re-vaccination in one insertion with a minimum of trauma, and deprecated multiple insertions and cross hatchings.

The points emphasized by the Committee of the League of Nations were as follows:—

(1) The rarity in the countries affected, of which England and Holland were the principal, of post-vaccinal encephalitis compared with the number of vaccinations.

(2) The fact that the encephalitis was not a mere coincidence.

(3) The distinction of post-vaccinal encephalitis from lethargic encephalitis. Children between 3 and 13 years are particularly predisposed to post-vaccinal encephalitis, while early infancy and early adult life are almost entirely immune.

All the observations tended to show that the encephalitis was not connected with certain strains of lymph or certain accidents in its preparation.

(4) As regards the ætiology, the vaccine virus was not in the Committee's opinion solely responsible, but there was also some unknown factor present as well, whether bacteria, ultra-virus or latent virus, which as the result of reciprocal action gave rise to the symptoms.

In conclusion, the Committee emphasized the importance of primary vaccination in the first year of life rather than in the later years of childhood.