Governments as meaning that by supplying free quinine they could discharge their whole duty regarding malaria. He leaned towards the preventive methods described by Dr. Hackett, but he agreed with Colonel James that there was perhaps too great a tendency to adopt mechanically for every country a measure which had anywhere produced good results. For malaria prevention there was no fixed rule; each district required individual consideration. At a place he visited near Astrakhan prophylactic quinine was the only measure applicable to local circumstances. Angora was nearly abandoned as the Turkish capital on account of malaria; quinine alone was ineffective, but when this was coupled with well considered drainage the disease was controlled, and anopheles became rare. In Anatolia it was the experience of local doctors that apparent resistance to quinine often disappeared when an ascariis infection had been eradicated. In his view the cases of so-called spring malaria were nearly always relapses of autumn infections. In Turkey he had acted on this belief as regards his personal prophylactic measures, omitting all precautions up to the end of May even in districts where malaria was endemic, and he had no reason to regret his action.

Dr. P. H. MANSON-BAHR (London) gave his experience with plasmochin and its compound with quinine in the treatment of malaria. He considered that this new drug, from its action on the gametocytes of tertian and subtertian parasites, would have considerable bearing on the prophylaxis of malaria in the future. All who had used it were agreed as to the phenomenal rapidity of its action upon the crescents of subtertian malaria, which disappeared from the circulation within three days after the exhibition of 0.24 gram of plasmochin. He quoted a striking illustrative case in which the compound was successfully employed after full doses of quinine had proved unavailing, and in which disintegration of the gametocytes was observed microscopically. The drug was well tolerated, and if it were possible to treat a malaria-stricken population daily with small doses, the transmission of infection through the anopheles would soon cease from destruction in the blood stream of the gametocytes. Under the present system of quinine prophylaxis the formation of gametocytes in peripheral blood was rather encouraged than the reverse.

Colonel S. P. JAMES briefly replied to the discussion.

ASTHMA AND TUBERCULOSIS IN RELATION TO "CLIMATE ALLERGENS."*

BY

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WE began about 1919 to investigate the action of various allergens on asthmatics, and found that only about 15 per cent. of our cases could be classified as supersensitive to the four groups of allergens known at that time—namely, pollens of various grasses and flowers, epidermal products, foodstuffs, and bacterial vaccines. We had, however, also noted those asthmatics who could not be classed under one of the four headings mentioned, but had yet to be considered supersensitive, although we were unable to identify the causative allergens. Among other things we found that more than 90 per cent. of asthmatics give a positive skin reaction to an extract of dandruff of human skin, whereas normal persons only react to such an extract in exceptional cases, proving that the skin at least of these patients is supersensitive.† Thus about 80 per cent. of our asthmatics suffered from some form of allergy, but the causative agent of their attacks was unknown.

In our endeavours to find the cause of the attacks in these 80 per cent. we utilized the known fact that the environment of the asthmatic patient is, as a rule, of primary importance in determining the intensity and frequency of his attacks. It is known that most asthmatics are free from attacks at high altitudes. Turban and Spengler, who have published statistics for Davos (about 5,000 feet), found that 68 per cent. of all asthmatics going to Davos become free from attacks within two or three days, that 25 per cent. improve considerably within two or three weeks, and that only 7 per cent. remain uninfluenced. It is also known that residence at the seaside or a sea voyage often improves the condition of asthmatics. This can be observed also in a flat country like Holland, where the health of asthmatics varies greatly in different regions. The character of the soil is also of great importance, sandy soil and a low level ground-water offering much better conditions for asthmatics than clay and peat soil and a high level ground-water. Recently these observations have been confirmed completely for Ost Preussen by Tiefensee, working in the clinic of Matthes in Königsberg, who found that from 1,100 asthmatics living in East Prussia, more than 90 per cent. had their houses on clay, moor, or peat soil, and only a very small number on sandy soil.

These observations exclude the known factors of climate, barometric pressure, temperature, humidity of the air, etc., as direct causes for the incidence of asthma, and make it clear that the conditions of the soil are of paramount importance. As will be shown later, humidity may play an important part in making a place "bad" for asthmatics, but it does this by facilitating the growth of certain micro-organisms which constitute the determining causes of the asthmatic condition in different regions.

Mainly on the basis of such observations we formulated the hypothesis that the difference between various climates is due to certain allergens in the air, the presence of which is dependent on factors of climate; they may be called climate allergens. These climate allergens must be considered as the principal causes of asthma in all flat countries with a high humidity and a moist soil.

In my monograph on allergic diseases¹ I fully described the results of experiments made to prove the validity of this hypothesis. Among other things it was shown that outside air in a place known as very bad for asthma (Rotterdam) contains water-soluble colloidal substances, which on injection into sensitive persons induce attacks of asthma, and that dust from the floors of private houses gathered in regions where asthma is very frequent contains many more allergens than dust from places which are good for asthma. In Switzerland there is a gradual diminution in the allergen content of house dust corresponding to the height of the place.

A number of allergens which may be considered representatives of groups of climate allergens have been determined. The first examples were found by us as the result of reading a paper by Ancona, who observed an epidemic of asthma in an Italian village, the cause of which was traced to a parasite occurring in grain (*Pediculoides ventricosus*) which formed allergens, to which most of the people who frequently handled this grain became sensitive. We then found that other insects—that is, the common mites which so frequently occur in grain, hay, and straw and packing material—form allergens which may be the exciting cause of asthma in about 20 per cent. of our cases. Later we found that common moulds, like *Aspergillus fumigatus*, and other aspergilli, penicillium, mucor, etc.—moulds that are abundant in moist and damp houses—form allergens to which more than 50 per cent. of our asthmatics are sensitive.

Since these allergens formed by moulds are to be considered as typical representatives of a group of allergens which is certainly most important for the entire problem of allergy, we will have to study their properties in detail.

Properties of Mould Allergens.

1. Mould allergens are soluble in water and are of colloidal nature; they are not destroyed by heating to 120° C., nor by acid, alkali, or formaldehyde. They are

* This article is a synopsis of a series of three advanced lectures given at the London University in February, 1927.

† These results have been confirmed by Professor Rost in Freiburg (Germany).

not soluble in ether or chloroform, and are probably not proteins or lipoids. They are harmless to normal animals or men, and do not act as anaphylactogens in guinea-pigs or rabbits, so it has not been previously possible to sensitize animals with these allergens.

2. *Skin Reactions on Human Beings.*—In about 50 per cent. of our asthmatics these mould allergens give positive skin reactions after subcutaneous injection, whereas normal persons are as a rule negative. These reactions are sometimes very intense, so that the entire forearm at the site of injection is swollen, red, and tender, and so remains for two days.

3. *Effects of Subcutaneous Injections on Human Beings.*—Subcutaneous injections in normal persons give no reaction. Sensitive people, however, may react in a peculiar way. Small doses, about 1 in 1,000,000 or less of our standard extracts, often have a decided therapeutic effect, in that if repeated at short intervals they serve to desensitize a patient, sometimes to a considerable degree. Slightly higher doses—that is, 1 in 100,000 of the standard extracts—may cause symptoms of vasomotor rhinitis, headache, rise in temperature, and general malaise. In very sensitive people the 1 in 1,000,000 dilution, or even 1 in 10,000,000 dilution, may have the same effect. Higher doses, or the same doses in a sensitive patient, may produce violent attacks of asthma and even be dangerous. The symptoms following the injections of mould extract last two or three days, and may be stopped by the injection of a solution of sulphur in oil.

4. We have been able to prove that the serum of patients supersensitive to moulds contains substances which may transfer this sensitiveness locally to the skin of normal persons; this serum also contains substances which may inhibit the action of the allergens in sensitive persons. Both kinds of substances are strictly specific. The presence of a "transfer substance" is shown by the experiment of Prausnitz and Küstner. If 0.1 c.cm. of serum from a patient supersensitive to a certain mould extract is injected into the skin of the flexor aspect of the left arm, and next day 0.1 c.cm. of mould extract is injected in the same place and 0.1 c.cm. of the same extract as a control in the right arm, the injection in the left arm will produce a large urticarial wheal, but the result of that on the right will be negative. This experiment proves beyond doubt the importance of moulds as a factor in allergic disease.

The presence of specific anti-allergens may also easily be shown. If 0.1 c.cm. of a solution containing a mould extract diluted 1 in 10 with physiological saline is injected intracutaneously on the flexor aspect of the left forearm of a patient supersensitive to moulds, and in a corresponding place on the right arm a 1 in 10 solution of the same allergen diluted with the patient's own blood, is injected, the reaction on the left arm will be positive and on the right arm negative.

Whether these anti-allergens are identical with the "transfer substances" is not certain. The experiment described proves that the moulds investigated form allergens, which may induce symptoms of illness in persons supersensitive to them, and the conclusion is strengthened by the fact that all the moulds used have been cultivated from material occurring in the close vicinity of asthmatics. We very frequently find *Aspergillus fumigatus* growing readily in kapok, which is used for stuffing mattresses in my country; moulds can be cultivated from house dust, from grain, and from human dandruff—in fact, from the most varying sources, but all accessible to asthmatic patients. Although we have only investigated the allergic properties of about sixteen moulds, many others may act in the same way, as well as some micro-organisms, such as bacteria and yeasts. Other climate allergens, perhaps more important than these, may yet be found, but so far as we can see at present the relation between mould allergens and allergic diseases is the same in all low-lying countries. Those investigating this subject must not forget that the kind of micro-organisms producing climate allergens may be different in different countries.

So far we have produced evidence for the theory which ascribes the beneficial influence of high mountain climates

for allergics to the absence of climate allergens in the air. The final proof can be reached in another way. If the beneficial influence of residence in high altitudes is due to absence of climate allergens, it should be possible to obtain the same improvement in Holland or any other low-lying country, provided that conditions could be realized which in respect to the air were identical with those in Switzerland. With the help of W. Einthoven, jun., we have succeeded in constructing an apparatus for investigating this. As this apparatus is installed in a special clinic for allergic diseases, and forms the basis of our work during the last three years, it must be described in some detail.

The Clinic for Allergic Diseases.

The clinic is established in two private houses rented for the purpose. The houses are rather badly built, damp, and situated on clay soil in a humid region near a canal. These are favourable experimental conditions, since we wish to demonstrate that, even in houses otherwise bad for asthmatics, it is possible by proper technical arrangements to make them suitable for these patients.

In several rooms of these houses small chambers have been built of eternit, a kind of asbestos, and a material on which bacteria or moulds cannot grow. The chambers contain an iron bed, an iron chair, and a small iron cupboard. Mattresses, pillows, and other bedding were new and sterilized before use; they were also regularly sterilized every month or six weeks, so that the possibility of micro-organisms growing in them and producing allergens is extremely small. Before going to bed the patient undresses in the room but outside the chamber, enters and shuts the door of the chamber, and stays in it during the whole night. During the first days of their residence in the clinic the patients often stay in the chamber during the daytime also. They are not allowed to take extra pillows, food, or any material which may contain allergens into the chamber. All the chambers in the clinic are ventilated by a large exhaustor, which draws air from the top of an iron tube fixed alongside an iron tower 100 feet high.

The system described is the simplest, and for most of our patients it is sufficient. Nevertheless, the air with which the chambers are ventilated will contain a certain amount of dust and a certain amount of climatic allergens. Hence, in order to obtain conditions more nearly identical with those in high altitudes the air must be purified—a problem presenting considerable difficulties. So far we have tried three different methods, but only one could be put on an efficient economical basis; by it the air is purified by passage through a refrigerator.

In the clinic for allergic diseases in Leiden there is a refrigerator with a capacity of 4,000 calories an hour, and a cooling surface of 180 square feet, sufficient to bring the dewpoint of the outside air from 15° C. to 6° C., or from 10° C. to 1° C., or from 5° C. to -5° C, if about 200 cubic feet of air passes through it per minute. This is sufficient to ventilate three chambers for two persons each. The air cooled in this way has to be warmed by a central heating system before it enters the chambers. As a rule the temperature of the chambers is kept at about 70° F.; this keeps the relative humidity between 20 and 30 per cent. We do not yet know to what extent the dryness of the air influences patients beneficially, but if dryness is an important factor for them the conditions in the clinic compare favourably with those at high altitude sanatoriums. It is true that during the winter the relative humidity in a number of places at high altitudes will be lower than 20 per cent., but in spring and part of the summer the figures of most of these places are higher.

We have so far treated about 500 patients in this clinic, and have found that about 75 per cent. were completely, or almost completely, cured within some days, about 15 per cent. improved materially within some weeks, and 10 per cent. remained unaltered. In comparing these figures with those published by Turban and Spengler we find almost complete agreement. In our opinion this shows without any doubt that the conception of the influence of climatic allergens on the condition of asthmatics in various climates and at various heights is correct.

*Application of the Principle of Allergen-free Air
Chambers to Other Diseases.*

Illnesses dependent on climatic factors are not limited to asthma and the other allergic diseases mentioned. Rheumatism is prevalent in moist and cold climates, and tuberculosis also. Highly interesting and careful investigations by Gordon, which were later confirmed for India by Sir Leonard Rogers, have demonstrated that great differences in the morbidity and mortality of tuberculosis exist between various regions in the same country, often quite near to one another—differences which are ascribed by these authors to the influence of strong rain-bearing winds. Most sufferers from migraine who have visited different places and different countries can tell of places where they are well and places where they always suffer badly. In those regions where the "Föhn" wind prevails its influence is very distinctly recognized by sufferers from migraine and epilepsy. In hot tropical climates there is in the lower regions a peculiar form of disease called "low fever," characterized by malaise and some rise of temperature; this condition is almost immediately cured if the patient moves to the mountains, but it comes back as soon as he returns to lower regions. The cause of this illness is unknown.

We do not suggest that in all these cases factors of climate are to be identified with the presence or absence of climate allergens, but we believe that some of these diseases should be studied from this angle. We ourselves started with tuberculosis, and also had the opportunity of studying five cases of whooping-cough in allergen-proof chambers. Our five patients with whooping-cough had severe attacks of typical coughing every hour or two on the day preceding their admission. They came into the clinic on the sixteenth, tenth, fourteenth, twentieth, and twenty-third day of the illness respectively. They were immediately put in an allergen-proof chamber ventilated with purified air and were not allowed to leave the chamber till their attacks had disappeared completely. As a result not only did the number of attacks of coughing decrease rapidly, but the intensity of the attacks was very much reduced; none of the children had in the clinic any attacks as severe as on the preceding days and nights at home. Although the benefit derived from this treatment is undeniable, we offer no explanation of it. Certainly we do not want to draw the conclusion that whooping-cough is an allergic disease; the subject is a matter for future research.

Pulmonary Tuberculosis.

We have elsewhere² discussed the reasons which led us to investigate the influence of allergen-free air on tuberculosis. Earlier in our work on moulds we made skin tests with mould extracts in tuberculous cases and found a fairly large number of positive reactions, and this, together with the consideration that high altitudes act beneficially on tuberculosis as well as asthma, suggested taking cases of tuberculosis into our clinic and observing how residence in an allergen-proof chamber would influence them. Although the number of patients so far is limited (16) there is already sufficient evidence that allergen-free air gives about the same results in treatment of tubercle of the lungs as high altitudes. We feel justified in making this statement, in spite of the small number of patients, because the conditions under which our therapeutic experiment was made were such as to exclude most sources of error. All these patients were suffering from severe tuberculosis. Physical and x-ray examination showed characteristic signs of proliferative disease and the sputa contained a great number of tubercle bacilli. Previous to admission they had been treated at home or in hospital in Amsterdam. They had during the preceding months or years spent the greater part of their time in bed, and none had lacked sufficient nourishment. Attention must again be drawn to the fact that the allergen-proof chambers used were built in the rooms of a private house, situated in a very moist and low-lying part, so that the only difference our treatment could make was that the patients were taken from a house in Amsterdam or somewhere else in the country, and brought into another house, certainly not better situated than the one they were in

before, but in which they lived in a small chamber isolated from the rest of the house and ventilated with purified air. Factors of rest, good food, and careful nursing were the same as before, and the patients received no medicines or other treatment, hence, as far as one could see, the only therapeutic measures were fresh air, and in some cases dry air, and protection from climate allergens.

Of the first sixteen cases treated in this way, one was not improved, and curiously enough this was a case which we had considered to be a relatively slight one—a girl of 15 years with tuberculosis of the left apex. One other case, a woman of 26, with a large cavity in the left apex, although gaining considerably in weight and feeling better, did not show much local improvement. A third case also only improved slightly, but all the others improved considerably. After having been in the chambers for one or two days the patients feel better, they breathe more easily, and they cough less. The quantity of sputum may or may not decrease during the first weeks, depending largely upon the presence or absence of a cavity. If no cavity is present the quantity of sputum may decrease quickly; if there are cavities the probability is that sputum will remain abundant and will only diminish very slowly, although in one of our cases with a large cavity (verified by x-ray examination) the patient was free from sputum within a month. The characteristic point, then, is that definite improvement occurs within a few days, and this is precisely what was expected, and is analogous with the improvement in our cases of climate asthma.

Of course, improvements in the patient's condition cannot be expected to show themselves in the physical examination of the chest until after some weeks have elapsed; then we find evidences of exudative processes being replaced by signs of fibrosis. In the cases favourably influenced the temperature settles after three or four weeks, and may remain normal entirely after two or three months. All our patients gained in weight, some of them considerably (15 kg. in some months). In two cases the patients went home against advice before they were sufficiently improved, and became worse almost immediately, although all conditions at home, with the sole exception of allergen-proof chamber and purified air, were the same as in the clinic.

Before considering the importance of the results given, I must call attention to the fact that so far I have only spoken of "improvement" and not of "cure" of tuberculosis. In order to appreciate the reason for this it must be remembered that in cases of "asthma" also we do not obtain a cure by keeping the patients in the clinic. Our cases of climate asthma are supersensitive to climate allergens, and consequently they will be subject to attacks in places where these allergens occur, and free from symptoms in places where they are absent. Tuberculous patients suffer from a bacterial infection, and in addition are sensitive to climate allergens. This sensitiveness handicaps the patient and forms an additional factor causing the tuberculous process to run a more severe course; it is this additional factor which is absent in our allergen-proof chamber. So the direct influence of this treatment—that is, the degree of improvement—will be mainly dependent upon the degree of sensitization to climate allergens shown by the patient, whereas the final result, including the question of permanent cure, depends on the relation between the virulence of the infection and the patient's resistance.

It seems to me that the possibilities suggested by these observations on the influence of climate allergens on tuberculosis are not exhausted here. There is another side of the question which has to be considered. We know that there is a relation between climate and tuberculosis. Why is the mortality and morbidity of tuberculosis high in some regions and low in others? Lack of good food and unfavourable conditions in factories and workshops are important factors, and another is the occurrence of climate allergens in the patients' environment. The knowledge of this factor may be of great help in the treatment of tuberculosis, but it may be of even greater help in prophylaxis. Preventive medicine should take this matter into consideration.^{3,4} If the simple transfer of a patient from one house to another, in the same town or region can make all the difference to his

health (as was the case with the patients who came to our allergen-proof chambers) it must be realized that one obvious factor in the prevention of tuberculosis is to make the conditions at home similar to those in our clinic.

We feel that, for all patients who are free from symptoms of asthma in our clinic, or who, suffering from tuberculosis, are greatly relieved, the problem of their health has been reduced for the most part to a problem of technique.

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Remarks

ON

THE EPIDEMIOLOGY OF POLIOMYELITIS.*

BY

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POLIOMYELITIS is an acute specific fever which, in its complete expression, presents three distinct clinical and pathological phases. Clinically these are a short-lived initial phase of *constitutional disturbance*, followed by signs of invasion by the virus of the *subarachnoid space*, and finally by signs of involvement of the *nervous tissue* itself. Each phase has its pathological substratum. In the initial phase the virus obtains lodgement in the liver, spleen, and lymphatic structures generally, in all of which lesions are found. The virus then reaches the subarachnoid space and leptomeninges by channels which are not yet fully known, and gives rise to a reaction which is manifested by characteristic changes in the cerebrospinal fluid, and finally, invading the nervous tissue, it produces there the inflammatory lesions to which the paralysis is due.⁸ The intensity of each phase varies, as do also the time relations of the first two phases. Further, the infection may die out after the first or the second phase, thus giving rise to the so-called "abortive cases." When infection dies out after a severe meningeal reaction we speak of a "meningitic" type of the disease.

The initial constitutional phase of poliomyelitis seldom presents sufficiently characteristic symptoms for identification, and it may be so mild that the patient continues to go about and thus has ample opportunities of spreading infection, since the virus is contained in the nasopharyngeal secretions. Like other infectious diseases it has its own seasonal and age incidence, incubation period, mode of spread, and susceptibility factor. Since the publication of Wickman's observations⁹ it has been generally held that the infection is carried and spread by healthy carriers of the virus and by sufferers from the disease. From the nasopharynx of both groups of individuals a virus has been obtained capable of producing the disease in inoculated monkeys, and Flexner and Amoss⁵ concluded that the nasopharyngeal mucosa during the ten days immediately following the initial signs of infection regularly contains the virus.

The two points to which I propose particularly to address myself are the question of non-human carriage of the virus, and a view which has recently been advanced to the effect that the sole agent in the spread of poliomyelitis is the healthy human carrier of the virus. Despite the inconclusive results of extensive search for non-human agencies of spread, these have not been finally excluded. Recently, in a small American outbreak, a strong case has been made out for milk as a possible agent of spread, and the whole question has thus been reopened.

An important modification of Wickman's views as to the joint responsibility of healthy carriers and sufferers from poliomyelitis in the spread of the disease has recently been suggested by Collier,⁴ who believes that the disease

is spread exclusively by the agency of healthy carriers, and that actual sufferers from the disease in any of its phases are non-infective to contacts, owing to loss of virulence in the infecting agent immediately the sufferer becomes infected. Elaborating this hypothesis, he states that every epidemic of poliomyelitis is preceded by a "carrier epidemic," in the course of which susceptible contacts are infected and an outbreak of the disease occurs. In any given area the presence of this army of carriers leads to the practically simultaneous mass infection of all available susceptible subjects. Further, he states that epidemics of poliomyelitis are characterized by a "rapid blaze, high peak, and rapid fall," a feature due to the mode of spread he describes. In such semi-isolated communities as country villages or boarding schools this manner of spread involves the universal and simultaneous striking down of all susceptible members of the community, and precludes the further extension of the disease within the community, with the result that all those not initially infected may safely remain within the infected community. The practical bearing of this conception is that all such communities should be kept together on the appearance of poliomyelitis within them and segregated from the surrounding society.

Since this hypothesis raises vitally important questions of public health and departs from the generally accepted body of teaching, it is essential that the data on which it is based should be carefully studied. Briefly, as formulated by Collier, these are: (1) the literature of the disease records no authentic example of case-to-case infection. Multiple cases within households are rare, and spread from a patient in a hospital ward is unknown. (2) The "rapid blaze, high peak, and rapid fall" of epidemics of poliomyelitis can be explained only on the basis of a preceding "carrier epidemic," and does not accord with case-to-case spread. (3) Finally, there is the categorical statement, for which no evidence is submitted, that at the moment of infection the virus ceases to be infective, thus rendering case-to-case spread impossible.

Before proceeding to discuss the first two postulates, let us summarily dismiss the third. It has been established by Flexner and Amoss that the nasopharyngeal secretions within the first ten days of onset of the disease contain a virus not less infective for the monkey than is that of a healthy carrier. For this susceptible animal there is, then, no loss of virulence. In the circumstances it is incredible that there should be a selective loss of virulence for the other susceptible animal, man. Throughout the whole range of infective agents pathogenic to man there is no parallel for the state of affairs thus alleged for the virus of poliomyelitis, and in the absence of evidence we may dismiss it as a speculation incompatible with the facts.

It is perhaps more difficult to establish unequivocally the occurrence of case-to-case infection; despite the strongest indications, it is always easy to maintain that somewhere in the background is the healthy carrier who is in fact responsible for spread; and while it may be impossible to demonstrate his existence at the relevant time and place, it may be equally impossible to exclude it. Nevertheless, we may reasonably object to the invocation of this factor in respect of every epidemic unless there is more substantial evidence of its operation than our inability to prove a negative.

In referring to the literature for examples of case-to-case infection it is essential to go direct to original sources in which all the facts of observation are recorded irrespective of their possible bearing upon the question at issue. For this purpose we cannot do better than turn to Wickman's original monograph on the Swedish epidemic of 1905. Wickman concluded, upon evidence which left him no alternative, that poliomyelitis tends to spread along the lines of human traffic, borne thereon by healthy carriers of the virus and by sufferers from the disease, more particularly during its initial phase and in its abortive form. Impressed as he was by the importance of the healthy carrier, he drew attention to the equally important role of the infected patient. Amongst the numerous foci of the disease analysed by him those in the parish of Trästena and on the islands of Sirkö and Borgö provide clear examples of a state of affairs incapable of explanation on

* These remarks were made in opening a discussion on the notifiable infectious diseases of the nervous system at the Annual Congress of the Royal Sanitary Institute, July, 1927.