

THE INTERNATIONAL CONGRESS OF HYGIENE,  
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It was my good fortune to be directed to attend this Congress as one of the delegates of the War Office, my colleague being Lieutenant-Colonel W. G. Macpherson, C.M.G., R.A.M.C. It had already been foreshadowed in the programme that the task of attempting to give any general idea of the work of the various Sections would be far beyond the capacity of two men, and this became more and more evident as the actual discussions proceeded. Colonel Macpherson and I had arranged beforehand as to a division of labour, and agreed on the discussions which we should, respectively, endeavour to attend; but, in my own case at least, it was found that it was impossible to carry out this scheme as completely as had been hoped. For instance, it not infrequently happened that two of the subjects in which one was interested came up for discussion in different Sections at the same time, while another difficulty was encountered in the alterations which were at times made in the order of the papers. Thus one had often to wait through some discussion, of little direct interest to us, in order not to miss that which one wished to hear; only to find out later that one had missed another of special interest in a different Section. Such difficulties are, I suppose, encountered at every large Congress, and I only mention them by way of apology for the apparent neglect of many important discussions from which one might have hoped to collect valuable information for a report of this nature.

The subjects to which it had been agreed that I should devote most of my attention, were those dealing with the causation of disease and problems of pathological and bacteriological interest; while Colonel Macpherson agreed to study the more strictly hygienic side of the Congress, and, in particular, all that bore upon questions of army sanitation. The same division of labour was adopted in the case of the exhibits in the Exhibition connected with the Congress, and in this direction also there was no lack of material for us both.

The Congress was held in the Reichstag, practically the whole of this magnificent building having been placed at the disposal of the Congress by the German Government. Large as it was, how-

ever, some of the committee rooms, in which the various Sections held their meetings, were uncomfortably crowded when the subject under discussion was one of general interest; but this can hardly be wondered at, as I believe the attendance was close upon 4,000 members! In spite of this enormous number, and the fact that so large an attendance had not been anticipated, the natural talent of our hosts for organisation carried them successfully over all difficulties, and no efforts were spared to make smooth the way of the stranger within their gates.

In the subjoined report upon a certain number of the discussions I must mention that, in some instances, I was not able to attend the whole of the particular sitting or sittings at which they took place; when this was the case I have endeavoured, as far as possible, to fill up the blanks in my notes and in my memory from the printed summaries which were sometimes available and from enquiries among those who had been present. It is possible that in this way some errors and omissions may have occurred, which I regret but which it was not possible to avoid.

I may, in the first place, give a list of the subjects which were discussed at the various Sections, as an illustration of the enormous range of modern hygiene. The Sections were eight in number, No. 6 being subdivided into two on account of the large number of subjects to be dealt with, and the custom in each instance was to open the discussion with the reading of three or four set papers on the subject by *Referenten*, or reporters, who had undertaken this task on the invitation of the Executive of the Congress. After this, the subject was thrown open for discussion, and the readers of the original papers were given an opportunity of replying, when all who wished had spoken.

SECTION 1.—MICROBIOLOGY AND PARASITOLOGY IN THEIR RELATIONS  
TO HYGIENE.

*List of Subjects.*

- (1) The ætiology of tuberculosis.
- (2) The bacilli of the typhoid group.
- (3) The cocci of meningitis and similar bacteria.
- (4) The ætiology of syphilis.
- (5) Pathogenic protozoa.
- (6) Pathogenic spirochætæ.
- (7) Insects as carriers of disease.
- (8) The methods of testing sera.
- (9) Modern methods of immunisation.

SECTION 2.—DIETETIC HYGIENE AND HYGIENIC PHYSIOLOGY.

*List of Subjects.*

- (1) The control of food supplies in different countries and the legislative measures bearing upon them.
- (2) Methods employed in the preservation of foods.
- (3) Legislative requirements in connection with food.
- (4) The diet of the poor and its effect on the social economy.
- (5) The necessary minimum of proteids.
- (6) Alcoholism.
- (7) Bathing and its effects on health.

SECTION 3.—THE HYGIENE OF CHILDHOOD AND OF SCHOOLS.

*List of Subjects.*

- (1) The care of infants.
- (2) Homes for children and the results which they have given.
- (3) Lectures on infantile hygiene as a means of raising the standard of qualification of midwives.
- (4) The production of pure milk for infants.
- (5) The system of school physicians.
- (6) The question of overwork in schools.
- (7) The best method for regulating holidays.
- (8) The care of the weak-minded.

SECTION 4.—THE HYGIENE OF TRADES AND THE CARE OF THE WORKING CLASSES.

*List of Subjects.*

- (1) Fatigue from work.
- (2) The success following preventive measures against accidents.
- (3) Instruction in hygiene for inspectors of industries.
- (4) Dwelling-houses for workmen.
- (5) Public baths and baths in factories.
- (6) Industrial lead-poisoning.
- (7) Experiments on the prevention of dust in trades.
- (8) The dangers of electricity and the assistance to be given in the case of accidents arising from the use of strong currents.
- (9) How to reduce the dangers to health in industries carried on in the home.
- (10) Ankylostomiasis.
- (11) Substitution of a harmless procedure for the tanning by mercury.
- (12) The disease of caisson workers.
- (13) The improvement of hygiene for the working classes by means of insurance.

SECTION 5.—THE PREVENTION OF INFECTIOUS DISEASES AND THE CARE OF THE SICK.

*List of Subjects.*

- (1) Uniform regulation of the methods of testing disinfectants and disinfectant apparatus.
- (2) The control of disinfection.
- (3) Insurance against disease and its results.
- (4) The prevention of tuberculosis and the care of consumptives.
- (5) Protective inoculation against typhoid fever, plague and cholera.
- (6) The prevention of contagious meningitis.
- (7) The prevention and spread of plague.
- (8) Modern methods of combating typhoid fever.
- (9) The measures for preventing the transmission of infectious diseases by vaccination.
- (10) Compulsory meat inspection with reference to the prevention of disease.

SECTION 6 (A).—THE HYGIENE OF DWELLINGS, OF TOWNS, AND OF WATER SUPPLIES.

*List of Subjects.*

- (1) Provision of dwellings for the poor.
- (2) Homes for unmarried persons.
- (3) Reports on the results of the mechanical, chemical, and biological purification of sewage.
- (4) Recent experience of the separating system of water supplies.
- (5) The utilisation and removal of sewage sludge.
- (6) The influence of clarified sewage upon the condition of rivers.
- (7) New methods of filtering drinking water.
- (8) The sterilisation of water by ozone.
- (9) Experiments in connection with water collected by means of dams in valleys.
- (10) Modern appliances for lighting and their hygienic importance.
- (11) The importance of artificial ventilation.
- (12) The smoke nuisance in large towns.
- (13) The hygiene of public thoroughfares.

SECTION 6 (B).—THE HYGIENE OF TRAFFIC. LIFE-SAVING.

*List of Subjects.*

- (1) The health of those employed in connection with traffic.
- (2) The food supply for travellers, and its supervision.
- (3) The dangers of epidemic disease in the railway service, and their prevention.
- (4) The dangers resulting from the employment in the railway service of persons affected with nervous complaints.

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- (5) Injuries incurred in railway travelling, and their prevention.
- (6) First aid in the case of street accidents. First-aid organisation in general.
- (7) Medical co-operation in the preventive measures taken against the dangers of traffic.

SECTION 7.—MILITARY, NAVAL, AND COLONIAL HYGIENE.

*List of Subjects.*

- (1) The water supply for an army in the field.
- (2) Reports on inoculation against typhoid fever in the Army.
- (3) The examination of officers and men as to their fitness for active service in tropical countries.
- (4) The disposal of waste in military camps and in the field.
- (5) Wholesale poisoning of troops by adulterated food.
- (6) The relation between pulmonary tuberculosis and functional diseases of the heart in soldiers.
- (7) Ships infected with plague rats.
- (8) Sleeping sickness.
- (9) The malaria campaign.
- (10) Ventilation and heating on board ship.
- (11) Vaccination against small-pox in the Tropics.
- (12) On sanatoria in the Tropics.
- (13) The campaign against yellow fever.
- (14) The permanent sanitary supervision of ports.
- (15) Lavatories, baths, and water-closets on board men-of-war.
- (16) The regulation of the bodily temperature in tropical climates and in Naval service. Sunstroke.
- (17) The prevention of infectious diseases on board ship.

SECTION 8.—DEMOGRAPHY.

*List of Subjects.*

- (1) Death tables.
- (2) The duration of life of the population.
- (3) Statistics of infant mortality. Influence of food on mortality. Control of milk. Mothers' nursing.
- (4) Statistics of the movement of the population in the German Empire and statistics of plural births.
- (5) Statistics of families.
- (6) Statistics of recruiting.
- (7) Inland immigration.
- (8) Emigration and immigration.
- (9) The hygiene and statistics of schools.
- (10) Morbidity and mortality of different professions.
- (11) Statistical forms for the record of cause of disease and death.

- (12) Mortality and wealth.
- (13) Supervision of dwellings. Statistics of dwellings.
- (14) Comparison of registers of general mortality with registers of life, income, and pension insurance.
- (15) The frequency and the results of accidents.
- (16) The development of fecundity.

#### THE BACILLI OF THE TYPHOID GROUP.

The discussion on this subject was opened by Loeffler, who gave an account of the various members of the group, laying stress on the extent to which they varied with respect to pathogenicity. Going into the question of classification, he proposed to include them all in one family, for which he suggested the name *Typhaceæ*. After pointing out the morphological and cultural characteristics which were common to the whole of the family, he went into detail with regard to the distinguishing features displayed by the various members on such points as motility and the possession of flagella, indol formation, fermentation of different sugars, pathogenicity for experimental animals, and their effects with agglutinating sera. To distinguish them he recommended the use of two special culture media: one for the typhoid group, containing peptone, nutrose, lactose and grape-sugar, and coloured with malachite green; the other, for the paratyphoid group, being of the same constitution with the exception that it did not contain any grape-sugar. By means of their behaviour in these two media he divided the members of the Family into three groups or sub-families:—

(1) *Typha*.—He distinguished five forms in this group, and their special behaviour with regard to the two solutions is that they form no gas in either, and that they form a precipitate in the “typhoid” solution but not in the “paratyphoid.”

(2) *Josarceæ*.—Contains eight forms, which all decolorise the “paratyphoid” solution and form gas and foam in the “typhoid” solution.

(3) *Coleæ*.—Containing two members, which produce gas in both solutions.

Loeffler concluded by proposing to the Section the formation of an International Commission for the purpose of settling the problem. This was adopted, and five bacteriological institutes—three German, an Austrian, and a French—were approved as places in which the necessary observations should be carried out.

Lentz (Berlin) followed, dealing with the question more from its pathological side. The progress of events in both typhoid and

paratyphoid fevers was the introduction of the specific germs into the lymphatic circulation from the digestive tract. Multiplication of the germs takes place there and also in the mesenteric glands, spleen, and bone-marrow. Thence they are washed into the bloodstream, and pass through the liver with the bile and through the kidneys with the urine. Multiplication does not occur in the intestines, where, on the other hand, the germs are killed off. Passing to the differential diagnosis of the two fevers, he said that the only certain method was a bacteriological examination; they could not with certainty be distinguished by their clinical signs, owing to the great individual variations of the clinical picture in each disease. He next discussed the close affinities which exist between the paratyphoid bacteria and such organisms as *Bacillus typhi murium*, *B. suispestifer*, and *B. enteritidis* (Flügge-Kaensche). As regards the bacilli of meat-poisoning, he pointed out that the preliminary symptoms of intoxication, caused by the bacterial toxins contained in the meat, may be followed by a bacteriæmia similar to that of enteric fever and giving rise to similar histological changes, as seen at the autopsies. The bacilli of this group—of which Gärtner's bacillus is the type—are closely allied, perhaps identical, with the rat bacilli, such as the organisms of Dunbar, of Danysz, and of Issatschenko.

Courmont (Lyons) and Lesieur then spoke of the occurrence of paratyphoid fever in France, and said that properly authenticated cases were rare in that country. It was absolutely essential to make the diagnosis by means of blood cultures, as the serum reactions were very misleading.

Professor Babés (Bucharest) should have read the fourth paper, but was absent, and the discussion was then thrown open to the Section, and was contributed to by Chantemesse, Yhon (Vienna), Stern (Vienna), Uhlenhuth, Eisenberg and others. Most agreed on the necessity for bacteriological examination by means of blood cultures in the differentiation of typhoid and paratyphoid fevers, but there was a considerable difference of opinion as to the possibility of distinguishing them by clinical signs. Uhlenhuth said that paratyphoid bacilli were frequently to be found in pigs, and suggested this as a possible source of infection for man. Levy (Strassburg) stated that in paratyphoid fever the bacilli were to be found in the blood in three-quarters of the cases.

#### MODERN METHODS OF IMMUNISATION.

This important subject naturally attracted much attention, and gave rise to one of the longest discussions of the Congress.



The protagonists or *Referenten* were Wassermann, Bordet and Paltauf, and the discussion which followed the reading of their communications extended over two meetings of the Section, and was only concluded on the last day at 8.30 p.m.

In opening the discussion, Wassermann dealt principally with the various methods by which active immunisation may be produced. His communication was an excellent summary of most of the recent work in this branch, and was enriched by his own experience and criticism. His article did not lend itself to abstract treatment, but was one which would be well worth studying when published in full. In alluding to "opsonins," he considered them identical with the amboceptors of Ehrlich's theory.

Bordet, who followed, said that, on the whole, we had not made any great departure from the original principles of active immunisation, as enunciated by Pasteur. Much, however, had been done to investigate the causes of the failures and poor results sometimes obtained, and in this connection he emphasised the importance of "anaphylaxis," whose nature and mode of action is still obscure. An attenuated (living) virus is, theoretically, that from which the best results are to be hoped; but it has been found possible to employ this method only in a small percentage of bacterial infections. Another great difficulty, which is a serious barrier to further progress, lies in the uncertainty which still obtains as to which are the special immunising principles in a bacterial culture. This is particularly the case in tuberculosis, where the relative importance of the part played by the bacterial bodies on the one hand, and the diffusible products of the bacilli on the other, has not yet been accurately determined. On this account there have been a multitude of different vaccines suggested and employed in this disease, and in many others. Again, the special substances which appear in the blood of the immunised animals are very numerous; and we are in similar doubt as to the value to be assigned to each in judging of the efficacy of a given method of immunisation. In some instances the "sensibilisatrices" (amboceptors) are undoubtedly of great, if not of paramount, importance, but their importance in other diseases is by no means so clear. The question as to the possible identity of Wright's "opsonins" with either the amboceptor or the complement, is of great importance in this connection, and ought to be further investigated. [Note.—There appeared to be a general feeling, among the Continental bacteriologists with whom I spoke on this subject, that the "opsonins" were no more than the immune body or amboceptor under a fresh



name, but in most instances the reasons given were founded on theory, and not on personal experiment on this line.] He was inclined to attach great importance to the endotoxins, and he described some of the recent methods by which it had been found possible to withdraw these from the bacterial bodies. "Aggressins" he did not consider to be separate bodies, and he thought that their importance had been exaggerated. Another point on which we are in ignorance is as to what constitutes virulence. In the case of certain organisms, such as staphylococci, streptococci and anthrax, the possession of a capsule or sheath, by which they protect themselves against phagocytosis, seems to be the factor on which their virulence depends, but in many others nothing of this sort has been observed. In concluding he advocated, in the case of tuberculosis in particular, that investigations as to the best method of immunisation ought to be placed on an international footing, in order that the work might be better systematised and brought to a more speedy conclusion.

Paltauf (speaking for Calmette as well as for himself) discussed the intimate nature of the process involved in serum therapy. For him, the endotoxins play the most important part; they are to be regarded as toxic *antigènes*, and, when inoculated, give rise to the formation of anti-endotoxins; they are produced from the bodies of the bacilli, but may also be contained in the filtrates derived from bacterial cultures. For the preparation of an effective serum, its anti-toxic power is the important element, and the stronger this anti-toxic element the better the serum. In order to judge of the immunising efficacy of a serum, one is justified in drawing conclusions only from experimental results in the case of animals in which the disease assumes a form closely akin to that of the natural form of infection. The specificity of endotoxins is not as pronounced as that of antitoxins.

In the discussion which followed, Bail (Prag) spoke on aggressins and "aggressivity"; he stoutly maintained his original views on these subjects, in spite of the large amount of opposition with which they have met. He found little support, however, from the majority of the speakers who followed.

Kraus (Vienna) confined his remarks to the nature of the toxins and antitoxins concerned in the case of the cholera vibrio and the typhoid bacillus. It was possible to demonstrate the presence of an antitoxin in the serum of infected animals which was capable of neutralising the toxin, either in the body of the animal itself or *in vitro*.

The numerous others who spoke dealt with such problems as the "deviation of the complement," the chemical nature of bacterial toxins, immunisation with tuberculin, bactericidal leucotoxin, streptococci and anti-streptococcic serum, and other subjects.

#### THE SERUM THERAPY OF TYPHOID FEVER.

This subject was dealt with at one of the general meetings of the Congress by Professor A. Chantemesse (Paris). In his address he gave a most interesting account of his recent experiences in treating cases of enteric fever with the anti-typhoid serum which he has employed and advocated for some years past. The results which he announced were sufficiently striking to arrest general attention. During the last six years (1901 to 1907), he had treated 1,000 cases in his hospital at Bastion, with the extraordinarily low case-mortality of 4·3 per cent. This figure he contrasted with that obtained from the other hospitals of Paris during the same period, where, out of 5,621 cases, there were 960 deaths, or a case-mortality of 17 per cent. Apart from the employment of the serum, his treatment approximated to that of his colleagues in other hospitals, namely, the employment of the cool bath at 24° to 30° C. He insisted, with justice, on the fallacious nature of statistics which deal with small series of cases only, especially in view of the well-known variations of virulence in different epidemics, and he instanced from his own experience a series of 100 consecutive cases of enteric without a death. The figures which he gave had been obtained from the hospital registers themselves. Bearing these and other fallacies in mind, he had analysed the statistics of the fourteen Paris hospitals, which furnished the 5,621 cases which served as controls to his treatment, and he found that in no single instance did the mortality fall below 14 per cent., while, as above stated, the average was 17 per cent. Other results, as good or nearly as good as those of Chantemesse himself, had been obtained in the cliniques of others who had employed his serum. As to the possible influence of the cool bath treatment on the favourable case-mortality, he pointed out that he only used the cool and not the cold bath, at 20° to 22° C., as advocated by Brand. In instances where the latter treatment had been carried out on a large enough scale to make the results significant from a statistical point of view, the lowest case-mortality recorded had been 8 per cent.

The effects of the use of the serum on the symptoms and on the course of the fever are very striking and constant. Following on the injection of the serum there is in the first place a stage of

reaction, lasting from a few hours to five or six days. During this time the temperature does not undergo any modification from the ordinary type; it may even rise somewhat higher. Then follows the second stage, in which there is a steady and often rapid decline in the temperature curve, accompanied by a marked feeling of betterment in the patient himself—so much so that he may feel fairly well and find his appetite improving even at a time when the height of the fever necessitates the employment of two or three baths a day. Vaso-motor changes are also in evidence, the usual cold extremities and blanched face giving place to a more healthy condition, while the stupor disappears, and the general condition is much improved. The cutaneous hyperæmia often persists for some time, even into convalescence, and the general appearance of the patients is widely different from the type which is looked upon as being characteristic of this fever. The earlier the serum treatment is commenced the better, and Chantemesse stated that he had never lost a patient in whom the treatment was commenced during the first seven days of the disease. Started later than this the results are not quite so favourable, as the damage already done to the tissues cannot be put right so rapidly. Among other symptoms which follow the use of the serum, he mentioned that the blood pressure was raised (so that it was seldom necessary to employ cardiac tonics), the pulse falls with the temperature, there is also a marked increase in the quantity of urine, which occurs soon after the serum has been given, instead of on the establishment of convalescence as is usually the case. The most important changes, however, are those which occur in the tissues which are the chief sites of the bacterial struggle, the blood, the lymphoid tissues and the bone-marrow. A leucocytosis of  $\frac{1}{4}$  to  $\frac{1}{3}$  is usually seen, the mononuclear cells being those whose numbers are increased; the eosinophiles, which are always absent during an attack, rapidly reappear after the serum treatment has been started.

As to the significance of the blood changes which follow the serum injection, Chantemesse said that these were principally to be seen in the increased capacity of the leucocytes of the patient's blood for the destruction of the invading bacilli, and he made the remarkable declaration of his adherence to Sir A. E. Wright's views on immunity: "*Il s'est fait dans le sang du malade une opsonisation antityphoïde.*" The effect of the serum on the spleen is remarkable; exact measurements were made by means of the phonendoscope, and these showed that it increased appreciably in size after the injections, and he attributed to this hypertrophy an important part

in the origination of the beneficial changes which are found in the blood itself. In general, the duration of the fever is shortened and its severity is modified favourably by the use of the serum. In very severe cases, or in those in which the serum treatment has been commenced late, the fever may run a longer course, and its favourable effects appear to wear off after about eight or ten days. The *local* injection of a minute dose of the serum in certain forms of post-typhoid osteitis, or periostitis, he has found to be very beneficial in relieving the pain and bringing about rapid cure. Complications are few, as is indicated by the low mortality; and he has only had four cases of fatal hæmorrhage, which he thinks due to the employment of ergotin and calcium chloride. As regards perforation, he has never seen a case where he was able to commence the serum treatment before the seventh day, and this he thinks due to the effect of the serum in warding off damage to the intestinal mucosa, if given sufficiently early.

He next described the method which he had devised for the early diagnosis of enteric, by applying to this disease the principles of the ophthalmic reaction of tuberculin as introduced by von Pirquet and Wolff-Eisner for the diagnosis of tubercular affections. He was led to experiment in this direction on account of the importance of commencing the serum treatment at an early date, before help could be obtained from the appearance of the specific agglutinins. He gave a detailed account of the method which he employed in the preparation of the typhoid toxin used for the test, and described the manner in which this was carried out. Great accuracy is required in the dosage, and the proper amount is dropped into the conjunctival sac. At the end of two or three hours the effects of the toxin become manifest, and they attain their maximum in six to eight hours; they are similar in kind, but milder in degree, than those which follow the ophthalmic test for tubercle. The essential part of the reaction lies in the persistence of the irritation and injection of the conjunctiva for one or more days, which only occurs in true cases of enteric fever. He had never seen a true case fail to give this reaction, and had never seen other cases react for more than one day. In his experience, the test was a very valuable one, especially in view of the early date at which it could be carried out with positive results. He had never seen any permanent consequences. After describing anew the method by which he immunised his horses, and mentioning incidentally that the best sera he had obtained were from animals which it had taken several years to immunise, he went on to

describe his system of treatment. Doses of a few drops only are given, and, since the effects of the first dose last about ten days, he rarely finds it necessary to repeat the first injection; if a second proves necessary, he only gives about one-half of the original dose. The serum is injected hypodermically in the upper arm. He then entered into the problems of immunity involved in the use of his serum, and, as already mentioned, concluded that the most important part was of the nature of a reinforcement of the phagocytic action of the leucocytes and the fixed cells of the tissues against the invading bacilli.

After describing the progress of events in the case of animals experimentally infected, he went on to apply these results in an explanation of the probable action of his serum in modifying an attack of enteric fever in man. He showed curves of the opsonic power of the blood in mild and in severe cases. In the former instance he found that the curve remained above the normal for a month or more after convalescence. In the more severe cases the curve rises after the injection of the serum, but later and to a greater height, and there is thus brought about an intense destruction of the bacilli and a liberation of their toxins. This liberation of toxins may account for the production of the reaction which follows the use of the serum, and also indicates the necessity for the employment of very small doses, especially if a second one is found to be necessary. The cool baths, he thought, should always be combined with the serum treatment, as they help to support the system against the intoxication due to the destruction of the bacilli, and he thought that their use could only be dispensed with when a serum should be prepared which combined with its opsonising power a strong antitoxic action.

#### THE CAMPAIGN AGAINST MALARIA.

The discussion on this subject took place in the Section of Military, Naval and Colonial Hygiene, and, although it was apparently of little interest to the civilian members of the Congress, there was a good attendance of those whose duties take them into tropical countries.

The paper of Ross has appeared *in extenso* in the JOURNAL OF THE ROYAL ARMY MEDICAL CORPS. In it he gave an extremely interesting account of the progress of the anti-malarial measures which had been carried out in the British Colonies, as well as in Egypt, Greece, and Panama, pointing out the special features of each campaign and commenting on the varying degrees of success which had attended these efforts. In concluding he advocated that

the Section should pass a resolution pointing out the necessity for obtaining full and regular reports from malarious countries as to the prevalence and prevention of the disease; and he recommended the appointment of special commissioners for this purpose, in order to correlate and superintend the work. At the end of the meeting this resolution was declared to be carried, but there appeared to be some doubt on the matter, as it was put to the meeting at the same time as another resolution on a different subject.

Galli-Valerio spoke of the introduction of malaria into Switzerland by the Sicilian navvies, who came to work at the tunnels, and went on to discuss the various preventive measures which might be put into force. These he divided into five groups: (1) The destruction of the parasites in the blood of sufferers; (2) the immunisation of men against the parasites by means of quinine given prophylactically; (3) the protection both of the sick and the healthy against mosquito bites by means of nets; (4) the destruction of mosquitoes and their larvæ; and (5) the removal of the various causes predisposing to malarial infection. He pointed out that each case must be decided with reference to the local conditions, and that at times only a few and not the whole of these measures could be put into force. He advocated the sale of a pure form of quinine to the people, and, if necessary, its free distribution by the Government. It was essential in every case to complete the campaign by educating the people in a knowledge of the manner in which the disease is caused and spread, and in the necessity for the various measures which were undertaken for their benefit.

Celli then spoke on malaria in Italy and on the measures which had proved most successful in controlling the disease in that country. The destruction of mosquitoes had not proved to be practicable in the case of large tracts of swampy country, and in such cases they relied chiefly upon net protection, both of houses and individuals. The prophylactic use of quinine he looked on as excellent, especially as it was on the youngest forms of the parasite that it was found to work most quickly and thoroughly. He described the steps taken by the Italian Government to secure the distribution of the drug among the peasants, and he put special stress upon the form in which it was taken, advocating its being given in sugar-drops or in the form of chocolate tablets. The various measures possible did not exclude but supplemented one another.

Savas, of Athens, discussed the question as it affected Greece, classifying the various alternatives according as they were possible of immediate application or such as would take a long time to



organise and carry into effect. In the latter class he placed such measures as drainage of swamps, regularisation of river-beds, afforestation, &c. In the class of those measures which might be carried out at once, he placed the education of the people in the nature and method of infection, the sale of quinine and the control of quinine prophylaxis by the Government, and the granting of legal powers to compel the sanitation of small collections of water near houses and small villages.

Ruge then dealt with the problems which the Germans have had to face in their African Colonies, laying stress, in common with the previous speakers, on the need for deciding on the necessary measures with due regard to the local conditions. He discussed in detail the methods by which the systematic administration of quinine could be best controlled and from which the best results were to be expected. It ought to be taken for at least two months subsequent to an attack of fever. In cases of malaria which occur in those who have been taking quinine regularly, he found that the disease ran a milder and more regular course and was less likely to be followed by blackwater fever. Neither net protection nor mosquito destruction had, as yet, been carried out to any great extent, but in some instances had given excellent results.

The discussion which followed brought no very new facts to light, and the same may be said of the original papers themselves; but it was interesting to hear how the problem of malaria prevention was viewed by workers from so many different countries, and satisfactory to gather that there was a general agreement as to the efficacy of the methods in general use, if conscientiously carried out.

#### MODERN METHODS OF COMBATING TYPHOID FEVER.

In opening this discussion Frosch (Berlin) said that, in endemic typhoid, infection was most commonly spread by contact, and the dangers were very greatly increased by the mild ambulatory cases and by those who, in convalescence, continued to void typhoid bacteria in their urine or their fæces. Bad hygienic surroundings also favoured the spread of the disease. Drinking water he regarded as only of secondary importance, and he did not think that it accounted for many cases; the chief danger, he thought, was in connection with the retail supply of milk. In the case of certain trades where there was a large amount of going and coming among the workers, there was a constant danger of the importation of fresh cases. In attempting to stamp out the disease, all the typhoid "carriers" must be detected and isolated, and attempts



must be made to improve the general hygienic conditions of the inhabitants as far as possible.

Almquist (Stockholm) strongly advocated the adoption of Koch's method in its entirety, and thought it could hardly fail to stamp out the disease if thoroughly carried out. He mentioned that in Sweden they have provided a travelling typhoid laboratory, containing all the equipment required for dealing with an epidemic, which, on notice of an expected outbreak, is at once sent to the threatened district.

Schneider (Saarbrücken) thought that such a campaign ought to include a war against allied bacteria and paratyphoid, dysentery and the like, as well as against Eberth's bacillus. He advocated a thoroughly organised system of dealing with the problem, the details of which he had evidently thought out with great care. Among these may be mentioned the proposed formation of a number of special laboratories throughout the danger zone, whose staff should undertake the diagnosis, the investigation of the probable cause, the enquiry into the sanitary environment of cases, and everything pertaining to the epidemiology of the outbreak. The staff should be large enough, and the allotted district small enough, to allow of one of their number being despatched at short notice to investigate each case on its being reported. He laid stress on the necessity for uniformity in such matters as the instructions to be given as regards prophylactic measures, the system of reporting cases and of compiling accurate returns, and of maintaining touch with the other laboratories. He also suggested that they should undertake research work in connection with the prevention and treatment of the disease. He strongly advocated the isolation of all cases, and said this could best be done in hospitals, and if more hospitals were required for the purpose, such should be provided by the State, which should also be prepared to pay for the cost of admitting and treating poorer patients. For those who could not be taken into hospital, trained sick attendants ought to be provided. The scheme should also provide for the training of a body of professional disinfectors, and for their effective supervision by the staff. The prophylactic measures adopted in each case should only cease when bacteriological recovery has been proved. He would not suggest the keeping of obstinate "carriers" in hospital longer than ten weeks on account of the expense involved, but would then discharge them after thoroughly warning them of the danger they were to others, and instructing them in the measures of personal cleanliness which they must adopt. Stronger measures would,

however, be necessary in the case of individuals concerned in the distribution of food, and in the case of prisoners or lunatics confined in asylums. He emphasised the importance of securing the co-operation of the local physicians, and the need for supplying them gratis with the necessary outfit for sending material to the laboratories for examination.

#### ANKYLOSTOMIASIS.

Löbker (Bochum) said that infection in this disease occurred either by entrance of the encapsulated larvæ through the mouth, or, when the capsule had been got rid of, through the skin. He pointed out that the majority of persons who are infected show little in the way of symptoms, as these are slight unless there are a large number of parasites present in the intestine and the condition is aggravated by the age of the individual, the long duration of the infection, and other factors. The disease may be cured spontaneously, provided the man is not exposed to fresh infection. Treatment directed to the expulsion of the worms will also cure, and the same treatment used prophylactically will prevent infection. For the effective checking of the spread of the disease it is necessary to make a careful search for all the carriers of the parasites. Extracts of *Felix mas* and thymol are reliable drugs, but must both be given with care as neither is quite free from risk.

Bruns (Gelsenkirchen) next described the measures which had been successful in checking the spread of the disease in certain mines in Rhenish Westphalia. These measures were chiefly directed to the detection of all men who were harbouring the parasites. This, he said, could only be done by the systematic examination of the fæces of every miner, as by far the larger proportion of carriers were found to be men apparently in good health, who were not showing any of the symptoms of the disease. The main centres of infection are the heaps of excrement in which the encapsulated larvæ develop, and he did not think that the larvæ were capable of travelling far from the site in which the ova were deposited. They might also be carried away from the spot by water, but he did not believe that a sudden spread of the disease in epidemic form had ever been caused by water, and he protested strongly against the abandonment of the system of irrigation of coal mines, which has so beneficial an effect in lessening the dangers of explosions of coal-dust. All the men who were found to harbour the worms were isolated, and were not allowed to return to work until they were cured. The men were also instructed in the causation of the disease, that they might guard against infection

as far as possible, and also prevent others from becoming sources of danger, by defæcating in open places. Closets must be provided both above and below ground, and kept in good sanitary order. As an instance of what may be done by thorough and repeated examination, in combination with the other measures which he advocated, he mentioned the case of a mine in which 2,200 men worked; 35 per cent. of them were found to be infected, but by application of the above principles this incidence dropped to 0.1—0.2 per cent. In some mines the whole gang of workers were examined ten to fifteen times in succession. The system entailed heavy pecuniary sacrifices both on the owners and on the men, and it was only by the willing co-operation of both parties that such successful results could be obtained.

Conti (Cremona) then read a paper on much the same lines, and advocating the same measures, namely, the systematic and repeated examination of all workmen to detect those who harboured the parasites, and the keeping of such infected men away from work until they were proved to be free from the disease. Thymol he regarded as the best remedy, but it was sometimes necessary to give it in large doses of 8-10 grammes, and to extend the treatment over a long period, possibly some months. Among other points he advocated the compulsory use of machines in brick-making, to lessen the dangers of contact of the clay with the skin, and the use of quicklime for the disinfection of excreta.

The next paper was by Malvoz (Liège) and was read for him in his absence by Delbasteille. It described the state of the question in the Belgian mines, where a careful examination had disclosed that 26 per cent. of the whole mining population were carriers of the parasite in 1902. In 1903 a systematic campaign was started, every carrier was subjected to treatment, and no owner would engage a man unless he had a certificate to say that his stools had been microscopically examined. The men were treated in special dispensaries and educated in personal hygiene before returning to duty. The incidence has now fallen in the Liège district to 5.5 per cent. He mentioned further that indemnities had been granted to sufferers by the Province for their compulsory abstention from work.

#### THE COCCI OF MENINGITIS AND ALLIED BACTERIA.

von Lingelsheim (Beuthen) spoke of his experience of epidemic cerebro-spinal meningitis in Upper Silesia in 1904 and 1905. He confirmed the original description of the meningococcus given by Weichselbaum, and went into detail as to its morphological and

cultural characteristics. The coccus he found was very readily killed by desiccation and difficult to sub-culture. It required for its cultivation a medium containing an albumin of relatively high constitution, such as blood serum or ascitic fluid, and he mentioned that it was always best to use a transparent medium, as the growth on these enabled the coccus to be more readily differentiated from the allied organisms, which are found in such abundance in the naso-pharynx. The morphological characters and the intra-cellular situation of the cocci by themselves were quite insufficient to distinguish the organism, which must be submitted to cultural tests as well. He then proceeded to give the cultural distinctions between the meningococcus and the following organisms, for which it might be mistaken: the *Diplococcus crassus*, the *D. mucosus*, the *D. cinereus*, and the *D. flavus III.* In addition, the *Micrococcus catarrhalis* and the *D. flavus I.* and *II.* had to be taken into consideration. He then spoke on the value of the agglutination test with a specific serum, and alluded to the possibilities of the method of fixation of the complement, which had not yet been sufficiently tried.

Ghon (Vienna), who followed, classed the meningococcus among the micrococci; and testified to the stability of its cultural and other reactions, which, in his opinion, marked it out sharply as a distinct species. He had seen no evidence of the "mutability" of character described by other observers, and considered the organism of Weichselbaum to be the specific and sole cause of a special form of meningitis, which was met with not only epidemically but also in sporadic form. The usual channel of entry was the nasal cavity, and it might exist there in saprophytic form or give rise to a manifest inflammation. Such inflammation may remain localised or may extend to the meninges, even in the absence of previous disease of the nasal fossæ or of the cavity of the tympanum. Two other organisms which are very closely allied species are known to be pathogenic for man, the *M. catarrhalis* of Pfeiffer, and the *M. gonorrhœæ* of Neisser. There are, however, a large number of non-pathogenic organisms which closely resemble it and make the differential diagnosis of the meningococcus a matter of considerable difficulty, which can only be decided upon when all the cultural and biological tests are taken into consideration.

In the short discussion which followed no very striking new facts were brought out, but Buchanan (Glasgow) gave an interesting account of the isolation of the meningococcus from contact cases of cerebro-spinal meningitis.

(*To be continued.*)