in rat plague as viewed from the epizootic standpoint. Thus in Sydney the plague among rats in any district was in its progress slow, long drawn out, and even insidious, and it was exceptional for large numbers of plague rats to be found in one place. The result is that rat plague might easily be overlooked in places where the search cannot be, or is not, systematically and thoroughly carried out. Dr. Thompson therefore emphasises as a very important practical rule that the discovery of a single infected rat should be taken as peremptorily indicating the most thorough scavenging and cleansing of the neighbourhood in which it was found. As regards the species of rat, he attaches no greater importance to one than to the others, all being susceptible. The prospective immunity of Europe, which is frequently based on the supposed lesser susceptibility of the *Mus decumanus*, thus apparently falls to the ground. Dr. Thompson believes that while plague may be casually acquired by man in several ways the flea is the ordinary agent of infection. He, however, admits that the importance of this mode of infection has still to be established by observations in the field of daily life. He evidently has not much faith in the efficacy of preventive measures against the flea but as the rat is the *fons et origo* of the infection in man he thinks the rational method of defence lies in so improving the construction of buildings as greatly to impede the entrance of rats to them and in so taking care of food that it shall not attract them. The report is full of observations and recommendations that are excellent and useful. The impression which is gathered from it is that plague is the easiest epidemic disease possible to deal with. That may have been, and indeed seems to have been, the case at Sydney but it is questionable if it is always so in different circumstances. For this reason it may be doubted whether the measures recommended would be either sufficient or applicable to largely infected areas in India, Europe, or America. We note that there is no reference to Mr. Haffkine's prophylactic.

THE annual meeting and dinner of the Association of Public Vaccinators of England and Wales will be held at the Hotel Metropole, Leeds, on Friday, Oct. 25th. The meeting will take place at 4 P.M. and the dinner at 6.30 P.M. Any further information can be obtained upon application either to Dr. Arthur Drury, Landon House, Halifax, or Mr. Charles Greenwood, 1, Mitre Court Buildings, Temple, London, E.C.

THE Department of Public Health of Queensland, in a bulletin dated Sept. 7th, states that no case of plague has occurred in Brisbane since July 26th but that one fatal case was reported on Sept. 4th from Cairns. The patient was a woman, aged 24 years, employed as a laundrymaid at an hotel. Two infected rats were found under the floor of the laundry.

THE Hamburg Scientific Society is sending two members of the Institute of Marine and Tropical Diseases to Amani in German East Africa to study sleeping sickness, relapsing fever, tsetse disease, and other diseases of human beings and the lower animals due to protozoa. Dr. Keysseltz and Dr. Martin Mayer have been selected for this service.

KING'S COLLEGE HOSPITAL.—The forthcoming bazaar to be held at the Camberwell Baths in aid of the fund for the removal of King's College Hospital to South London will be opened by their Royal Highnesses the Duke and Duchess of Connaught on the first day, Oct. 29th. Fancy dress will be worn but the costumes will not be confined to one period, as in the case of the Elizabethan fair and fête held last year. The official name of the bazaar is "Ye Olde Camberwell Fayre." It is a sort of revival of an institution that was held annually in the Middle Ages. It is just 50 years since the last fair was held. The large bath will be transformed into a realistic representation of a street in old London.

THE MODE OF SPREAD AND THE PREVENTION OF PLAGUE IN AUSTRALIA.¹

BY J. ASHBURTON THOMPSON, M.D. BRUX., D.P.H. CAMB.,
PERMANENT HEAD, DEPARTMENT OF PUBLIC HEALTH,
GOVERNMENT OF NEW SOUTH WALES.

Preface.

THE way in which plague spreads is one and the same everywhere. If it has seemed to be not identical in all countries, I think that the observed differences are casual and dependent on local habits. Man plays no part in it. Plague epizootic in the rat is the essential factor in the diffusion of this disease and in the production of its epidemic form, but the infection of the plague rat cannot be commonly communicated to man except with the help of an intermediary. The efficient intermediary is the flea, which infests the rat and occasionally attacks man after its proper host has died. Prevention of epidemic plague consequently lies in habitually maintaining a distance between the rat and man, for measures directed against the flea can have scope only in special circumstances. The requisite separation between rat and man will be better secured by improving the construction of buildings than by attempts to exterminate the rat. These conclusions were deduced solely from epidemiological observations made in favourable circumstances at Sydney in 1900 and 1902; they have since constituted the principles on which all efforts towards the control of plague in New South Wales have been directed. They were first published in July, 1903, and they have now been confirmed by the experience of the subsequent years.

Report.

Australia escaped invasion by plague until after the disease had appeared at the capital of New Caledonia (1), an island which lies a thousand miles from Sydney, in the fourth quarter of 1899. The infection entered by way of Sydney, where attack in the first case occurred on Jan. 19th, 1900. But the people had been threatened from the time plague appeared at Hong-Kong (2, 3), and their danger was apparently increased when it began to prevail at Bombay (4) and at Mauritius (5), for with all these ports Sydney has communication in the way of trade, which in the case of the two former places is regular and frequent. In Sydney the population of about 500,000 was wholly white, wholly civilised, spoke the mother-tongue of the observers, and had been well trained in obedience to the peremptory discipline of the health authority in the course of several epidemics of small-pox which had been summarily suppressed during the preceding 20 years. The first outbreak (6) lasted from January to August, 1900, and consisted of 303 cases. A plague-free interval of 15 months ensued, terminated by the commencement of a second outbreak (7) in November, 1901, which lasted till June, 1902, and which consisted of 139 cases. It will be noticed that the numbers of cases were on the one hand large enough to avoid observational error, and on the other not so large as to cause embarrassment.

[Dr. Thompson here discussed in much detail the household distribution of the patients in the two epidemics. He also brought forward arguments adverse to the old view that healthy persons might be directly infected by plague patients, and continued as follows:]

All this evidence thus checked appears to me decisive and to warrant a general rule—namely, that the *epidemic* spread of plague occurs independently of communication of the infection from the sick and that the infection of plague spreads by means which are external to man and independent of his agency as subject of the disease.

It then fell to be inquired in what the infectiveness of locality consisted. A possible explanation was at hand. From antiquity it had been observed that rats sometimes died in numbers in places where man died from plague; and after 1894, when it was first made possible to identify the disease in the rat with the disease in man (8), this coincidence was more regularly recorded. It was even observed occasionally that the rats suffered first. But whether the rat infected man, or man the rat, and whether both did not acquire the disease independently of each other from some source which

¹ An abstract of a report to Section V. of the Fourteenth International Congress of Hygiene and Demography, held at Berlin, September, 1907. (The parenthetical numbers occurring throughout the report refer to the bibliography at the end.)

was common to both, remained undetermined. In the meantime this clue had been taken in hand at Sydney, and an attempt had been made to follow it through the maze which apparently contradictory observations had gradually woven. It was noticed first of all that the infection might suddenly manifest itself on new areas which were separated by wide tracts of plague-free houses from any other area up to that time infected and might there set going a sub-epidemic which would run its complete course independently of the course of the disease on other areas. This showed that the infection could be harmlessly transported over inhabited districts of wide extent, be planted afar, and there could take effect. It is also worth noting here that while a very short line of wharves at which the produce trade (hay, grain, chaff, potatoes, bananas, &c.) is carried on has always been the immediate source of the local infection, all the sub-epidemics referred to began either at produce stores or at stables to which produce had been carried from the neighbourhood of those wharves. It was further noticed that the connexion between the infection and locality was transient and that the simplest operations of the scavenger cleared the infection away from houses as well as from districts once for all. Mere sweeping up and destruction of accumulated rubbish, the pulling down of a few ruinous outhouses, and a general cleansing of alley-ways and basements sufficed, without any disinfection properly so-called. By these observations attention was forcibly redirected to the rat as the cause, for they were at all events most completely explicable on the supposition that the infection was diffused by some animal which was free to wander among the dwellings of man but which had access to the interior of only some of them.

By following the direction thus pointed out I found that the required close association between plague rats and man did exist in the small number of cases which constituted the outbreak of a later year (9). There were but 12 cases, spread over the seven months March to September; they occurred in nine buildings. In the small central area where the epizootic had begun before the first case occurred, seven of the buildings stood well, or even widely, separated from each other; the other two were situated at long distances from it, the one six miles towards the south and the other ten miles towards the north. In the two last-mentioned neighbourhoods no plague nor any suspicion of infection had ever existed, and the only feature by which they were distinguished from the rest of the metropolitan district (save the central area) was the ascertained presence of plague rats and of cases in the two buildings. So also the central area was distinguished from the rest of the metropolitan area (save the two distant neighbourhoods) solely by the presence of plague rats and cases in man in the seven buildings, and of plague rats unaccompanied by cases at other parts of it. The link by which these three widely separated neighbourhoods were thus connected was also definitely discovered. Materials which experience has shown to be especially dangerous in connexion with the introduction of plague into clean places—namely, hay, chaff, and corn in the one case, and gunny-bags and similar wastes to be used in paper-making in the other—had been conveyed to the two houses from premises on the central area which were ascertained to be infected with plague in their rats. This instance should not be undervalued because the number of cases to which it relates is small. In epidemiological investigations accuracy and completeness are the essentials; large numbers introduce confusion and soon render the method impracticable. As it was, the time and labour entailed by quasi-detective inquiries into the circumstances of the patients at home, at work, and at leisure, into those of the businesses with which they were connected, into the state of the rats on premises occupied or frequented by them, into the state of the neighbourhood of the premises as to rat infection and as to freedom from it, and the establishment of dates by documentary evidence whenever possible, from time to time unduly taxed the attention of a staff not exclusively devoted to the investigation of plague.

As a rule, plague among rats in any district is so far from possessing a devastating character that its progress is slow, long-drawn out, and even insidious. The disease picks out individual rats, affects a minority of the horde at any one time, and exhibits its activity only in comparatively small circumscribed areas which are successively attacked. On individual premises I have occasionally found almost the whole colony dead; but this has been exceptional, and even there the rule has been that few plague rats and many more

healthy rats have been collected during consecutive weeks. I have already published several examples (10, 11) of this which left little doubt of the fact, but the evidence was not perfectly good since it was impossible (save in one of those examples) strictly to exclude repeated invasions from the generally infected neighbourhood. Nevertheless, I can show from the cases of two ships that it was probably entitled to its *primâ facie* value; and the chronicity of epizootic plague (not as disease but as epizootic) seems to me a circumstance of so much importance in relation to plans for the prevention of plague that I shall describe at some length the illustrative cases presented by two ships.

The first example (12) is that of the troopship *Antillean* which sailed from Capetown on Feb. 1st, 1901, after having lain repeatedly alongside in the docks at South Arm. She first touched at Albany, Western Australia, where plague has never existed, lay there in the stream for about 48 hours from Feb. 20th, and sailed again for Sydney direct after having taken in a little coal. On Feb. 22nd cleansing of the holds was begun preparatory to her arrival and the reception of troops, and during these operations about 15 carcasses of rats were discovered and cast overboard; no definite statement as to their condition was got, but they were not dried up. She arrived at Sydney on March 2nd and reported one deck-hand sick; his case was clinically plague, the disease was identified by morphological, cultural, and inoculation tests, and he died on the fifth day of illness. The rats on board were destroyed by sulphur fumes and, as the vessel was in ballast, no difficulty was found in completely gathering their carcasses; the total number was less than 100. The great majority was free from disease; more than two, but very few, were infected. In one of the two plague was identified by morphological, cultural, and inoculation tests, and was ascertained to be present in the other by morphological and cultural tests. At Capetown (13, 14) history of unusual mortality among the dock rats reaches back to the middle of December, 1900, and the first identified plague-rat was collected there on Feb. 4th, 1901. On Feb. 27th, 1901, occurred the first case of the epidemic, which, as is well known, comprised 766 cases; but inquiry revealed (in all probability) two earlier cases, of which the first dated back to Jan. 4th. It may be taken, therefore, that the infection present on board on March 2nd may have been active since a short time before Feb. 1st when the ship sailed, but had certainly begun to take effect before Feb. 22nd; yet a majority of the few rats carried were in good health, and this notwithstanding that the single store-room must have been a centre of attraction for all the rats.

The second case (15) is that of the barque *Alsterschwann*, 2500 tons, which left Buenos Ayres on May 17th, 1903, after having shipped a full cargo of maize in bags at Rosario, and which arrived at Sydney direct on July 19th. When this vessel got alongside many carcasses were found beneath the hatches; but as the latter had been specially closed tightly with some idea of saving the cargo from deterioration it was supposed by the master that these rats had been stifled. Nevertheless the occurrence came to notice and it was learned that 112 carcasses had been gathered and disposed of. The result of the search then carried out was the collection of 51 rats and carcasses of rats, all of which turned out to be healthy except two, in which plague was identified by morphological, cultural, and inoculation tests. Then, after a first fumigation with sulphurous-sulphuric fumes, a further and larger number of carcasses were collected and examined, among which, however, plague was identified in nine only. This search was necessarily more or less superficial, for the cargo was still in the holds, but after a second fumigation the barque was taken alongside and unloading allowed to begin; a great many more comparatively fresh carcasses were afterwards turned out, but the fact of plague infection having been fully established already further examinations were not made. Plague first appeared at Rosario (16) in September, 1899. The infection must have been carried on board the barque during 74 days, notwithstanding which a large majority of the rats which were examined were still free from plague.

General experience ashore, as distinguished from that derived from particular premises, was to the same effect. Thus the length of the epizootic periods in each of the four years 1903 to 1906, reckoned from the first day to the last day on which a plague rodent was identified, was 4, 9, 11, and 11 months respectively. The total number of rodents examined during each of these terms was 14,671, 43,822, 28,446, and 27,731. Although there were exceptions

they may be regarded as having been all taken on the same small area of the city, and they were collected by the rat intelligence staff in a regular way, the numbers brought in week by week having been approximately uniform. All of them were examined in the laboratories and plague was identified in 161, 243, 141, and 174 of them.

When whole blocks of houses have been taken in hand and systematically cleansed no remarkable number of rats ever has been turned out. When that course has not been taken then the difficulties in the way of securing plague rats, save in small number, have lain in the fact that only healthy rats, active in their search for food, are likely to be, and as a rule are, trapped, yet trapping is the only means available to an intelligence staff, for systematic poisoning no more leads to discovery of carcasses than does plague itself.

In all these circumstances, it will be perceived, rat plague might easily be overlooked in places where the search cannot be, or is not, systematically and thoroughly carried out. From all this a very important practical rule derives—namely, that the discovery of a single infected rat should be taken as peremptorily indicating the most thorough scavenging and cleansing of the neighbourhood in which it was found. Rarely will the labour entailed have been spent in vain. The case is quite different with an imported case in man; that, as we have already seen, calls for no action in respect of the neighbourhood.

The species of *Mus* met with at Sydney are *Mus decumanus*, *Mus rattus*, together with its Alexandrine variety which it is unnecessary further to mention separately, and *Mus musculus*. These comprise all which have become domesticated. Plague has been identified in all of them and in such numbers as shows, I think, that the proportions of each species enumerated in any year depended rather on local distribution than on any difference in susceptibility.

I will now proceed to consider the manner in which the infection of plague is communicated from the rat to man. The ways which may so frequently come into operation as to cause epidemic prevalences are but two—namely, inoculation and feeding; but it is quite certain that the infection of man is not commonly brought about by feeding, and it seems to me that this conclusion rests securely on the general pathology of the disease.

The same pathological evidence strongly supports the more generally received opinion that the infection is taken by man by inoculation. Indirect evidence is furnished by the observation that the frequency with which buboes appear in this or that region of the body is closely proportionate to the extent of the drainage area from which the lymph which is filtered in the glands of those regions has been drawn (17). The bubo is the characteristic lesion of plague and is seen in all those cases in which resistance to the infection has been sufficiently strong. Its absence merely shows that resistance was defective, either absolutely or in relation to the dose or to the strain of the inoculated virus, and when the bubo does not form then primary septicæmic or primary pneumonic plague results. The bubo appears where the assault on the body was first delivered and was most strenuously resisted, and it is distinguishable from the general glandular enlargements which later occur in every part of the body by the vastly greater damage done to the gland. All the lymphatic glands ultimately exhibit some rosy tumefaction; but one, or rather often two or three adjacent and immediately connected glands, alone show evidence of the violent struggle just mentioned in hæmorrhage, necrosis, and periaidenitic effusions, and they alone indicate the area of skin into which the virus was inoculated.

Inoculation into the skin might be effected in two ways. The virus may be deposited by the rat or by man on inanimate objects with which the skin of healthy man may come into contact. Such conjunction is not sufficient to infect, as is seen from the impunity with which post-mortem examinations are habitually made unless the skin happens to be wounded. The uninjured skin is an efficient defence against infection by casual contact with the virus. These considerations have long been entertained, and originally it was thought that the preponderance of buboes in the groin among unshod people resulted from absorption of the infection through the wounds commonly present on undefended feet. But at a very early stage comparison between shod whites and unshod natives exposed on the same area showed that buboes in the groin preponderated among the former just as they did among the latter. So in 1900, I observed that out of 286 habitually shod persons who exhibited

buboes no less than 73 per cent. had them in the groin (18). Casual inoculation through pre-existing wounds of the skin of the lower extremity is therefore not the reason why buboes are most commonly found in the groin.

In 1902 I proceeded to inquire into the way in which man came to be inoculated in the course of daily life by the same method as had yielded the results already described in connexion with other points and to seek some explanation of the fact that such inoculation takes place in the lower extremity more frequently than elsewhere (19, 20). First, I found that 106 of the 139 cases of that year exhibited buboes in the groin. But as buboes in the femoral chain alone are evidence of inoculation in some part of the lower extremity, 46 cases in which they were situated in the inguinal chain had to be thrown out; 60 remained. But the majority of these 60 were for various reasons not available for my purpose. Thus, in 16 of them either the place at which they were infected could not be determined or the evidence for infection at home and at work was equally cogent, while in 25 others it was considered that the infection had been received at home, where, consequently, the patients had been exposed at bedtime to the risk (if any) attaching to bare feet which it was necessary to exclude. In four others the general history of the patients was defective; and in still three others, although infection probably did take place at work, the evidence was considered to be not quite unimpeachable. The result of this rigid sifting was the rejection of 48 of the 60 cases, so that ultimately 12 remained in which solitary buboes situated in the femoral chain were exhibited by persons whose movements had been ascertained with certainty and who beyond reasonable doubt were infected while at work. At their workplaces they were all fully clothed. But their skins were not completely protected by their clothes. Their hands and arms, their faces, necks, and (as the weather was hot) often their chests too, were exposed; only their lower extremities were invariably protected by boots, socks, and trousers or petticoats. Yet they were inoculated not in their exposed parts but in their protected parts. The deduction was almost obvious and quite unavoidable. Inoculation must have been effected by some agent to which neither clothes nor the epithelium offered insurmountable obstacles, by some agent which could evade the one and which could penetrate the other without causing either noticeable pain or a visible wound. The flea alone answered these requirements. Moreover, within buildings fleas live in the dust between flooring-boards and in corners outside them in the soil, and notoriously reach the legs first in places where they abound.

When these observations were first published (1903) there was very little experimental evidence that the flea possessed even the power of communicating plague between animals. It was limited to Simond's successful attempts in two experiments out of four made with an undetermined species of flea (1898), and the five successful experiments reported five years later by Raybaud and Gauthier (21, 22), which were made with the species *Ceratophyllus fasciatus*. Against these rare successes were to be set the greatly larger number of failures reported by several competent observers, and from my own laboratory. Since then, possession of this power by the species *Pulex cheopis* (Rothschild) has been placed beyond dispute by the First Report of the Plague Research Committee which was appointed as the outcome of representations made by the Lister Institute to the Secretary of State for India in 1905, and which is still working in India under the direction of Dr. Charles J. Martin, F.R.S., Director of the Lister Institute (23). It may be expected that in the next report the committee will be able to define the conditions under which this power is exercised, both in relation to species of fleas and to mechanism. Probably all fleas share it on condition that they are of kinds which infest rats and sometimes attack man. This is the more likely because the position of the bacillus among the schizomycetes seems to connote a merely mechanical transference of the infection by the flea, but, on the other hand, my field-observations seem to me to require duration of the power to infect over considerable, and even over rather long, periods (25). In conclusion, on this head I would point out that although the experimental demonstration thus furnished is essential and may be accepted as affording ground for inferring that the virus can also be conveyed by the same means from lower animals to man, yet the importance of this mode of infection as a factor in the production of epidemic plague can be established only by observation in the field of daily life. I conclude

from the investigations which have just been described above that while plague may be casually acquired by man in several ways the flea is the ordinary agent of his infection, and it as well as the rat is indispensable to produce epidemicity.

It is not possible to discuss this subject in detail within the limits assigned on the present occasion, but a few leading points can be mentioned.

In the first place, notwithstanding that plague is not *maintained* by communication of the infection from the sick, yet it is communicable from them and occasionally is seen to be so communicated. Further, although such communication from them as occasionally takes place cannot by itself give rise to epidemics, the following consideration is entitled to weight, namely: Since plague can be and generally is communicated from rat to man by the flea, so it must be possible for it to be communicated from man to the rat, an accident which might bring about an epidemic. But the frequency with which this risk will be encountered depends first on parasitic infestation of the patient, secondly on his proximity to rats, and thirdly on his disease having reached the septicæmic stage. These are chances which must weigh importantly in all countries against communication of the infection from man to rat, although in some they may have less influence than in others. Plague in the rat is almost always a septicæmic disease, but in man the primary septicæmic form occurs much less often than the bubonic, yet any bubonic case may become septicæmic shortly before death, and many do so. My own experience has furnished little which pointed to transference of the infection from the sick even to man when the circumstances have been fully discovered, but nevertheless every case of plague should be segregated, and I note that every case has always been and still is segregated at Sydney within a few hours of notification. Never have I had reason even to suspect that the infection had been communicated from man to rat.

Secondly, it would seem that preventive measures should be directed not only against the rat but against the flea, and this course has been advocated. I think it evident that it cannot be taken with hope of practical success save in special circumstances. They are these: When plague rats have been found in a dwelling or other building which is about to be cleansed the first thing to be done is to spray the floors very freely with a 5 per cent. solution of coarse carbolic acid or an equivalent solution containing mixtures of the tar acids. This is a very effectual method of driving away and of killing fleas and thus of avoiding the only risk connected with the cleansing of plague-infected premises. The residuum left from the distillation of kerosene is also efficacious for this purpose, but it is a stinking and oily substance of which the use is limited by those qualities. For the rest, it seems to me that effort to destroy fleas, which cannot be successful, must divert attention from the rat, or at least divide it. Now the flea derives its importance from the rat, and although it wanders to some distance after its host has died still the direct attack should be upon the rat. The rat is the *focus et origo* of the infection for man. When the difficulty of staying the infection by action directed to the rat is considered, and, above all, the impossibility of staying it within so short a period of time as shall effectually avoid the danger to man, I think it will be perceived that the rational method of defence lies in so improving the construction of buildings as greatly to impede the entrance of rats to them, and in so taking care of food that it shall not attract them.

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THE INTERNATIONAL SOCIETY OF TROPICAL MEDICINE.

ON the occasion of the Fourteenth International Congress of Hygiene and Demography which has just taken place in Berlin there was a meeting of the members of the Congress who are especially interested in tropical medicine. The meeting was held on Sept. 27th in the Altbaiern Restaurant and was largely attended. The following motions were adopted:—

1. The object of the International Society of Tropical Medicine is to bring together the societies of tropical medicine of different countries for the purpose of an exchange of views between the societies.
2. With this object congresses of tropical medicine are to be held about every three years.
3. The time and place where these congresses are to take place shall be determined by the committee of management.
4. The committee of management shall for the present consist of representatives of different countries, each national society of tropical medicine electing two representatives.
5. The committee of management shall meet in London within one year to consider further arrangements which may be necessary.

The meeting was attended by the following gentlemen resident in the various countries named or in their colonies:—

Brazil: Dr. Oswaldo G. Cruz (Rio de Janeiro), Dr. S. de Magalhaes, and Dr. da Rocha-Lima.

France: Dr. Borel (Havre), Dr. J. Dupuy, Médecin Sanitaire Maritime (Saint Nazaire), Professor Hugo-Marcus (Nice), and Dr. F. Mesnil (Institut Pasteur, Paris).

Germany: Privat-docent Dr. F. Doflein (Munich), Professor Fülleborn (Hamburg), Dr. Giemsa (Hamburg), Dr. Max Hartmann (Berlin), Stabsarzt Dr. Lion (Bamberg), Dr. Mense (Cassel), Professor Morgenroth (Berlin), Marine-stabsarzt Dr. Mühlens (Wilhelmshaven), Regierungsrath Professor F. Neufeld (Berlin), Professor R. O. Neumann (Heidelberg), Medizinalrat Professor Nocht (Hamburg), Physikus Dr. M. Otto (Hamburg), Professor A. Plehn (Berlin), Dr. S. Prowazek von Lanov (Hamburg), Marine-Generaloberarzt Professor Ruge (Kiel), Marine-stabsarzt (retired) Dr. L. Sander (Friedenau), Privat-docent Dr. P. Schmidt (Leipzig), Oberstabsarzt Dr. E. Stendel (Grosslichterfelde), Marine-stabsarzt Dr. zur Verth (Charlottenburg), Privat-docent Dr. von Wasielewski (Heidelberg), and Marine-Oberstabsarzt Professor H. Ziemann (Cameroon).

Great Britain: Fleet-Surgeon O. W. Andrews, R.N., Dr. A. Breinl (Liverpool), Captain W. F. Harvey, I.M.S. (Pasteur Institute of India), Lieutenant-Colonel W. B. Leishman, R.A.M.C. (London), Sir Patrick Manson, F.R.S. (London), Lieutenant-Colonel W. G. Macpherson, R.A.M.C., Professor G. H. F. Nuttall, F.R.S. (Cambridge), Dr. F. M. Sandwith (London), and Lieutenant-Colonel D. Semple, I.M.S. (Central Research Institute of India).