practitioner is the most familiar, but I doubt if it is generally remembered that failure to comply with the requirements of the Act renders him liable to a penalty of 40s. One of its requirements is that the notification shall be sent to the medical officer of health "forthwith" on his becoming aware that the patient is suffering from an infectious disease to which the Act applies. It is not unusual for these notices to be received some days after the medical practitioner has become aware of the nature of the disease, sometimes they are post-dated, and occasionally they are not sent until a reminder has been received from the medical officer of health. It is not necessary to point out that unless the notification is sent "forthwith" the main object of the Act is completely frustrated. This is one of the few instances in which the Legislature recognizes the fairness of remunerating the medical practitioner for his services.

I wonder how many medical practitioners know that, if called in to visit a patient suffering from lead, phosphorus, arsenical, or mercurial poisoning, or anthrax, contracted in any factory, he is required by the Factory and Workshops Act, 1901, to send to the Chief Inspector of Factories a notice stating the full postal address of the patient and the disease from which, in his opinion, he is suffering, for which he is entitled to the fee of 2s. 6d. Failure to send the notice forthwith renders him liable to a penalty of 40s. Under Section 123 of the same Act, where there is no certifying surgeon for a factory, the Poor-law medical officer is to act as the certifying surgeon, and it is to be presumed, is entitled to the fees (although this is not stated in the Act) upon the scale set forth in a schedule to the Act; the fee for each person examined is 6d.

The Housing of the Working Classes Act, 1890, which I think I am not exaggerating in describing as a huge failure, falls back upon the medical practitioner when the medical officer of health has failed in certain of his duties or has acted in opposition to the opinion of a certain number of the ratepayers, and if the medical practitioner agrees with the ratepayers his representation is to be acted upon, and not that of the medical officer of health (vide Section 16). This is a curious arrangement for settling a difference between the ratepayers and an official of the local authority.

In considering the various statutes already referred to, which only partly represent the duties, either voluntary or obligatory, falling to the lot of the medical practitioner, there are two points that need special notice; one is that where in the Act it is stated the medical practitioner "may" do so and so, no reference is made to his remuneration; another, that where the duty is prefixed by the word "shall" a prescribed fee is usually mentioned, but always with the warning proviso of a penalty for non-compliance. In other more recent statutes, such as the Midwives Act of 1902, and the Births Notification Act of the present year, the medical practitioner may be called upon to discharge difficult or onerous duties requiring much skill, and possibly at much personal inconvenience, for which no payment whatever is provided. Indeed, in the Births Notification Act, not only are the duties obligatory and without payment, but non-compliance renders the medical attendant liable to be summoned before a court of justice, where a fine of 20s. may be imposed upon him. Surely here we have the last straw to break the camel's back! and the meekness shown by the profession in omitting to protest vigorously against it, is the measure of our present state of helplessness. No other section of the community has ever been so treated by the Legislature.

One reason, and probably the chief, in explanation of the medical practitioner being so frequently referred to in the Public Health Act of 1875 is that at that time sanitation was in its infancy. There were then no medical officers of health or inspectors of nuisances except in the larger boroughs, and all the work that had previously been done in the way of preventive medicine was for the most part at the initiative of the medical practitioner. It was but natural, therefore, that he should be constantly in the minds of the framers of that Act, and that his opinion and advice in the matters then under consideration should form the basis upon which the Act was to be constructed. With the appointment, however, of paid officials for every district throughout the country whose duties it should be to attend to these matters, it became equally natural that the medical practitioners should leave work

which brought neither popularity nor remuneration to them, entirely to these officials; and thus it came about that thenceforth we find them apparently taking so little interest in it. Sentiment and a spirit of philanthropy are all very well, but after all, the medical practitioner has to live, like other people, and he cannot be expected to bestow valuable time upon an object with which he may nevertheless have the fullest sympathy.

The medical profession is unfortunately so weakened by its own internal differences and jealousies that it is absolutely at the mercy of the Legislature, and not of the Legislature only, but also of all public bodies, institutions, co-operative societies, and even of the public itself. Whilst our expenses are increasing year by year, and whilst our neighbours have been demanding and obtaining higher and higher remuneration for their services, a persistent and ever-increasing pressure is being put upon the medical man to obtain from him more and more work for less pay. It is time that these facts were brought home to the minds of that minority of the profession who occupy the higher ranks, and whose exalted position hinders them from acquaintance with the grievances of their poorer brethren. Some years ago the condition of the Poor-law medical officers in Ireland was investigated and reported upon by a Commissioner specially appointed by the BRITISH MEDICAL JOURNAL, and anything more heartrending and deplorable than the position of most of these men as described by him it would be difficult to depict. Even in this country at the present time the average earnings of the general practitioner amount only to a sum of £200, or a little more, per annum, out of which he has to keep his wife and family, for many object to an unmarried man as the family medical attendant. The age limit is also short; under 30 he is often thought to be too young, and over 60 too old. This means that there are some 10,000 or 12,000 hard-working men in the prime of life whose incomes are less than £200 a year—how much less we need not stop to inquire.

The medical profession is strong in numbers; its benefits to mankind were never more highly or more widely recognized than in the present day. Would that its power and deserts received the same recognition! I am afraid this will never be until by some means we become more united as a body. We do not want union as the trades-unionists appear to understand it. The glory of the medical profession has ever been its altruism, and its self-sacrificing spirit, but organization we must have if we are ever to present a strong and united front to all those, whoever they may be, who would for their own selfish ends, not only withhold from us the reasonable dues to which we are entitled, but who would also reduce us to a position of social inferiority.

The title of this paper forbids that I should occupy further time with my own personal views upon this important subject, but I would invite your attention to the excellent address of Dr. H. J. Campbell, Chairman of the Bradford Division of the Yorkshire Branch of the British Medical Association, which you will find in the SUPPLEMENT to the JOURNAL of November 9th.

A. PLEA FOR THE STUDY OF BACTERIOLOGY. BY THE GENERAL PRACTITIONER.

BEING THE CHAIRMAN'S ADDRESS TO THE SWANSEA
DIVISION, BRITISH MEDICAL ASSOCIATION.

By J. ARNALLT JONES, M.D., D.P.H., J.P.,

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BACTERIA are classified according to their shape into:

1. *Cocci* or spheres, and these may exist singly or in pairs, in fours, in chains, or in clusters, hence the names diplococci, streptococci, staphylococci, etc.

2. *Bacilli* are rod-like bodies.

3. *Spirilla* are twisted like corkscrews.

All these are members of the vegetable kingdom and belong to the lowest order of plants; they are really fungi, and consist of protoplasm enclosed in a definite membrane of cellulose resembling in character the woody fibre of trees.

They multiply by fission, each individual cell dividing into two, and the two daughter cells take the place of the

original parent cell, and although the parent has lost its identity, yet there has been no death and no dissolution; the bioplasm of the parent exists in the progeny, and settling aside accidents, bacteria are immortal, and under favourable conditions they can multiply so rapidly that sixty generations may be developed in thirty hours; indeed it has been estimated that a bacillus dividing once every hour would in twenty-four hours have increased to 17 millions, and the mass in three days would weigh no less than 7,500 tons.

During the last quarter of a century we have witnessed the rise and progress of the modern laboratory. There are now established bacteriological and zymotechnical laboratories imparting instruction in the study of yeasts and mould fungi, agricultural stations, foresting, and dairy schools, and so on—all indications of our latter-day progress, and demonstrating that utility is the one powerful incentive of modern specialization.

Different bacteria have different missions, and commercially some are of the utmost importance, for without them there would be no fermentation, and the wine, beer, and indigo industries would suffer, and the ripening of cheese and like processes would not occur.

Municipal bodies in the treatment of sewage harness for their use myriads of bacilli, and set them to work on the sewage in septic tanks, converting the sewage into a harmless and innocuous residuum, and a liquid effluent which can safely be admitted into running streams of water.

A good type is that which is in use at Exeter; the plant is twofold, consisting of a septic tank and several cultivation or bacteria beds.

The septic tank is a closed underground vault, with a capacity proportionate to the population; that of Exeter receives the sewage of 1,500 inhabitants, and contains nearly 54,000 gallons.

At the entrance is a submerged barrier forming a grit chamber to arrest gravel and coarse detritus, the remaining solids pass on to the tank, from which light and air are excluded as far as possible. At the bottom of the tank is sediment, on the top floats a thick scum, and here the bacteria break down the organic compounds, making them soluble. The bacteria at the bottom of the tank work only in the absence of air (anaerobic); they effect the liquefaction and digestion of the sewage, and generate numerous gases in the small masses of organic matter, causing them to rise. The bacteria on the surface are aerobic and denitrifying, converting ammonia into nitrites and nitrates. The sewage is broken down by a process of digestion until all the organic matter is in solution, and this process goes on continuously without rest, for the incoming sewage replenishes the supply of organisms.

The next stage is the distribution of the sewage from the tank into the half-dozen cultivation or filter beds by an automatic arrangement, which fills each tank in turn. In these beds oxidation takes place through the agency of aerobic nitrifying bacteria, with the result that the ammonia lessens, the oxidized nitrogen increases as nitrites and nitrates, and the total solids and organic nitrogen almost disappear. In these cultivation beds, to maintain the vigour of the nitrifying organisms, definite periods have to be allotted for labour, for rest, and for refreshment, so each bed is given 6 hours to fill. It remains resting for 6 hours, it is given half an hour to empty, and rests empty for 11½ hours.

The word "fermentation" usually recalls the ordinary processes concerned in the brewing of beer and making wines and spirits; but we must not forget that the word comprises all decompositions or alterations induced by the life-activity of fungi—one kind of fungus aids us in the disposal of refuse, another helps to prepare our drinks.

Alcoholic fermentation is the oldest bacteriological experiment. Through Hansen's work at Carlsberg, Copenhagen, the brewer can now work with yeasts of uniform type, and he has learned to know the diseases of beer and how to treat and avoid them. The destruction of timber by fungi is due to an enzyme produced by them. A bacillus converts a sterilized decoction of the indigo plant into indigo sugar and indigo white, the latter then oxidizing to form the indigo dye, whereas a sterile decoction without the bacillus produces no indigo. A special bacillus is concerned in destroying a portion of the flax and hemp plants which enables us to use the material for

commercial purposes. In tanning, the steeping of skins in water involves bacterial action by which the hair and surface skin are removed; the bacillus is introduced by the pine bark, and is responsible for the proper acidification of the tanning solution and is much valued in the making of certain leathers.

Bacteriology plays a prominent part in the dairy. Milk is a great transmitter of disease, and there are few of us who have not seen enteric fever, scarlatina, diphtheria, or tubercle conveyed by its agency, and if we accept the statement of a Continental authority that each time we eat a slice of bread and butter we devour a number of bacteria equal to the population of Europe, then we have good grounds for demanding information as to what these bacteria are and what they are doing. The souring of milk is caused by lactic acid bacteria. Originally, when left to itself, the process often went wrong, because other putrefactive bacteria were present. Now, on Weigmann's suggestion, pure cultivations of lactic acid bacteria are employed, and all goes well in butter-making. A few years ago Storch found that the peculiar aroma of a good butter was due to a bacterium, which he isolated, and Weigmann has now cultivated two races, one of which produces an excellent flavour and aroma, but the butter keeps badly, while the other develops less aroma but has good keeping qualities. In America pure cultures of a bacillus which develops the famous "June flavour" hitherto met with only in butter of certain districts during a short season of the year, has been isolated, and this fine flavoured butter is now prepared constantly in scores of American dairies, and perhaps a hundred years hence our Welsh farmers will do likewise.

Properly considered, the manufacture of cheese is a form of microscopic gardening even more complex than the brewing of beer. From the outset the cheese-maker guards and cools his milk, till his stock is ready, and does all he knows to keep down the growth of germs; he then adds rennet and the curd is treated as a medium, on which with the necessary precautions, fungi and bacteria are grown, protecting them against the inroads of animal and plant pests, against unsuitable temperature, moisture, access of light, etc. Having succeeded in growing the right micro-organisms on his curd, his art then demands that he shall stop their growth at the critical period, when his cheese is ready for the market. For instance, to the well-known Roquefort cheese is added a certain fungus (*penicillium*), which is cultivated on bread, and by its growth destroys the lactic acid formed by the first relay of bacteria; this neutralization of the acid enables another series of organisms, which were inhibited by the acid, to grow, and gives the peculiar flavour to the cheese.

In agriculture, bacteria are particularly useful. As in the septic tank, so here, we find organic matter acted on by one set of bacteria which split up the complex organic substances into simple chemical bodies, the final type of which is ammonia; then the ammonia compounds are attacked by a different set of organisms, which convert the ammonia groups into nitrites, and then another group of bacteria convert the nitrites into nitrates. These are the nitrifying bacteria, which it is proved can fix the free nitrogen of the atmosphere, and render it available for plant food. On the roots of leguminous plants, such as beans and peas, little tubercles or nodules may be seen arranged in clusters and attached to the roots—these nodules contain millions of bacteria, which absorb nitrogen from the air and give it to the plant to which they are attached, and, after the wants of the plant are supplied, they still continue to absorb more nitrogen and store it in the ground to enrich future crops. This is why plants of the pea, bean, vetch, and clover class are of such great value in the rotation of crops; they fertilize the soil for succeeding plants—the sequence is turnips, barley, clover, wheat; and here practice has been ahead of science. So progressive are the Americans that they collect these nodules on a large scale and sell them (nitragin) for the inoculation of poor soils, with wonderful results.

So much for utility; but before now bacteria have threatened the prosperity of a country. Take the cases of the silk industry and sheep farming in France. Both were threatened with extinction by pébrine attacking the silkworms and anthrax the sheep, but the genius of Pasteur stemmed both plagues and restored both these valuable industries to their former prosperity.

Bacteriology only touches animal pathology at a few points, and it should be recognized that the majority of organisms are not unfriendly to man. With regard to the germs of disease, or pathogenic organisms, Koch has laid down certain "postulates," which must be proved before the connexion between an organism and a disease can be admitted:

1. The organism must be found in the tissues, fluids, or organs of the animal affected with, or dead from, the disease.
2. The organism must be isolated and cultivated outside the body on suitable media for successive generations.
3. The isolated and cultivated organism, on inoculation into a suitable animal, should reproduce the disease.
4. In the inoculated animal the same organism must be found.

In some diseases—for instance, leprosy—from difficulty in isolating and cultivating the micro-organisms, we have to be satisfied with the fulfilment of the first postulate only.

In the middle of the last century the mortality in the surgical wards of hospitals was positively appalling, and Lister, availing himself of the discoveries of Pasteur, pointed out to the world that the reason surgery was handicapped was the parasitic infection of wounds by the exposure to certain baneful influences of the part injured or operated on; so antiseptics were employed to get rid of the infected material and kill the micro-organisms. This was the antiseptic era of surgery, and it has been followed by the aseptic era. Our aim now is not so much to kill the germs as to exclude their entrance. The sources whence the micro-organisms of suppuration may pass to the wound are numerous, and that is why the modern operating surgeon is armed *cap-à-pie*, as it were—in sea-boots, with a sterilized overall, wearing a veil like an Oriental beauty, to ward off from the wound the dangerous germs which escape from his nose, throat, and mouth when breathing, talking, and coughing; his hands well scrubbed, soaked in antiseptics, and gloved; his instruments, towels, swabs, and dressings thoroughly sterilized—all admirable and necessary precautions to ensure success.

Surgeons have availed themselves of the knowledge of immunity to which bacteriologists have contributed so much—they recognize the importance before operating of raising the resisting power of the patient, by insisting on rest and increasing nutrition, and they recognise how harmful is the influence of lowered nutrition on the recovery from major or even minor operations, as in cases of diabetes and granular kidney. So, again, susceptibility to infection (as the reverse to immunity) has received attention from surgeons in the operative manipulation of cases of malignant disease—a person with cancer is susceptible, obviously enough, to a disease which has a local origin, hence in operating, a surgeon who has had cause to incise a growth during the operation does not now continue his dissection with the same knife and forceps, and enlarged glands are treated as delicately as possible so as not to extrude their contents mechanically by the efferent vessels. So, again, in operating on a carbuncle, most surgeons would cut it out in preference to scraping it away with a sharp spoon.

The value of a knowledge of bacteriology in general practice is seen when dealing with aural and nasal discharges after scarlet fever or diphtheria as sources of infection; and as suggestive of a past infection, especially when such acute sequelae occur as lateral sinus thrombosis on a suppressed aural discharge, a continued fever of endocarditis or ulcerative endocarditis after pneumonia, after enteric fever abdominal symptoms from suppurative cholecystitis due to invasion by the *B. typhosus*, or acute periostitis of a long bone from the same cause years after the attack of fever.

Any obscure case of fever may have a previous infection as an etiological factor, found only when inquired for, and the practitioner who is on the alert and alive to the possible pathological sequelae of any given infection will diagnose more cases successfully, and be able to treat them more efficiently, and certainly will make fewer mistakes, if fortified by a knowledge of bacteriology.

Anthrax is a disease which receives much attention from every student of bacteriology, for it was one of the first in which the causal agency of bacteria was proved; it is a disease which was known in the time of Moses, and Rome was visited by it in 740 B.C. In 1849 Pollender found the characteristic rods in the blood of animals

suffering from anthrax, and in 1863 they were described by Davaine, and the disease attributed to them; and in 1876 Koch isolated the bacilli in pure culture. The bacillus is a sporing bacillus, but the spores are only produced in the presence of free oxygen, and so are formed only outside the body. They may infect a farm for many months, and, indeed, may cling to the land for years, because the spores are so resistant that they can stand a brief period of boiling, and immersion in 5 per cent. of carbolic or 1 in 1,000 perchloride for quite an hour, whilst the bacilli without spores are readily killed at 54° C. in ten minutes. When an animal dead of anthrax is buried earthworms (as Pasteur pointed out) can re infect the pasture by bringing up spores from the buried corpse.

The disease attacks herbivorous animals mostly, but the Barbary sheep is immune, and so are cats and white rats. Fowls and frogs are naturally immune, but Pasteur communicated the disease to fowls by artificially lowering their temperature by standing them in a bath of cold water, and frogs were given the disease by keeping them in warm water at 35° C., both examples of overcoming a natural immunity by lowering the powers of resistance.

The genius of Pasteur discovered that by inoculating an animal with a cultivation of anthrax, attenuated by growing it under unfavourable conditions, so that its virulence was modified, it could be protected against a subsequent inoculation with virulent bacilli. He prepared an attenuated culture by growing it at 42° C., so that after twenty-four days it would kill neither rabbits nor sheep, and this he called his "*premier vaccin*," and by growing the bacillus under similar conditions for half the time (twelve days) he obtained the "*deuxième vaccin*." He injected 5 drops of the *premier vaccin* into the sheep, and twelve days later 5 drops of the *deuxième vaccin*; fourteen days later an ordinary virulent culture was introduced without evil result, a good example of acquired immunity.

The world will always be indebted to Pasteur for what he did in connexion with rabies. He discovered: (1) That the virus was not only in the saliva, but in the central and peripheral nervous system, yet absent from the blood; (2) that the disease was most readily inoculated in the nervous system; (3) that the virus could be attenuated; and (4) by these means preventive and curative methods could be adopted. He failed to detect a specific microbe, though it is highly probable one exists. He found that by drying the spinal cord of an infected animal, its virulence lessened day by day so that on the fifteenth day of suspension the cord was practically innocuous and non-virulent. When treatment is commenced a small portion of a fourteenth-day cord is used so make an emulsion or vaccine, about 3 c.cm. of which is injected into the flank. The next day a thirteenth-day cord is used, and so on until a rabid cord emulsion of the first three days has been injected; the dose finally depending on the urgency of the case, whether bitten through the clothing, on the bare skin, or on the face or head.

Pasteur's treatment of rabies is therefore a vaccination of attenuated virus resulting in antitoxin formation to the further protection of the subject against rabies. It was my privilege to be a witness of the funeral of Pasteur. Being a Grand Officer of the Legion of Honour the huge garrison of Paris turned out to do him honour and lined the streets to Notre-Dame, and I could not help being impressed by the way his compatriots honour and respect men of science in contradistinction to the scanty recognition they receive in Britain, and by the genuine mourning of a great city for the noblest and most brilliant of her sons. His name will ever live in the splendid series of discoveries by which he enriched science and benefited mankind.

We speak of bacteria as the cause of infective disease, but as one authority puts it, when one strikes a match to light a fire the match is in a sense the cause of the fire, but the fuel must have been laid properly, and be dry, or no fire results. Now the tubercle bacillus is the cause of phthisis in the sense that the disease could not be set up without it; but there must be a receptive and susceptible soil on which it can grow and flourish, or no disease will occur. We all know how the tubercle bacillus runs riot when it gains a lodgement in the lungs of diabetics, because the sugar in the circulating blood stream favours germ growth, and the powers of resistance of the patient are lowered by an exhausting disease.

The ordinary strong healthy man does not present a soil suitable for the growth of the bacillus, but there are certain individuals and families who do, and even those not naturally predisposed may become so by living under unhealthy conditions such as overcrowding, bad housing, lack of ventilation, fresh air, and sunlight, and insufficient food—factors which render the body a suitable soil for the growth of the *B. tuberculosis* by lowering the vital resistance of the individual; they are the predisposing causes and the bacillus the exciting cause, and what applies to phthisis applies to most other infectious diseases also. In dealing with tuberculosis it can be seen that it is possible to wage war against infectious disease in a manner different from that usually followed, to trouble less about the bacteria, and more about the health and vital resistance of the population; and experience shows that the mortality from phthisis, and indeed the incidence of any given infectious disease, may be reduced by methods which bacteriology suggests.

In the care of phthisis our first aim should be to reduce the sources of infection from human beings and animals. The segregation of human beings is not possible on an extensive scale, but a great deal can be done by the education of patients to destroy all infective material, especially those who as parents are liable from their position to pass on the infection to their children. During a visit to Brighton I was enabled to see what good Dr. Newholme, the medical officer of health there, had been able to do by taking the phthisical poor into the borough sanatorium for a short period, not only for treatment but also for education. The early detection of the bacillus is important in the diagnosis of phthisis, for the earlier the disease is recognized the better both for the patient and the public. To reduce the sources of infection from animals close inspection of all slaughter-houses should be made by competent and trained inspectors, and private slaughter-houses should be abolished. All cows supplying milk should be tested by tuberculin unless their sound health is beyond suspicion, and all animals should be properly housed. Dairies should conform with modern sanitary requirements, and be subject to frequent inspection; the common methods of distributing milk call for urgent reform.

The study of immunity has taught us to raise the powers of resistance of the population by placing it in their power to obtain cheap and good food which has been properly inspected; by preventing overcrowding, and seeing that the habitations of the people have good window area, are well ventilated, and free from damp; and that all people work under sanitary conditions.

Some bacilli—for example, those of diphtheria and tetanus—have the power of generating a poison or toxin. You are all familiar with the preparation and have used diphtheria antitoxin, and know how healthy horses are prepared by injecting into them at first weak preparations of diphtheria toxin, daily increasing the strength of these injections, until finally they become immune to diphtheria; the horses then are bled, and the serum collected, tested, and preserved. This serum is antitoxic only, and not antimicrobial, for the bacillus will flourish in it; therefore it is necessary to treat the throat antiseptically, although antitoxin has been injected.

In like manner tetanus antitoxin has been prepared, and Calmette has produced an antitoxic serum for snake-bite by injecting horses with increasing doses of snake venom, with excellent results, both in laboratory work and in man.

There are no doubt great possibilities awaiting bacteriologists in connexion with the treatment of disease by antitoxins; they have only to labour and to wait, and there will be few locked doors for which they will not be able to produce a key.

Pneumonia is a specific fever, and two micro-organisms are associated with it—one the pneumococcus of Fränkel, the other the bacillus of Friedländer, which is only present in about 3 per cent. of the cases. The pneumococcus is always present in the mouth and air passages, and in the pulmonary alveoli, even of healthy persons, but it never invades the tissues as long as the individual is in good health, vigorous, and strong; but let him get depressed by a chill, exposure to cold and wet, deprivation of food, or exhausted, as soldiers are after defeat, short rations, and harassed retreat, then the vital resistance is lowered

and the pneumococcus effects an entrance through the alveolar walls into the pulmonary tissues, so producing inflammation of the lung.

Stall-fed cattle often get pneumonia, especially when kept in close, ill-ventilated, and dark sheds, whilst cattle kept in the open never get it; their powers of resistance are improved through living in the open air.

The bacteriology of enteric fever is full of interest. The Widal reaction aids the bacteriologist in deciding, from a blood examination, if the patient is probably the subject of the disease. The *B. typhosus* is a motile organism, and the test depends on the fact that the bacilli, when brought in contact with the diluted blood serum of an enteric patient (especially after the first week of the disease), first become immobile, and later are gathered into clumps, just like rallying squares to receive charges of cavalry—a feature which can be watched under a high power in a hanging drop—and this agglutinative property of typhoid serum extends long into convalescence.

The diseases which dog the footsteps of our brethren in the tropics are cholera, plague, and malaria, the remedies for which are: For cholera, the tea kettle; for plague, the rat trap; and for malaria, the mosquito net.

What science can do in the way of preventing disease was afforded a brilliant practical illustration in the recent Russo-Japanese war. Major Seaman, of the U.S. Army, in his report pointed out that the Japanese medical officer was invariably found in the first screen of scouts, with his microscope and chemical reagents, testing and labelling wells, so that the army following should not drink contaminated water. When they reached a town inquiry was made as to the presence of cases of infectious disease, and if found a cordon was placed around the infected quarter. The medical officer examined all flesh, fruits, and other articles of food for the troops, with the result that little dysentery and fever developed. In the vast force of General Oku engaged in that war there were less than 200 cases of enteric fever, and less than 400 of dysentery, and only 40 deaths; whilst by contrast in the Boer war we lost more than 13,000 men from preventable disease alone.

The development of the tropical areas of our great Empire depends largely on the progress of our profession; this is at last recognized by the State. The formation of schools of tropical medicine in London and Liverpool is the outcome of this recognition by the State and by broad-minded merchant princes like Sir Alfred Jones and others. The institution of a Chair of Protozoology in the London University is a happy omen for the future, as was also the calling together of the late international conference for the stamping out of sleeping sickness.

In preventive medicine, as in war, the principle is that every defensive disposition should look to offensive action—mere defence is absolute ruin. "In the long run," said Napoleon, "no position whatever can be defended if it does not threaten the enemy." We have to learn not only how to treat the wound but also to annihilate the enemy inflicting it. In the study of bacteriology there is much to please the student; there is a pleasure in watching motile bacilli rushing hither and thither in a hanging drop, just as we delight from a bridge to watch a shoal of minnows in the stream below.

It is manifestly desirable that the general practitioner should be able to find out for himself the presence of the specific pathogenic organisms in cases of diphtheria, phthisis, enteric, malaria, gonorrhoea, etc. If one has time for it, it is a refreshing recreation, and our sporting instincts appreciate the pleasure of hunting down these micro-organisms and bringing them to bay.

The object of this address is to stimulate my fellows in general practice to take up the study of bacteriology, even if, as in my own case, they only touch the fringe of it.

THE Royal Mail Steam Packet Line have again this year organized a series of winter tours to the West Indian Islands, the choice open in point of expenditure both of time and money being a wide one. The shortest tour takes thirty-three days, and the longest ten weeks. This season the fleet which is devoted to this service has been strengthened by the *Orcy* and *Magdalena*, which hitherto have been on the Australian and River Plate services. A description of the possible tours is contained in an attractive pamphlet, which contains a good collection of maps of the various islands.