MICROBES.

By "THE NEW DOCTOR."

E are bored to death with microbes now-a-days! We can scarcely take up a morning paper without reading one or more episodes of microbe life. Yesterday an Italian scientist discovered the microbe of old age, and to-day an enterprising Yankee has suggested an infallible cure for the same complaint. To-morrow all this will be disproved, and some Englishman will pronounce the astounding "fact" that a human being is himself a collection of microbes, living peacefully together when he is in health, but causing disease and death when they start quarrelling.

And some persons believe it all. They read all this sensational padding, and what they firmly believe to-day, because they saw it in print, they will disbelieve to-morrow when the whole thing is refuted. And they go on from day to day, and from year to year, alternately believing and disbelieving until they give the whole subject up in despair and at last say, "I really do not know the truth."

It is a grand thing to say, "I don't know," when asked a profound question which you have not thoroughly studied. It clearly indicates an amount of fortitude and truthfulness which but few of us possess. And we are forced to say it, though it goes sorely against the grain, that of all people medical men are the least inclined to say, "I don't know." Whereas, as a matter of fact, it is the only legitimate answer that can be given to most abstruse medical questions.

"I don't know." What an ignorant man you would think your doctor if he gave you this answer when you asked him what was the matter with you. Would you not search the neighbourhood till you found a man who would say, "Oh, yes, I know what is the matter with you. You have got something in your blood"? Would you not at last feel comfortable and think him a very clever man, to be able to diagnose your complaint? And suppose his diagnosis is wrong, you will never be any the wiser.

Sir William Gull once said (and no man who ever lived had a greater knowledge of the social side of medicine than he) that the public liked a little hypocrisy. A wag sitting next to him said, "Say rather, doctor, that the public likes to be *gulled*." And this has now taken its place amongst medical aphorisms. "The public likes to be gulled." And unfortunately there is no doubt that it is true.

When a new country is discovered, wild stories of its fabulous wealth and enormous resources are soon spread abroad and believed in, until the country is thoroughly explored. And then the pendulum swings the other way, and the place is pronounced a desert of value to no one. But in time the true wealth of the country is recognised, and the land, which was first an El Dorado and then a wilderness, becomes a country of great resources and an enormous boon to the civilised world.

And so it is with every new science. And with the newest science it is more so than it has been with any other before it, for it attempts to solve the unfathomable mystery of the cause of disease.

The science of bacteriology is in its infancy. It is now a promising child, but it needs a strict education to thoroughly wean it from the fictitious elements which are already assailing it.

We have said that bacteriology is a new science. It is not yet thirty years since the first microbe was seen by living eyes. But it did not spring into existence unexpected. The first disease germ was not discovered by accident: its presence beneath the microscope was not a chance. No; it was looked for, it was expected.

Long before we knew that disease was caused by microbes, the conviction had been forced upon us that such must be the case. We watched the infectious fevers which are always with us; we watched the plagues, which at irregular times have decimated our species; how, starting we know not where, they attack first one and then another absolutely healthy person; how they spread definitely from one person to another along definite lines; how a perfectly healthy man goes home in the evening, finds his wife ill with the plague, catches the disease and dies the next day, and we said, "Can anything in the body do this? Can so rapid a process be a degeneration or a perversion of the body or its members?"

And our answer to it has always been, "No! It is, it must be, an infection from without."

Are not the symptoms of the infectious diseases exactly like those due to poisons, which we know find their way into the body from without? The symptoms of cholera are so similar to those of poisoning by arsenic that it is not always possible to tell the one from the other.

And in the face of these facts could we doubt that the infectious diseases are poisons introduced from without? But the poisons must be very virulent ones, and, moreover, they must be capable of increasing within their host.

And so the first microbe was discovered by a man who sought for it. The germ which was first discovered was the organism which causes pustules on the face. The matter from an acne spot had been examined for years to find out if there was a living organism within it, but the reasons why the germ was not discovered till the latter half of this century were, first, that no microscope had been made powerful enough to render it visible to the naked eye; and secondly, the organism being absolutely transparent, it could not be seen until it had been stained.

And the man who first saw this germ, what did he see? A collection of exceedingly minute rounded bodies without any obvious structure. He therefore named the germ "Micrococcus," which means "little berry." From that day bacteriology became a living science.

Not long after this discovery many fresh facts were ascertained about this "Micrococcus." It was found that it would grow like a fungus upon gelatine in a sterilised tube, and that whenever it found its way into the human body, it produced inflammation.

We cannot further trace the history of this most important and interesting science of bacteriology. We are writing this account in order that you might understand something about the greatest of all dangers to your physical health, so it behoves us to turn to the study of the germs themselves.

We have said that the science is in its infancy, and though it is not thirty years old, it has already been so hampered by theoretical and utterly false matter that it is impossible for anyone save a practising physician to sift the facts from the fictions.

Therefore have we taken it upon ourselves to tell you in as simple language as is possible something about microbes. We will tell you the truth and nothing but the truth. We are only going to put before you what to the best of human knowledge can now be called fact.

And it is first necessary to know what these germs are. They are not animals as is usually supposed, but they are the lowest forms of plants.

Another vastly important point is, that not one microbe in a thousand is capable of producing disease in man. The great majority of microbes cannot exist in living matter. Not only are the majority of microbes inert as regards their action on the body, but a certain number are absolutely essential to maintain the body in health.

We hear a lot about microbes lurking everywhere. So they do, but disease-producing germs do not lurk everywhere. Some are common; others are fortunately very rare; whilst others have never been found outside the bodies of persons suffering from the disease which they produce.

Not every disease is the result of microbic infection. Some illnesses have been proved to be due to this cause; and others are without doubt due to germs which have not yet been discovered. But a very large number of human physical affections originate within the body itself, and have nothing to do with microbes.

The germ of tubercle (consumption) is the most important of all the enemies to human health. Wherever there is a congregation of men, the tubercle germ is sure to be found amongst them. Therefore everybody in a large city is constantly inhaling into her body tubercle germs in greater or less quantities. But not everybody suffers from the effects of this microbe. No, for the body is capable of dealing summarily with a certain number of germs.

If a perfectly healthy person inhales a small number of microbes into her lungs, no harm will come because her lungs will destroy the germs before they can do any damage.

If, however, a larger number of germs are inhaled, or her lungs are not in a healthy state, then the germs will attack her lungs and she will become the victim of consumption. But it will be a mild attack, and before long if no more germs are inhaled, her body will overcome the disease and she will be restored to health; or, if her body is incapable of destroying the germs, it may still fight a hard battle and yield inch by inch till it is finally conquered or helped to again reassert itself by artificial measures.

But if an enormous number of germs are inhaled, then is the body nonplussed and her life is rapidly destroyed by acute tuberculosis.

The following are the laws of the causation of sickness by organisms:—

1. Each infective disease is produced by one organism only, and by no other.

2. The disease cannot possibly occur without the presence of the specific germ.

3. The severity of the disease depends upon the number of organisms which have gained entrance to the body; the state of virulence of the organism; the physical condition of the patient at the time of invasion; and the seat of entrance of the organism.

Let us briefly inquire into these statements. Each infectious disease is produced by one organism and that organism alone. We now take this as an axiom and found our classification of disease upon it.

Thus the germ which produces acute rheumatism (which, by the way, has never been discovered, but which we feel sure will be well known in a very short time) produces St. Vitus's dance and nearly all the heart diseases of young persons. It also produces sore throats and pleurisy and many other

complaints. We, therefore, say that rheumatism, heart disease (of young persons), etc., are all the same disease, namely, rheumatism—the disease which stands next to tuberculosis as the greatest enemy of the human body.

Now though the germ of rheumatism can produce all these ailments, it cannot produce any tubercular disease; nor can the tubercle germ produce any rheumatic affection.

That the severity of an infection depends upon the number of organisms at work we should *a priori* have expected. Since we have shown that infections are comparable with poisoning, and we know that the effect of a poison depends largely on the dose, it is not surprising that the effects of an infection depend upon the dose of infective matter which has been taken.

But there is this important difference between poison and infection, that whereas the former is a constant quantity, the latter is capable of rapid increase within the body of a suitable host.

Perhaps the most important point in the life history of microbes is the variation in their virulence which is exhibited by nearly all disease germs. There are some germs which are only harmful during the summer months, just as the nettle, which is innocuous during the spring, becomes a most unpleasant customer in the summer. Then the medium on which the organism has been growing affects its virulence. The organism which causes an acne spot also causes erysipelas. But in the latter affection the germ is in a much more virulent condition.

The bacteriologist can artificially render germs more or less virulent. The germ which causes pneumonia will grow upon blood serum in a test tube. By various processes it is possible to get a "culture" of these germs which is quite inert, or one which is so intensely virulent that it cannot be handled with impunity.

That the effects produced upon the body by a germ is in a great measure dependent upon the health of the person and the state of the organs attacked is a well-established fact. But here a caution is necessary. It is not the person who looks "the picture of health" who is necessarily in the best condition to withstand the attacks of microbes. How often do we hear of two sisters, the one robust and healthy and the other sickly, both suddenly attacked by the same complaint, and the one we thought was the healthier succumbs whilst the other escapes.

That the seat chosen by the germs should influence the disease they produce to an extreme extent is not to be wondered at. The organism which causes a small pimple on the face, a mere nothing, also causes an abscess in the brain—a disease which is for certain fatal unless relieved by surgery.

The spot chosen by the microbes to work is not due to chance. Usually the organisms start their work where they have entered the body. The microbe of tubercle enters the body through the mouth and nose; it therefore starts its work at the first spot in the alimentary or respiratory system which will harbour it—in the former case the bowels, in the latter the lungs.

But there are other things to consider besides these. The tubercle germ enters the body through the nose. Why does it not start by attacking the nose instead of travelling right down to the lungs before commencing its work? And to this question we can only give the unsatisfactory reply that some organs possess a greater resistance to the attacks of germs than do other organs. The germ of tubercle can readily produce ulcerations of the bowels, yet ulceration of the stomach from tubercle is so rare as to be nothing more than a curiosity.

There is so much of interest in the study of microbes that we could go on for weeks together describing to you the wonderful properties and powers of these "minute structureless atoms of jelly." But space is limited, and we must hurry on to the last and the most wonderful of the reactions between germs and the human body. This is the phenomenon of immunity.

Measels is an infectious disease; we do not know what germ it is that causes it, but it is an exceedingly virulent one, for measles is the most infectious of all diseases. Certainly, ninety per cent. of the human race have measles, yet how many have it twice in their lives? Certainly, not one person in ten thousand!

Two sisters go to visit a sick friend, one has had measles, the other has not. Two days afterwards they get a note to say that the friend they visited is suffering from measles. The sister who has not had measles will almost for certain sicken for the disease in a fortnight or so, the one who has already had the complaint will almost for certain escape.

What does this strange phenomenon mean? It means that measles is a disease in which one attack produces immunity from other attacks. It means that the body, whilst in the process of conquering the germs of the fever, has produced something or done something which has not only cured the disease, but which will enable the body to instantly destroy any other of the microbes of measles which may find their way in at a future date.

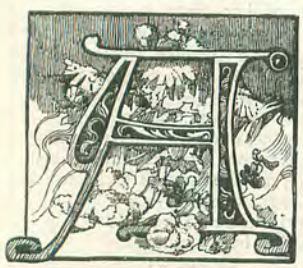
And as it is with measles, so it is with all the other infective diseases. They all produce an immunity, some for life, others only for a short time. Measles, for instance, produces immunity for life, whilst pneumonia only renders the patient immune for a few months, or years, and the patient is then again as liable—or rather more liable—to be attacked by pneumonia as is anyone else.

Bacteriology is not thirty years old and we cannot hope to fathom so extremely complex a subject in such a short span. It will take centuries before we are thoroughly conversant with the germs and their histories.

MORE ABOUT PEGGY.

By Mrs. GEORGE DE HORNE VAIZEY.

CHAPTER III.



FORTNIGHT later the passengers on board the steamer were congratulating themselves on having accomplished half their journey, and being within ten days' sail of England. The waters of the Mediterranean surrounded them, clear and blue as the sky overhead, a healthful breeze supplanted the deadly calm, and the spirits of the travellers rose ever higher and higher. Homeward bound is a very different thing from outward bound, and every soul on board had some dear one waiting for them in old England, someone who had loved them faithfully through the years of absence, and who was even now counting the days until their return. The mothers boasted to each other concerning the doings of the children whom they had left at school, and in the midst of laughter turned aside suddenly to conceal their tears; the men thought lovingly of the wives from whom they had parted years before; and one or two radiant bridegrooms exhibited photographs of the brides whom they were going to carry back to cheer their exile.

After a fortnight at sea the company on board this particular steamer might be said to be divided into four distinct cliques—namely, members of military and diplomatic services, Civil Service employees, second-class passengers, and — Miss Mariquita Saville. The young lady must be taken as representing a class by herself, because while each of the other divisions kept, or was kept, severely to itself, Peggy mixed impartially with all, and was received with equal cordiality wherever she turned. The little person had made such a unique position for herself that there is no doubt that if a vote had been taken to discover the most popular person on board, she would have headed the list by a large majority; but whether her unfailing affability was due more to pride or humility, Hector Darcy, among others, found it difficult to determine.

Major Darcy had attached himself to the Saville party with a determination hardly to be expected in so languid a man, had even lowered his dignity to the extent of asking the fellow-passenger who occupied the coveted seat at table to exchange places with himself, so that breakfast, lunch, and dinner found him seated at Peggy's side, finding ever fresh surprises in her society. Sometimes the surprise was the reverse of pleasant, for Miss Saville was a prickly little person, and upon occasion would snap him up in the middle of an argument with a lack of respect which took away his breath. When any difference arose between them, she never seemed to have a shadow of a doubt that she was in the right, and as Hector was equally positive about his own position, relationships frequently grew so strained that Peggy would rise from the table half-way through the meal, and stalk majestically out of the saloon. She invariably repented her hastiness by the time she reached the deck, for dessert was the part of the meal which she most enjoyed, so that when the Major followed ten minutes later on, bearing a plate of carefully-selected fruit as a peace-