

THE BACTERIOLOGY OF "INFLUENZA"

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In order to understand the apparent vagaries of the present epidemic it is necessary to go to the root of the matter, and look upon it as just one of the numerous battlefields on which the eternal war between the microbe and the man is being waged.

This conflict is always going on between the opposing armies. That of the microbes is composed of many military units—some of them are famous regiments, have won their spurs, and are known as formidable foes; the organisms of tubercle, diphtheria, and enteric fever are good examples. When a patient is attacked by one of these we are not surprised, as we know his microbe of old, and can often defeat him by methods with which we are also familiar.

Sometimes, however, we are faced with the activities of what the general public—and especially the sensation-mongering section of the daily press—hastens to call a new disease. It usually goes on incidentally to affix such sensational titles as "the scourge in our midst," "the terror that flieth by night," and so on. Furthermore, the public is more impressed by the fact that a disease has killed the local mayor than by any accurate conception of what it can and cannot do in the way of destruction or damage.

An epidemic, however, is simply the bringing into action by the enemy of a microbial unit that has not recently seen much fighting, and to get a clear view of its activities it is better to look at large maps. Otherwise we are in danger of not being able to see the wood for the trees.

Let us carry the military analogy a little further. A fighting force does not consist merely of one arm. For infantry, for instance, to be effective, they must have the way prepared for them by artillery fire, and their rations and ammunition brought up to them by the transport. So it is in an epidemic. There is the microbe that actually delivers the attack and is always found in the tissues of a patient suffering from the disease, but it is accompanied by other germs whose function is to weaken the patient generally, or to damage some particular organ, so that on the whole the patient's power of resisting the principal germ is lessened or destroyed altogether.

Thence comes confusion. When the bacteriologist gets to work, he may find numerous organisms in his patients, sometimes one, sometimes another, and until he has had the opportunity of examining a fair number of cases, he is often unable to work out the precise function of each microbe.

But the general public has no such difficulty. One newspaper says the "pestilence" is due to streptococcus—if it is able to spell it—while another trumpets the rival claims of a pneumococcus, until the effusions remind one of the Eatanswill election. Occasionally they become lurid by summoning alien bacilli altogether, such as those of plague, spotted fever, and goodness

knows what besides, to their aid, if there are signs that the public is getting tired of their previous microbial claimant.

All this, incidentally, is not merely inaccurate or ridiculous : it does great harm by actually lowering the resistance of those who are impressed by it, so that they are more likely to succumb than those who keep not only a healthy body, but a sane mind also

Let us, however, come back to influenza. There are really two kinds of "influenza," one that is and one that is not. The latter is the type that a man has, or says he has, every year, and is due not to the *Bacillus Influenzæ*, but to another organism altogether, the *Micrococcus Catarrhalis*. Personally, I dislike the term influenza when it is applied to an illness for which the old name "feverish cold" is much more appropriate, as it is quite sufficiently accurate.

This epidemic, however, is true influenza, that is to say, it is due to the *bacillus influenzae*, or, as it used to be called, Pfeiffer's bacillus. If one examines any particular patient, or if you like, any particular half-dozen patients, it is quite possible that the *bacillus influenzae* will not be found in one's cultures, but it does not follow that it is not present in the patient. As a matter of fact, the *bacillus influenzae* is rather difficult to cultivate. For one reason, in a swab containing a mixture of other organisms with it, the *bacillus influenzae* is apt to be choked out by the more rapid growth of the others. Then it will not grow at all unless the culture medium employed exactly suits it. It prefers human blood to any other food, and in practice one often succeeds in cultivating it on an agar tube that has been streaked over by blood shed from a finger prick. Curiously enough, some people's blood seems to be of more use than others in this respect. I remember, for instance, that I could more often succeed when I punctured my own finger than when I performed a similar human sacrifice on a certain laboratory assistant !

If then a large number of patients are taken, and suitable media employed, the *bacillus influenzae* can be obtained in a sufficient number of instances to justify one in saying that it is the cause of the disease. Definite proof, however, is obtained from the fact that it will reproduce the disease when it is injected into a suitable experimental animal. In appearance it is a very minute, thin rod.

At the onset of the disease it grows in the throat and nose, where it gives rise to the well-known catarrh, with which the attack starts. The toxins or poisons which it then forms are absorbed into the blood and produce the rise in temperature and prostration, while later on the organism itself may spread downwards into the lungs, where it gives rise to bronchitis and not infrequently to a disease which has the characteristics of a broncho-pneumonia, with the distribution of the lobar variety, or upwards through the Eustachian tube into the middle ear, where it is particularly liable to set up mastoid disease.

The microbes with which the *bacillus influenzae* is often associated in this epidemic are usually a streptococcus or the pneumococcus, or both—and there can be no doubt that they are both responsible for many of the fatalities which have occurred. The reason is that many organisms grow

better—both in culture media and in the body—when in association with others, just as one can imagine a soldier fighting better when he has his friends alongside him. The phenomena is known as “symbiosis,” and one occasionally takes advantage of it in a laboratory when one wants to grow a particularly virulent strain of a microbe. In the preparation of diphtheric antitoxins, for instance, a much more luxuriant growth of the diphtheria bacillus can be obtained if one adds some bacillus podigosus to the cultures.

The pneumococcus-influenza combination seems to be particularly liable to attack the lungs, and the addition of staphylococcus appears to increase the severity of the initial toxæmia, and of suppuration such as mastoid abscesses.

Coming now to treatment. As regards the patient himself, we try both to kill the microbe direct and to increase the bodily resistance, so that he is able to manufacture antibodies to the germ for himself. As regards the first, we cannot do very much. There is no drug taken internally that will kill the microbe, but there is some evidence that irrigation of the nostrils with a weak solution of permanganate of potash is able to retard the growth of the germ in the nose. The measures adopted to keep up the resistance of the patient are common to most infectious diseases, and comprise nursing, good food, tonics, stimulants, &c., but the two most important are bed and more bed. I need not dwell on these now.

Secondly, can we do anything in the way of preventive treatment? Apart from obvious essentials of sanitation, such as free ventilation and disinfection, together with prompt isolation of those suffering from the disease, the general public is asking us to inoculate them against it. They have a sort of idea—for which I am afraid we must blame some over-enthusiastic bacteriologists—that we can now “inoculate” against anything from a chilblain to the plagues of Egypt; that all we have to do is to collect the germ, kill it, and inject it under the skin of a healthy person in order to prevent him from contracting the disease.

I wish we could do that. There would soon be no more disease of any kind, and most of us could sell our microscopes and buy a farm!

Unfortunately, however, the problem is by no means so simple. A vaccine is like a sharp scalpel, and is capable of doing almost unlimited harm in the hands of an unskilled person, or when improperly used.

As regards the present epidemic, it is easy enough to prepare a vaccine containing a mixture of bacillus influenzae, streptococci and pneumococci, but the trouble is that its use is followed by a marked “negative phase,” as it is called, that is to say, that for a variable period after inoculation, the patient’s resistance to influenza is actually lowered. It is true that this is followed by a prolonged rise in his defensive powers, but as he may go down in the negative phase, it is usually undesirable to inoculate during an epidemic: we should wait for it to subside, and then try to immunise the patient for the future. It is probable that a course of about twelve injections is required for success in this respect. The vaccine may appropriately contain *b. influenzae*, *streptococcus* and *pneumococcus*.