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## LECTURE.

### BACTERIA.

By Miss M. Robinson, of the Bacteriological Department, Fulham Public Health Offices.

We spent a most interesting evening when Miss Robinson, from the Bacteriological Department of the Public Health Offices at Fulham, came on 17th March to give us what she termed "a talk" on Bacteria. Before commencing to use the microscope the lecturer said that Bacteria are unicellular organisms of various forms, devoid of chlorophyll, and having an imperfect nucleus. Some are motile and some non-motile. Their minuteness may be judged of by the fact that in one direction at least, they do not usually measure more than  $\frac{1}{1000}$  inch. The various forms of pathogenic organisms can be classified under four main groups:—(a) The Coccus or globular shape, such as Streptococci, Staphylococci, etc. (b) The Bacillus, or rod shaped, such as Typhoid, Tubercle, Diphtheria. (c) Spirillas, such as Treponema and Pallidum—the syphilis germ. (d) Spirochaetes, a filamentous and flexuous organism showing true spirillity, such as Vincents Angina.

Owing to their minuteness these bacteria are not visible to the naked eye and can only be seen by the aid of a powerful microscope, magnifying them 1000—2000 times. There are some that cannot even be seen with the aid of the most powerful microscope.

Bacteria are to be found everywhere and so we are constantly being attacked on all sides by those minute organisms. Nature, however, guards us against such attacks; in our blood we have the leucocytes, or white blood corpuscles, which devour any invading organism and thus rid the body of such parasites; the process is known as the phagocytic action of the blood, and our resistance or immunity depends largely upon this factor.

The power of an organism to infect the body is determined by many conditions. Hunger, thirst, excessive fatigue, exposure to extremes of temperature, debility—all these predispose to infection. While many people are very susceptible to an organism, some absolutely resist infection: they have a *natural immunity*. In the case of some diseases, notably in smallpox, and to a less degree in measles, mumps and whooping cough, it is not often that the same person is attacked twice; one attack is protective, and this is known as an "*acquired immunity*." On the other hand, an attack from certain other diseases may predispose the patient to a second attack of the same disease. This is true of influenza, pneumonia and erysipelas. Sometimes combinations of diseases are met with, such as syphilis and gonorrhoea, diphtheria and scarlet fever, pneumonia and typhoid. These are known as *mixed infections*, but if, as is generally the case, one disease has lessened the immunity to the one acquired last, the latter is known as a *secondary infection*.

The four main groups of bacteria are identified by means of the following:—(a) A powerful microscope. (b) Staining methods. (c) Cultivation.

Before an organism can be clearly seen under the microscope, and its characteristics noted, various staining methods are employed. These stains are chiefly aniline dyes dissolved in absolute alcohol and diluted with distilled water to the required strength. The commoner stains used are Fuchsin, Methylene Blue, Gentian Violet, Bismarck Brown, Neutral Red. The organisms are again classified by their reactions to certain stains. Supposing a specimen is to be examined, a little of it is smeared on a slide, it is fixed in a flame and then we proceed to stain and examine it under the microscope. We may then see any one of those four groups already mentioned, or a mixture of them. There are several methods of staining, before finally deciding to which class an organism belongs; having decided that, further details concerning it have to be found out. The preparation of culture media needs great care, as it must be, when ready for use, absolutely sterile. There are two kinds of media—solid and liquid. The liquid media is mostly made of beef extract, peptone and salt, and is known as broth. The solid is this broth with agar or gelatine added to solidify it. These are the principal means whereby germs are cultivated, but of course the different species require media adjusted to suit their type. The media when mixed is poured into test tubes, and when sterilised and cooled is ready for use.

A tube is then inoculated, by means of a sterile platinum wire, with some of the specimen under investigation and placed in an incubator, registering a temperature of 98.4, and left there for a period of 12—24 hours; some germs grow more readily than others, therefore the period of incubation varies accordingly. Bacteria that will grow in the presence of oxygen are known as *Ærobes*—such are those of Tubercle, Typhoid, Diphtheria. Those that will not grow in the presence of oxygen are called *Anaerobes*: of this class Tetanus Bacillus is the best known. In the case of the *Anaerobes*, the media is prepared in exactly the same way as for the *Ærobes*, but when the tubes have been inoculated, they are placed in special jars, the oxygen is then exhausted and hydrogen pumped in, and the jar sealed and placed in the incubator.

There is a group of organisms which cannot be differentiated by their staining reactions. This group have the capacity to ferment sugars, breaking down the fermentable substance, producing acid products and frequently gas. These must be dealt with by means of special media, consisting of a sugar such as lactose, glucose, etc., dissolved in some peptone water and coloured with blue litmus. A series of these different sugars are inoculated from a young culture from the specimen under investigation, and incubated for 4 hours or more. According to the production of acid and gas on the different sugars, so the organism can be classified and identified.

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