BACTERIA.

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Bacteria are also called Germs, Microbes, Micro-organisms.

They are all minute living organisms of a single cell, of the lowest order of vegetable life, $\frac{1}{25000}$ inch in size. (This means that 25,000 of them, lying side by side, would measure one inch.) Every human person carries a vast number of bacteria about with him, both on his skin and inside his body, but many of them are harmless to man. They are different in shape, colour and habits.

It was in 1850 that Dr. Louis Pasteur demonstrated to the world, beyond doubt, that all infectious diseases are caused by bacteria, and that each bacterium can produce its own toxin (poison).

In 12 hours one single bacterium can produce 17,000,000 similar bacteria.

Bacteria are of two kinds: A lower group and a higher group.

The higher group are single cells containing a nucleus, which is essential for its reproduction. They are all parasites to man—*i.e.* they feed on his blood and tissues.

Necessary conditions for bacterial growth are:—

Moisture; food (dead or living animal or vegetable matter); warmth; darkness; oxygen or lack of oxygen.

Severity of attack depends on:—

(1) the virulence of the bacteria; (2) the number of the bacteria; (3) the resistance of the body tissues.

Bacteria may be killed by:—

(1) Living tissues which are more virulent than the bacteria, *e.g.*, a healthy blood stream containing many leucocytes; (2) by heat, *e.g.*, at boiling point for not less than 20 minutes. (Except spores, which require a greater heat and more prolonged.) (3) by chemical agents, *e.g.*, carbolic, mercury, lysol, dettol, phenol, alcohol, etc. (4) by the strong and direct rays of the sun.

Bacteria multiply:—

(1) by fission, or splitting, and each half forms a minute bacterium, *e.g.*, the lower group: (2) by the branching-off method, *e.g.*, the higher group.

Aerobes are germs requiring free oxygen for life, *e.g.*, the greater majority of bacteria.

Anaerobes are germs which can live with outoxygen, *e.g.*, the tetanus bacillus and the bacillus Wellchii.

Saphrophytes are germs that can thrive on dead tissue, causing putrefaction and fermentation.

Parasites can only flourish and multiply in living tissues.

Pyogenic bacteria are pus-producing germs.

Pathogenic are germs capable of causing disease.

Spores.—This is the resting stage in the growth of a germ, usually a bacillus. It forms an outer covering around itself, which is very difficult to penetrate, and it is therefore very difficult to kill, *e.g.*, the tetanus bacillus, the anthrax bacillus, and the amœbæ of dysentery, which form cysts.

Flagellae are hair-like processes growing out from a bacterium, which enable it to move along, *e.g.*, the bacillus typhosus.

Virus.—A filter-passing virus is a minute organism, so small that it is quite invisible even with the most powerful microscope. Viruses are, however, of great importance, as research has proved them to be responsible for a number of common diseases, *e.g.*, small pox; chicken pox; measles; mumps; psittacosis (parrot's disease); common cold; influenza hydrophobia; acute anterior poliomyelitis; yellow fever; typhus fever; trachoma; canine distemper, and others.

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Phagocytosis is the process of enveloping and ingesting a germ by a white corpuscle.

Susceptibility can be of two types:—

(1) Natural, *i.e.*, man is born very susceptible to certain diseases, *e.g.*, syphilis, pneumonia, hydrophobia.

(2) Acquired, *i.e.*, by lowering the body's resistance—*e.g.*, by cold, hunger, thirst, fatigue, excessive alcohol.

Immunity is the power of the body to resist bacterial invasion. It can be of two types:—

(1) Natural Immunity, which occurs in two ways:—

(*a*) It can be inherited, and peculiar to the individual's forbears, and to his race.

This consists of a healthy skin and a whole mucous membrane. The natural antiseptics of the body, *e.g.*, bile and hydrocholoric acid.

The natural antagonistic action of certain cells and fluids in the body, *e.g.*, blood serum and white blood corpuscles.

(*b*) It can also result from a previous attack of a certain disease, *e.g.*, measles, when the body produces anti-bodies and anti-toxins to fight against that particular disease, and these always remain in the blood stream.

(2) Acquired Immunity can be of two kinds:—

(*a*) Passively acquired immunity, by the injection of serum, containing anti-bodies from an animal's blood stream.

(*b*) Actively acquired immunity, by the injection of toxins from dead bacteria, which stimulates the patient's own body to produce the necessary anti-bodies. These are vaccines, either generalised stock vaccines, or one made from the patient's own bacteria, called an autogenous vaccine.

There are three main divisions of the lower group of bacteria named according to their shape:—

Bacilli—which are rod-shaped. Cocci—which are globe-shaped. Spirilla—which are spiral-shaped.

Examples of Bacilli are:—

Klebs Loeffler Bacillus—causes diphtheria; it is found in discharges from the tonsils, throat and nose. Bacillus Lepræ—causes leprosy; it is found in ulcers, sore lesions and in nasal discharges. Bacillus Anthracis—causes anthrax; it is found in pustules and ulcers. It can form spores. Bacillus Tetani—causes tetanus; it is found in earth and dung, and it gets into the blood stream *via* a skin abrasion or an ulcer. It can form spores. Bacillus Wellchii—causes gas gangrene. It is found in septic closed cavities, *e.g.* a septic peritoneum. Bacillus Coli Communis—this is a normal germ to have in the colon, but it is pathogenic elsewhere in the body. It is found in the urinary system causing cystitis pyelitis, also in the peritoneum and in the blood stream. Bacillus Typhosus—causes Typhoid Fever. It is found in the fæces, in the blood stream, and it infects water, milk and food; to enable it to move, it forms Flagellæ. Bacillus Paratyphosus—causes Paratyphoid Fever; it has three forms: A, B and C; it is found in stools, blood, water, milk and food. Bacillus Pertussis—causes whooping cough; it is found in sputum, breath and in nasal secretions. Bacillus Pestes—causes plague; it is found in stools, saliva and in all secretions. Bacillus Pleiffer—causes mild influenza; it is found in sputum, breath and throat. Bacillus Proteose X—is present in Typhus Fever; it is carried by ticks from rats, squirrels, etc., and is found in the blood stream. Bacillus Flexner Y and Bacillus Shiga, cause dysentery and ulcerative colitis; they are found in stools and infect food and water. Bacillus Koch-Weeks—causes infective conjunctivitis; it is found in tears and discharges from eyes and nose. Bacillus Aertrycke, Gærtner and Botulinus—cause ptomaine poisoning; they are found in stools and blood stream, and in tainted meat, pies, shellfish, etc. Koch's Bacillus is the Tubercle Bacillus and causes tuberculosis. It has three forms:—(1) Human—causes phthisis; it is found in breath, sputum and lungs. (2) Bovine—affects glands, bones and

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