

from its combination with other elements, *anaerobies*.

There are three sub-divisions or genera of bacteria:—i. Micrococcus, when the cells are round or elliptical; diplococcus, two of them joined together; streptococcus, if united into a chain. ii. Bacillus cylindrical rod-like or filiform cells. Cohn termed curved filaments vibrios. iii. Spirillum, spirally twisted or screw-shaped cells.

In order to detect these minute and almost invisible organisms and study their characters and habits, microscopes magnifying from 400 to 1,000 diameters are required. They are so minute that according to Dr. Dallinger 50,000,000 would not occupy a space greater than the 1-50th part of a cubic inch. They are found wherever organic matter, animal or vegetable, is undergoing decomposition, in stagnant water, and all solutions containing organic substances, and dried bacteria or their spores are found in myriads adhering to every object around us and to the minutest particles of dust floating in the air, seen in a ray of sunlight, and which make the ray visible.

The decomposition or putrefaction of organic matter and the process of fermentation are solely the result of the life-work of bacteria.

Having no chlorophyll they develop only in fluids and other media containing organic matter, and thrive best where it is abundant.

They develop very rapidly under favorable circumstances; according to Cohn a new generation can form in an hour. They require a certain amount of heat for their development which varies with different species; cold and high temperature arrest their development; in the moist state a temperature of 140° F. will destroy them, but a higher degree is required in the dry state.

The spores of bacteria are of all living matter the most difficult to destroy, are unaffected by low temperatures, and require in the moist state the temperature of boiling water to destroy them, and when dry a temperature of 300° and over. Bacteria thrive best in alkaline solutions, hence in the stomach the normal acid present during the process of digestion checks their growth, but they grow luxuriantly in the intestines where they are supposed to assist in normal digestion. In normal healthy animals they are not found in the blood or tissues. The latter must have the power of overcoming the ordinary bacteria of putrefaction; but certain species are capable of holding their own there and multiplying, when a disturbance in the

animal economy ensues, which is shown in the symptoms of the various infectious diseases. These are the diseases producing a pathogenic germs.

It was a Dutch microscopist named Leeuwenhoek, who first announced, in the year 1683, the discovery of these minute micro-organisms which are now known to be so intimately connected with the processes of disease, fermentation, decomposition, etc., but it is only by investigations made during the past 20 years that most of the knowledge we now possess on this subject has been gained. Conspicuous among those who have labored in this field stand the names of Louis Pasteur and Dr. Koch, although much has been learned from the researches of Cohn, Rayer and Davaine, Loeffler, Toussaint Chauveau, Buchner, Klebs, Tommasi Crudeli, William Budd, Watson Cheyne, Bilroth, Ehrlich, Lukomsky, Klein, Vandyke, Carter Luginbuehl, Oertel, Hansen, and many others.

Bacteria have been discovered by different observers associated with the following affections, and have in some of them been satisfactorily demonstrated to be their cause, anthrax, pyæmia, septicæmia, osteo-myelitis, malignant œdema, erysipelas, glanders, relapsing fever, typhoid fever, variola, cow-pox, and sheep-pox, virus, measles, diphtheria, malarial fever, syphilis, gonorrhœa, endocarditis, croupous pneumonia, pertussis, trachoma, pterygium, tuberculosis, and some others.

Recently Pasteur has discovered a micro-organism in hydrophobia and by attenuating the germs and inoculating dogs with them has rendered the latter insusceptible to the influence of the most potent rabic virus.

From these facts the existence of a cholera germ would seem to be very probable, and accordingly we find that for forty years back search has been made for it. Bohm, in 1838, found cryptogamic bodies like ferment fungi in the dejecta and intestines. Brittan, Swayne, and Hughes Bennet found micro-organisms in the Bristol epidemic of 1849. Vibrios were discovered by Pouchet and cercomonas by Davaine; and Paccini in 1854 and 1856 discovered bacteria in connection with this disease. Dr. Bristowe, in 1866, seems to have approached nearest to the discovery of the cholera bacillus; he found a curved bacillus, but the cessation of the epidemic rendered further study of the germ impossible. McCarthy & Dove found motile elements.