

is not to give an exhaustive discussion of the subject of agricultural bacteriology, but merely to consider, in a general way, those problems concerning which information is frequently desired.

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WHAT ARE BACTERIA, HOW THEY LIVE AND GROW

So much misconception exists in the minds of the general public, as to the nature of bacteria, what they do, and how they do it, that a brief description of some of the more prominent characteristics will undoubtedly be helpful.

Bacteria are Plants.—Everyone recognizes them as living things, but the public-at-large consider them as animals rather than plants. In all probability, this arises from the fact that they are the cause of disease processes, and, inasmuch as animal forms (bugs, vermin, etc.) are known to be able to cause various maladies, the bacteria have been connected with this class. The bacteria are also able to move and, to the general observer, motion is usually considered an animal characteristic. In the microscopic world, however, motion is no proof of animal life, although with the more highly organized forms, this may be regarded as a general rule.

The bacteria are classified with the plants because their method of nutrition is plantlike rather than animal; their structure and method of growth also ally them with the simpler plants, rather than animal life.

Size.—It is quite difficult for any one to get any adequate conception of size where objects are enormously large or extremely minute. The bacteria belong to a group of living things so small that the most perfect microscopes are needed to determine their form and size. Measured in inches, they range from 1-25000th to 1-10000th of an inch long, and from 1-50000th to 1-25000th inch wide. This gives but a faint idea as to their minuteness. If they could be laid side by side, it would take about 250 of the average sized kinds to equal in thickness a sheet of this paper: 250,000,000 spread out in a layer one row thick would cover an area about the size of a postage stamp. Yet these tiniest of living things may affect our weal or woe in the profoundest manner.

How They Grow.—The single individual is reduced to the simplest possible conditions, simply

a single cell, a speck of living jelly. As the cell grows, it lengthens in one direction, then divides into two equal sized cells. Under favorable conditions of growth, proper temperature, moisture, air and food, a cell may divide as frequently as once in 30 minutes. This rate does not continue long, for, as they accumulate in numbers, the cells on the interior of a growing mass are starved out because food cannot reach them. Then again, the environment is never wholly favorable to the growth of any single species. Competition between different kinds is indeed fierce. The chemical reaction of the medium in which they live, may often retard development; sunlight and drying destroy many; so that the actual growth is far from being what is possible under favorable surroundings. Indeed, it is well that this is so, for, if unhindered growth were possible, it has been estimated that the progeny of a single germ would be able to people all the oceans of the globe within five days.

How They Move.—If we examine a drop of stagnant water under the microscope, a microscopic menagerie is seen in full procession. Animalculæ of all sorts are to be seen disporting themselves in various moods. For our purpose, we may neglect these, and note the simpler and smaller plant forms. While there exists but little difference between the various kinds as to form, many of them have a peculiarity of movement that distinguishes them at once. Here come some stately bacilli with a slow swinging movement, relatively; they possess aldermanic proportions, and have quite such a swagger. Scuffling along, at a much more rapid rate, comes a troop of nervous, irritable, smaller forms, while here and there a spirillum bores its way through the throng in a straightforward, business-like way.

This ability to move is due to very delicate threads of protoplasm, called *cilia*, that protrude from the cell wall. By lashing these to and fro, the cell body is propelled through fluids. In some cases, only a single cilium is present, as in the cholera germ; then again, they may be very abundant, being spread over the entire surface of the cell.

(To be continued)

