Bacteria — Their Relation to Disease.

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The human mind in its earnest search for the existing realities of the world, is constantly ~~is constantly by unfolding~~ before our eyes, those things which nature has seemingly obscured from our view for centuries. In this process of knowledge gathering, we are continually astonished to find that apparently obscure truths were only relatively so; that they are often in plain view, but we have failed to appreciate their presence.

We can hardly realize that the true theory regarding the shape of the earth and its relations to other worlds about us, has only been established a few centuries. We can hardly realize that man lived up to the present century without knowing how to utilize the elements of steam, electricity and the gigantic mechanical appliances which are now used. When we look at our high state of development along educational and

social lines, we can hardly realize how vastly greater they are than were those of half a century ago.

Progress has been made by steps not leaps. The mysteries of yesterday are cleared up by the simple rules and theories of today. The great problems which have perplexed men for ages are solved by hard, abstract thought in the minds of unnatural reasoners; the mists of obscurity rise and are gone forever, leaving all so clear that we wonder at the past stupidity of our own minds.

It is true that there is little known compared with the great unknown. We have hardly passed the first mile-stone of knowledge; but of the total amount of truth that is now known is it not surprising how much has been collected almost within our own memories; within the past half-century, quarter century or even within the past decade?

This, however, can partially be accounted for by observations in the material world. A snow ball started down the mountain side does not increase much, at first either in size or velocity. Afterwards, however, both increase very rapidly.

This has also been true in the world of knowledge. Centuries passed before knowledge gained much momentum. One barrier has been removed before another could be approached. One truth has been unfolded before another could be known, and these may have been in the same or in very different fields.

Thus we find that a great many of our discoveries have been made with in a comparatively recent date

This is true of that branch of biology known as Bacteia

The forms of life known as bacteria existed perhaps even before

man himself. Yet many a generation had passed away before man, with his microscope, detected the presence of his invisable neighbors.

We cannot tell when life made its appearence upon this planet. We cannot tell from whence it came, notwithstanding the endless theories which try to account for its origin. Men have spent many a wearisome hour trying to tell just what this mysterious element — life, is but as yet no very satisfactory defination has been constructed

But what ever life is, when ever it came, and what ever its origin may have been, we must keep on studying its varied forms with the hope of comprehending more fully its greatness.

Life at first was perhaps in very primative forms of a single cell, like the amoeba, but some may have evolved to more complex

forms in which they have distinct organs and in which we find the physiological division of labor in its highest forms. But not all have become so highly developed. There still remain some so small and simple that they are invisible to the naked eye. These known as bacteria are thought to be among the world's earliest forms of life.

For years their exact nature was a mystery but it is now known that they belong to plant life and are related to the lower "algae"

All bacteria are classified according to their form into three groups:—

I Micrococci, or spherical.
II Bacilli, or rod-shaped.
III Spirilla, or cork-screw".

All these forms are sub-divided into an almost endless number of species. Perhaps most of which

little or nothing is known.

They are all most inconceivably small, but by means of comparison we can gain some idea of their size. The average Baccilli are so small that it would require over 1000 of them placed end to end, to reach across the head of an ordinary pin. They are transparent in color and must be stained with aniline dye to be made distinct under the microscope

They perform a variety of movements by means of "cilia" These have been seen by the aid of photography, altho they may also be seen under the microscope when properly stained.

The conditions necessary to the growth of bacteria are moisture warmth oxygen organic matter containing nitrogen with alkaline reaction. They cannot exist in a medium of acid reaction. When conditions are favorable, they

increase in numbers limited principally by their environment. They reproduce by cell division and this is so rapid that sometimes a single germ of some species, will produce 16½ million distinct organisms in twenty four hours

"If proper conditions could be maintained, a single bacillus measuring 1/000 of an inch in length, would increase so fast that in less than five days the mass of bacteria would fill the entire space occupied by the oceans upon the earth's surface".

These figures are startling and cause us to inquire whether or not these rapid producing organisms, will sometime leap their bounds and crowd all the higher forms of life out of existance. But we need not fear for the perfect conditions under which they multiply with such startling rapidity are rarely found in nature, but usually only in the

laboratory of man. We have lived with them for ages and natural environment has always kept them in check. They soon exhaust their source of food supply or by their own poisonous excretions produce conditions under which they cannot exist. War, which has been such an important factor in human history is also at work, even in the existance of these little organisms. One nation after another has fallen before the advancing ranks of their stronger rivals. This also occurs in the lower forms of life. One form surpresses another. One species takes advantage of the conditions under which the other could not exist.

Arbitration may some time be introduced into human affairs but it never can be introduced into the bacterial world. For Nature's own methods never change.

The bacteria have a process of nutrition which is carried on by chemically tearing to pieces organic matter and using what is necessary for their simple growth. The remainder is set free in forms that are available to other living things.

Whenever dead organic matter exists in the presence of Oxygen, nitrogen and alkaline reacting media, and sufficiently warm temperature there will also be present bacteria. Under these conditions they are constantly carrying on their work.

Sometimes the work of "putrefaction" begins so soon after life has ceased in organic forms, that it seems impossible that the bacteria came from any pre-existing life like their own. But the theory of "spontaneous development" has been given up long ago. The presence of

life can always be traced to some pre-existing organism, however seeming impossible this may seem.

These bacterial germs are present everywhere. They float in the air attached to minute particles of dust and are thus carried from place to place by the motions of the atmosphere. They may be in the water or carried in different ways by living animals. We breath them at every breath, we eat them continually in our food and we drink them in the water. So their perfect distribution accounts for their rapid work when conditions are favorable.

As the work of the bacteria stopped right here the subject need not claim any special attention or play any important part in comports a existance of human life. We would study their forms only for the pleasure of the knowledge

of their life and not for any practical benefits. But we find that some species do not confine their work to lifeless forms nor indeed do they exist there at all. They find the conditions best suited for their growth in the bodies of the higher animals. And these "pathogenic" or disease producing germs are largely responsible for one of the greatest miseries of life — that of disease.

"Disease occurs in the body when any important cell community is injured so that it cannot perform its work or when it fails to work in harmony thro. some fault of its own or some disorder in the co-existing mechanism."

These germs lodge in the tissue, set up a growth, and lay their "poisonous" excretions known as "ptomaines" and "Leucomaines"

These pollute the blood and disease in some of its forms is the result.

When ever living tissue is exposed to the air by wounds or injuries or from some other source there is great danger of blood poisoning due to the effect upon the system of the poisonous excretions of the bacteria. The danger from this source is only when the wounds are comparatively fresh. as nature furnishes a dry crust for which the bacteria cannot exist.

Blood poisoning abscesses and inflamation in all their various forms are caused by certain well known species which are always present in in dirty, filthy places and are in great abundance in hospitals and where people are crowded together.

The discovery of the use of antiseptics by Joseph Lister is one of the greatest triumphs of modern surgery. He found that by applying certain substances to wounds, the entire action of

the bacteria is stopped.

There is a species of bacteria which by their action annually carry off one seventh of all those who die. It is the consumption or Tuberculosis germ.

The cause of this disease was not known until 1882. It has been considered hopeless in the past but is looked upon more hopefully, altho no one has made any great success in staying its progress.

The germs usually enter the body thro the air, into the lungs, but they may also enter in the food. The lungs however are the most favorable location for their growth.

There is a certain condition of the body cells which is most favorable to their growth, and this conditions seems to be largely hereditary. In the healthy body the cell tissue is strong enough to resist the action of the bacteria, and the disease cannot get a foothold.

The disease is also quite common in our domestic animals, especially in cattle and is identical to the tuberculosis of the human family. This is one of the sources which the disease may be contracted by man. The germs may be in the flesh or the milk and in this way enter the body. But the danger from this source is small compared to that of receiving the germs directly from the air from consumptive persons or animals; for the process of cooking and the digestive fluids usually destroy them before they can act.

Typhoid fever is another bacterial disease caused by the germs entering the alimentary canal with the food or drink. They produce ptomaines which are absorbed by the blood and carried to all parts of the body. They enter the body in this disease most frequently through the water. They can live

for a long time even in ice and may thus lay dormant waiting for favorable condition to begin their work of destruction.

The list of known diseases caused by these organisms, has grown in the last few years to a surprising length and perhaps if the truth were only known many of the diseases that are not now well understood, could also be traced to some mysteriously concealed germ. Suffice it to say that for every disease there is a cause and the weight of the proof goes to show that these seemingly insignificant little organisms are responsible for a goodly portion of the suffering during our life; that they are often our greatest adversaries in the life and death struggle, and are our closest companions even to our eternal resting place, the grave.

Proper sanitation is one of the greatest in eliminating the danger-

ous effects of the bacteria.

Indeed if proper sanitary conditions were maintained, and proper caution was taken we might hope to destroy the entire dangerous effects of the germs. But these conditions are neglected. People use water that is unfit for use. This may be drained from the most poisonous organic matter which is decaying. The water used by a whole city may be polluted with the most deadly germs gathered from sources that are constantly at work breeding these germs. Food is often marketed which is unfit for market, and used by those who have no means of knowing what it contains. The dwellings are often unfit for habitation. Cellars may be filled with decaying vegetable matter, which can furnish germs enough to infect the whole human race. Persons affected with tuberculosis, and other

diseases of that kind, seldom realize that upon their personal habits and caution depends the safety of those associated with them. So sanitary education is a problem which is demanding much attention at present.

Ideal conditions are seldom realized and ideal sanitary conditions are among the hardest to obtain. Much is being done, however to reduce the danger to a minimum, and science has already made considerable progress along these lines. Asiatic Cholera which has twice swept our country, is now with in bounds and not to be feared as long as we observe the proper precaution. Many of the cities have begun to realize the importance of pure water and by means of filtering and other methods of purification the danger from this source is greatly reduced. This practice is at present far from being universal.

We are also protected by "Food Inspectors" and "State" and "Municipal Boards of Health", which look after the general welfare of public health.

The study of Bacteriology is one of the greatest in importance. It not only furnishes an unlimited field for those who would learn more of the varied forms of life, but it also furnishes a field in which the knowledge gained there from will be welcomed by the world, and used in our every day existance.

Science has but entered upon the study. Much is known in its various realms of the study and those collateral to it; but so much can be seen ahead that we are justified in saying that we know relatively nothing, as compared to that, which will be known upon the subject.

An artist in representing any object in perspective, pictures it as diminishing

in size as it recedes from the eye of the observer, but if this subject were to be portrayed it would be represented by inverted pyramids radiating in all directions from the present.

After the chemist has exausted all the materials of the inorganic world, he will still find a fresh field in the bacterial world. He will find many interesting compounds in the products and excretions of these little beings.

When the botanist has learned all there is to be known about the terestial Flora, let him then turn his microscope upon the invisable bacterial forest. He will be surprised and delighted for he will find there endless new forms of which he previously knew nothing.

The Comparative Biologist finds here the relation between the lower forms of plant and animal life.

The Zo-ologist and even the Geologist

finds here elements which throw
light upon their respective lines
of study.

What wonder that scientists
differ so widely upon the origin
existance and destiny of life,
when they cannot even tell
what it is and know so little
of its mysteries.