

The Relation of Bacteria to the Home.

Martha Amelia Briggs.

The Relation of Bacteria to the Home.

84

Until recently, a knowledge of bacteria, was considered essential only to physicians, or such persons wishing to make a special study along that line, but that time is passed and to day every man and woman is expected to have a general knowledge of the subject of bacteriology and its relation to the home.

Bacteria may be defined as single celled plants, microscopic in size, usually destitute of chlorophyll and reproducing by fission. By microscopic examination it has been found that bacteria are composed of a cell wall and cell contents. The cell contents is composed of protoplasm, as is also the cell wall, in the latter case however we find the protoplasm in a more condensed form. The contents of some bacteria contain starch grains while others do not. Whether bacteria contain a nucleus or not is a question as yet unsettled.

We find in the study of bacteria that various conditions are favorable to their growth while other conditions are not favorable. The conditions that affect bacteria are moisture, temperature, light, electricity, chemicals, movement and the presence of other bacteria.

By experiments it has been proven, and is a well known fact that a certain amount of moisture is necessary to bacterial growth. This amount can be exceedingly small for some bacteria, but the majority of them however, grow best in liquid media. The question of temperature greatly affects the growth of bacteria, and

we find the temperature requirements vary for different species. We may say that the limits between which bacteria can exist is from ten degrees Centigrade to sixty degrees Centigrade. There are but few, however, that can live through this entire range. A medium temperature, or about twenty four degrees Centigrade, the temperature of our rooms, seem best adapted to their growth, yet some develop at the freezing point or even below that. Ordinary day light is not detrimental to the growth or development of the bacteria, but direct sunlight is injurious to the most tenacious forms. The action of electricity on them is not very thoroughly understood, but it has been found that powerful discharges of electricity through the culture media have killed the organisms. Certain chemicals retard the development of bacteria and in some cases kill the genus entirely. When bacteria are growing in a liquid medium perfect rest seems to be the condition best adapted for their development. Slow movement does not effect them to any great extent but violent agitation greatly hinders or prevents their growth. A test of water from a rapidly flowing stream where the water is much agitated, and one from a slowly moving stream, other things being equal will prove that this is true. When several species of bacteria occur in the same place they may oppose each other, if they do a struggle for existence ensues and the result may be the destruction of the weaker or least favored species; or it may

be that two associated germs help each other.

Bacteria are omnipresent. No other living organism is so widely distributed, there is scarcely a thing that is free from them. The air, soil and water are swarming with them as are the objects of our daily use. Our clothing and our dwellings, our intestinal canal, and our skin swarm with microorganisms. The upper layers of the atmosphere and the interior of the earth contain few if any bacteria. We know of only one field that is uninhabited by them and that is uninjured healthy tissues of the bodies of plants and animals; and it is claimed that the atmosphere of the high Alpine altitudes is free from them, but wherever man, animals or even plants live they are sure to be found.

The soil is exceedingly rich in bacteria, and particularly the upper layers, below six or eight feet the microorganisms are less numerous; in porous soil however we find them at a much greater depth. The bacteria in the air are chiefly from the soil; they are pulverized or ground up with dust and then carried into the air by means of winds. Most of the bacteria which are carried about by the wind are saprophytic and are perfectly harmless to the human being. Pathogenic bacteria are present relatively in very small numbers. A dry sandy soil, or a dry surface of any kind favours the presence of organisms in the air. The confined air of inhabited houses contain more germs

than the external air, that of city more than that of the country.

Most bacteria found in water are harmless unless the water is contaminated by sewage or seepage. Pathogenic bacteria find entrance to water in various ways, for instance they may come from bodies of animals or their products, from infected soils drained by water or they may come from the air.

Foods are also a means of distribution and contain many bacteria some of which are harmful and others which are not. Food may be infected by various sources; for instance, animal foods are sometimes infected because they have been obtained from diseased animals. Vegetable foods may become contaminated by pathogenic bacteria either by contact with the soil while growing, or after harvest in the cellar or store room, or they may become infected by direct contact with infected bodies.

Therefore, knowing as we do, that the soil, air, water and food swarm with microorganisms and that in some localities they are more numerous than in other places, the fundamental question to consider is the situation and location of the home. The chief essentials to be sought are pure air, sunlight, and dryness. In the first place, choose, if possible, an elevated place or hill slope for the location of your home thereby securing thorough drainage from all sewage and waste water. If the home must be built

on a low place, seek a sandy or gravelly soil; and avoid building over clay beds, or even where clay bottom is found under the sand or loam, for this will tend to hold the water. In the last mentioned case however, if drainage is properly understood, pipes may be so arranged as to secure against any standing water but in most cases it is safer to avoid the clay or compact soil. Avoid swampy and marshy places as diseases are prevalent in such regions.

Guard against too many trees near the house as they shut out pure air, and nature's most effectual germicide, sunlight. A few trees near enough to furnish shade in the yard is by no means objectionable, it is only in such cases where the trees are so profuse that the sunlight is entirely excluded from the house and we find the air in and about the house damp and musty. Such conditions as these predispose to scrofulous disease and tuberculosis.

The surface of the earth surrounding the house should have a good growth of healthy grass, should slope slightly away from the house, and the lawn should be kept free from debris of every kind. One of the most important questions to be considered is the proper disposal of sewage water and waste material, especially is this true if the well is in the door yard. Not infrequently is drinking water contaminated by the careless disposal of such materials. The surface for several feet around the well should be

closely packed with good gravel and all waste water should be disposed of at such distance that there will be no possible danger of contamination.

After considering the question of the location and surroundings of the home we find it no less important to consider a few points in regard to the construction of the home in general. It is an accepted fact among the civilized people, that cleanliness is necessary to health, and yet, we have known of instances where the home has been scrupulously neat and clean, the inhabitants of the home dieted on proper food, and good drinking water was supplied, but in spite of these facts, some contagious diseases have broken out in the home. Upon investigation it was found that the trouble came from the cellar. It may have been due to standing water in the cellar, or it may be that the cellar was comparatively dry but contained in it some decaying vegetables, or household rubbish such as old shoes, rags ~~and~~ etc. No house however clean it may be kept will guard against disease germs if the cellar is in one of the above conditions. Strange to say, nevertheless, it is true, that some people forget that the cellar is a part of the house, or that the condition of the cellar will have any effect on the rest of the house. The cellar should always be well drained and free from dampness, and have windows so located as to thoroughly ventilate, and also arranged so that some sunlight may penetrate

the cellar. When the cellar is suspected of being infected, the walls, floors, ceilings, and all objects upon which suspicion rests should be thoroughly saturated with either a five percent carbolic acid solution, or sulphuric acid solution, and kept wet with it over night.

A five percent creoline solution or two percent chloride of lime solution may also be used for disinfecting.

In arranging the different rooms of the house it is a wise plan to reserve the rooms on the north side of the house for store rooms, refrigerators and rooms seldom occupied, while the living rooms and bed rooms, should as far as possible have full sunshine during a part of the day.

All furnishings of the home should be of such nature as to be easily kept free from dust and impurities of all kinds. Not only should the inside wood work and walls of the house be smooth and easily cleansed, but even the concealed portions of the furniture should be made with smooth surfaces, and either varnished or oiled, so that the lodging of dust and the absorption of poisonous gases may be prevented. The general acceptance of the germ theory of disease makes it imperative for every housekeeper to guard against all accumulations of dust, since such accumulations may harbor dangerous germs.

On this account upholstered furniture or heavy woolen draperies which cannot be easily freed from dust is objectionable. Heavy Brussels and velvet carpets cover

ing the entire floor accumulate dust and furnish a place for disease germs. Hard polished or painted floors with rugs are preferable, for they may be kept clean by removing and dusting rugs and then wiping the floor with a damp cloth.

Ventilation should be well provided for; in the ideal home flues are built for this purpose, but ventilation can be carried on very successfully by windows if they are properly arranged.

Great care should be taken of store rooms, or cellars where food is being preserved, since nothing is so readily attacked by bacteria as food products. The store room should be well screened from flies since they are conveyers of bacteria and are always attracted to food. Ventilate well and guard against any decaying matter. Food products might be preserved indefinitely were it not for the presence of bacteria. Some of the foods have a natural protection against micro-organisms, take for example some of the fruits; as long as the skin remains whole they are not so susceptible to decay, then too there are various artificial methods by which the growth of bacteria in food may be hindered or prevented, such as drying, cold-storage, preservation by the use of chemicals and hermetically sealing.

There are so many ways and means by which bacteria or disease germs are spread, that we not infrequently find houses in which the principles of

sanitation have been closely observed, visited by some contagious disease, hence it is important to have some knowledge of the treatment of such cases and to be familiar with such chemicals as will either kill the disease germ or render them harmless.

The room to be occupied by a person suffering from a contagious disease should be furnished as simply as possible; the draperies should be of some light washable fabric. Heavy carpets, upholstered furniture, books, and bric-a-brac should be dispensed with for they only serve as a means of accumulating disease germs, and cannot be disinfected without a great deal of trouble and extra labor.

A dilute solution of carbolic acid with an equal amount of water may be used in washing the patient after which he should be thoroughly washed with soap and water. Hands soiled in caring for persons suffering from contagious diseases may be washed with the carbolic solution the same as the patient. Soiled clothing, towels, sheets, and etc. should be immediately immersed in a carbolic solution before removing from the sick room. After soaking two or three hours they should be wrung out and boiled for one hour in strong soap suds. The furniture in the room such as beds, chairs, and woollen clothing which cannot be washed should, at the end of the disease, be thoroughly disinfected by exposing to formaldehyde gas.

Discharges of all kinds from a patient suffering from a contagious disease should be received into glass or earthen receptacles containing carbolic or bichloride of mercury solution or milk of lime. The amount of the disinfectant should be twice the amount of the discharge. Discharges may also be received on old pieces of cloth, or paper napkins, and immediately burned, especially is this method preferred in cases of tuberculosis where the sputum from the patient, contains the germ which causes the disease. Dishes, knives, forks and spoons used by the patient, should be used by no one else, nor should they be removed from the sick ^{room}. They should be washed in a carbolic acid solution, then in strong soap-suds after which they should be rinsed in boiling hot water. Any food left over from a patient's meal should never be saved but immediately burned.

Rooms which have been occupied by persons afflicted with some contagious disease should be thoroughly disinfected before being used again. For this purpose careful fumigation with formaldehyde gas is excellent. All apertures in the room should be closed, or tightly sealed, and then from six to twelve ounces of formalin used to generate the gas for one thousand cubic feet. The time of exposure varies from twelve to twenty-four hours, according to the nature of the disease, the

penetration required, the concentration of the gas, and the size and shape of the room. For perfect disinfection the temperature of the room should be as high as possible and certainly not less than fifty-two degrees Fahrenheit, then too, much better results are obtained where the gas is generated rapidly.

The body of a person dead from an infectious disease, should be completely wrapped in several thicknesses of cloth wrung out of a carbolic acid, or bichloride solution and if possible placed in a metal casket. Burial of the body should follow as soon as possible. It is well to remember in the use of disinfectants, and in guarding against disease germs, that nature's germicides, fresh air, sunlight and absolute cleanliness, not only helps protect the attendants from infection and aid in the recovery of the sick but directly destroys the bacteria which cause disease.

In guarding against these many germs or microorganisms we do not wish to carry the idea that all bacteria are detrimental or injurious to man, far from it. As a matter of fact the greater number are his benefactors. Many not only act as scavengers by removing decomposing organic matter, but also by converting it into inorganic substances, which furnish nutrition for plants, indirectly prepares food for man. The beneficial effects of bacteria are well illustrated in the dairy, in the making of butter and cheese. The ripening of

cream and probably cheese is due to the presence of bacteria and it has been found that cream which has undergone this ripening process, is more easily churned, gives a larger yield of butter, and the butter receives a flavor much prized. The different flavors of cheese also depends upon the action of bacteria. The souring of milk is due to *Bacillus acidilactici*. Yellow milk is due to *Bacillus synxanthus* which curdles the milk and produces a yellow pigment.

Fermentation is caused by the presence of bacteria, and is an important factor in preparation of different foods. The flavor of sauerkraut is due to fermentation caused by certain bacteria. Vanilla extract, made from the vanilla bean; which when taken from the plant possesses no flavor, is due to a process of fermentation. The garry flavors of meat so highly prized by some people is due to bacterial decomposition. Many articles of commerce are prepared for market by the aid of bacteria such as sponges which are cleaned of the organic matter by bacterial decomposition.

The preparation of indigo from the indigo plant is brought about by a special bacterium found on the leaves. If the leaves are sterilized no fermentation occurs and hence no indigo is formed.

In view of these facts, it is evident, that in this enlightened day and age of scientific re-

search and investments, it is not only necessary for physicians and bacteriologists to be versed along the line of bacteriology and its relation to the home, but it is of the utmost importance that every individual should have a knowledge of this subject upon which their success in life so largely depends.