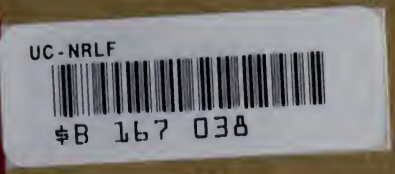


THE GREAT WHITE PLAGUE

SIMPLE LESSONS ON CAUSES AND PREVENTION

BY

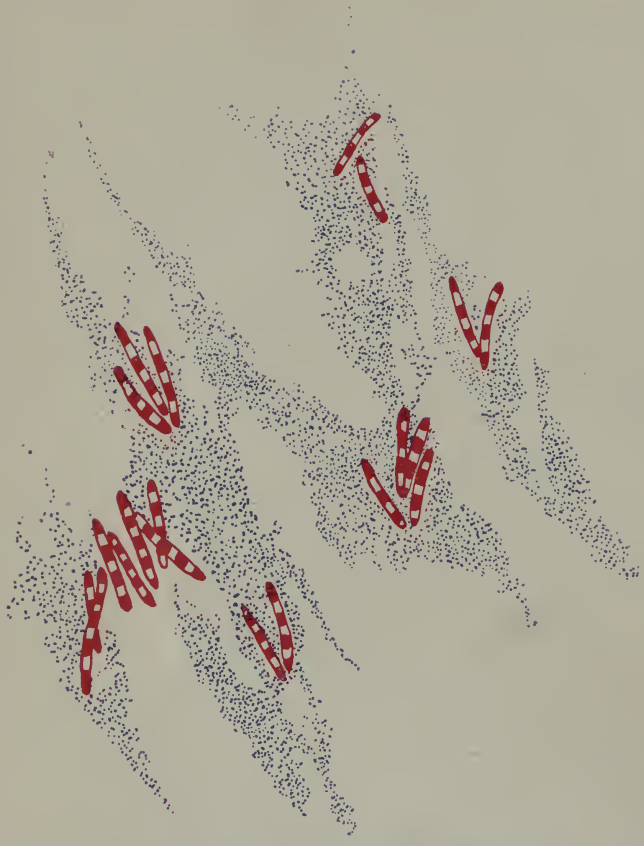
W. D. FROST AND M. V. O'SHEA

ISSUED BY

C. P. CARY, STATE SUPERINTENDENT

MADISON, WISCONSIN
DEMOCRAT PRINTING COMPANY, STATE PRINTER
1912

BACILLUS TUBERCULOSIS.



The germs of tuberculosis from the spit of a consumptive as they appear under the highest powers of a compound microscope. Each little red rod is a separate individual and capable of producing the disease under favorable conditions.

THE GREAT WHITE PLAGUE

Simple Lessons on Causes and Prevention

INTENDED ESPECIALLY FOR USE IN SCHOOLS

BY

W. D. FROST
of the Department of Bacteriology

AND

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PREFACE

This little book is intended for pupils from the age of twelve or thirteen years onward. It has been the aim to make the material contained in it of practical interest to teachers as well as to pupils. The treatment throughout is simple and concrete, and every principle developed is illustrated with instances drawn from the every-day experiences of children of the ages for whom the book has been prepared. Generous use has been made of photographs and diagrammatic pictures.

If the pupils now in the schools could be so instructed in respect to the subject matter of this book that it would take effect in their daily living, tuberculosis would be materially diminished immediately; and in a generation or two it would probably disappear completely. It is doubtful if it can be got rid of in any other way.

The authors have had the co-operation of the Wisconsin Anti-Tuberculosis Association in the preparation of the book; and acknowledgment is hereby made of valuable financial help as well as criticisms and suggestions made by the officers of the Association. Acknowledgment is also made of assistance received from Superintendent C. P. Cary, and from Professor W. E. Leonard, Miss M. E. Ashmun and Mrs. E. E. Hoyt of the University of Wisconsin.

Madison, Wis., March, 1912.

The Authors.

THE GREAT WHITE PLAGUE.

Lesson I. MINUTE FORMS OF LIFE.

You have all seen India ink, and you know how black it is; but do you know that its blackness is due to very fine particles of the ink so small that they cannot be seen with the naked eye? When they are seen under the microscope they look like pieces of coal.

We cannot see the moisture in the atmosphere, and yet we know it is there, else we could have no rain or snow.

Although everyone is familiar with many kinds of plants and animals differing as to size, some people do not realize that there are a great many forms of life so small that they cannot be seen with the naked eye.

Mention all the forms of life you know which are so small that you cannot see the individuals, although you can observe masses of them when they multiply into billions. How can you tell that there are individuals in these masses? You should make a few experiments to show that there are very minute living things that will do work which we can observe when the conditions are right.

In an ordinary compressed yeast cake there are billions of living cells, or plants, that are called yeast plants. These cells are so small that we cannot see the individuals without a microscope, but we can see the work which masses of them do working together. Everyone is familiar with the "raising" of bread when yeast is put into it. Anyone can show the working of yeast by putting a few teaspoonfuls of sugar into a tumbler of warm water—just warm enough to hold the finger in—and then crumbling into this a considerable portion of a compressed yeast cake. In a little while, the yeast cells or plants will begin to work, and soon gas will be seen escaping, with the appearance of a frothy scum on the surface. These changes are due to the activ-

ity of the yeast cells, which break up the sugar, forming alchohol and carbonic acid gas. It is this gas which we see rising in bubbles.

Minute, invisible forms of life exist everywhere about us. They are so small that they cannot be seen by the naked eye, but if they fall upon a suitable food such as the cut surface of a boiled potato, or a slice of moist bread or cheese, they will increase in number so rapidly that in a few days they will form spots or "colonies" which are easily visible. The air always contains a greater or smaller number of these invisible forms of life, but, fortunately, they are usually not harmful.

Fig. 1.—Yeast cells as seen under a very powerful microscope.

Have you observed what happens to meat, milk, or almost any other article of food, if it is left exposed to warm, moist air? Describe what happens. Why do people boil milk to keep it from "spoiling?" Why will cooked meat keep longer than raw meat? Why do people, when they can cherries, pears, or other fruits, try to make the cans air-tight? What will happen if they do not do so?

Our forefathers from remote times until a few decades ago lived without having clearly understood that there are vast numbers of both plants and animals so minute that one can see them only with the aid of a powerful magnifying glass. But when the microscope was perfected, people began to understand that there is a world of living things of which many have never even dream-

ed. Some one has spoken of this newly discovered world as that of the "infinitely little." And as we have come to know more about these microscopic plants and animals, we have come to realize how important they are. They do much of our work, such as preparing our food, carrying off and destroying our waste material, and performing other necessary and useful tasks. Some of them are our friends. They ripen our cream for butter-making, cure our cheese, make our vinegar; they purify our sewage and disintegrate our garbage; they keep the soil fertile, etc. Many of them, however, are our enemies; and the fact that they produce diseases of different sorts is one reason why we have become so much interested in them, and why we are trying to discover under what conditions they grow, and how we can control them.

The forms of life we are to study about are altogether too small to see without the help of a large and expensive microscope; and unless we can use this instrument, the only way in which we can learn anything about these minute bodies is to observe the work which they do.

LESSON II. THE WORK OF MICROBES.

Bring from your home, or secure from a grocery store, a rotten apple and a rotten potato, and also a few sound ones of each variety. Your teacher will then place the rotten apple on a table or shelf, and, close to it and touching it, a sound apple. Place another sound apple near the diseased one, but not touching it. Wrap another apple in a piece of paper (waxed paper, if you can get it), and put this so that the paper touches the rotten apple. Do the same thing with the potato and note what happens.

You will need to make observations in this experiment for about one week. After this time, describe what has happened to the apple or potato in contact with the rotten ones. Has the same thing happened to the one near but not touching the rotten one? Has the paper served as a means of protecting the apple or potato from decay? What does this experiment show in regard to the way in which decay in fruit and vegetables is spread? Is decay catching? Why?

Secure some moldy fruit or vegetable, or a piece of moldy cheese, and allow it to dry so that it can be pulverized. Then take some fresh bread and cut several slices. This latter work ought to be done in a separate place from that in which the moldy food is handled; it ought also to be done by a different person from the one who prepares the molds. Why? Place each of three slices of the fresh bread on a sheet of blotting paper, and on two pieces of the bread sprinkle a small quantity of the mold dust. Cover one of these with a glass bowl, or some other glass dish. The third "unseeded" piece should also be covered with a glass. Those pieces which are covered should be kept moist by placing water on the blotter from time to time. Keep track of developments for a few days. At the end of this period describe what change has taken place on the uncovered piece of bread. What was the object in covering the bread? Note that the molds do not grow unless they have been seeded. If a few molds do grow on the third piece of bread, it simply means that the mold "seeds" or "spores" fell on it from the air before it was covered; note

also that of the two pieces of bread seeded with mold, only the one that was kept moist developed a heavy crop.*

Many kinds of *microbes,* or tiny invisible forms of life, do a great deal of good for us, and it would be quite impossible, or at least very inconvenient, to get along without them. But microbes are known chiefly for the harm they do, since in many ways they interfere with our happiness. The decay of fruit, vegetables, and other food products is an undesirable change which microbes produce, and with which we are all familiar. You have already seen the experiments with a rotten apple or potato. If we suffered the loss of a single apple or potato occasionally we should not mind it much; but in our experiment we discovered that when one apple becomes diseased, the perfectly sound apples around it will soon decay, first on the side which is in contact with the bad apple, and then all the way through. We know very well that if we leave a decayed apple in a basket or barrel, it will not be a very long time before all the neighboring apples will become diseased. The microbes which produce these changes pass directly from one apple to another when the apples touch. The same thing is true of potatoes; whenever we find a rotten potato in the bin, we always throw it out to prevent the rottenness from spreading.

In somewhat the same way that microbes produce decay and rottenness in fruits and vegetables special sorts of microbes produce diseases in man and animals. We have heard of "contagious" or "catching" diseases. We know that a person who has smallpox, measles, or whooping cough is being attacked by microbes, and just as microbes may pass from one apple to another in a barrel, so smallpox, measles, and scarlet fever may pass from one person to another, or from the sick to the well.

Have you ever seen a house with a colored placard on the door bearing the words "Scarlet Fever," or "Diphtheria," or "Smallpox?" Why was the placard placed on the house? Could people come and go in that house as they chose? Why?

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* In explaining why these things are true the teacher can bring out the importance of environmental conditions, such as, air space, amount of light, moisture and dust.

LESSON III. MICROBES PRODUCE DISEASE.

In a good many cases we do not know how the "germs" or microbes of disease pass from one person to another. But we do know that in some way, whether by way of the mouth, or the nose, or the skin, they do leave the sick body and in some manner, either through the air we breathe, or the food we eat, or through the skin, they do enter the bodies of healthy people. Diseases of this kind are spoken of as "infectious" or "contagious" diseases. They are produced by microbes, without which they would not exist.

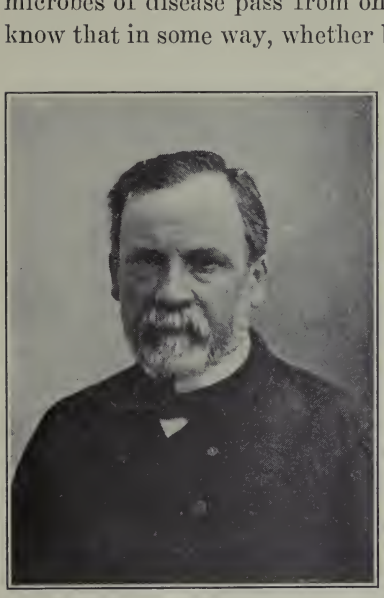

Fig. 2.—Pasteur—One of the greatest benefactors of the human race. He said "It is within the power of man to make the germ diseases disappear from the world."

Microbes produce disease in man and animals in two different ways. One class grows in our food materials and produces poison. When these poisons are taken into the stomach with food, they may produce sickness or even death. These poisons are known as "ptomaines." Instances of "ptomaine poisoning are frequently noticed in the newspapers. The dangers of ptomaine poisoning can be avoided by protecting food materials, especially meats, from the growth in them of the "putrefaction" or decay microbes or "bacteria."

Microbes, however, usually produce disease in man and animals by growing in the body of their victim. They live upon the material of which the body is made. From this flesh and blood they make poisons which cause sickness and death. These microbes are "parasites." (What is a parasite?) Diseases caused in this way are spoken of as "germ" diseases. To these diseases, also, the terms "contagious," "infectious," and "preventable" are given for reasons to be explained later.

A particular germ is always the cause of a particular disease. These germs are usually named after the diseases which they produce, as the "diphtheria" germ, the "typhoid" germ, or the "tuberculosis" germ. People never have these diseases unless the particular germ which causes them is growing in and poisoning the body. The disease germs always come from parent germs, and never start from "nothing" as some people used to think, or from the body itself. These germs always come from some previous case of the disease which they produce. Certain of these diseases are "caught" by one's coming into contact with some one having the disease. For this reason they are called "contagious" (touched; carried). Decay or rottenness in fruit or vegetables is produced in the same way, you will remember. Some other germ diseases are carried indirectly from the sick to the healthy; as, for example, through food or drink, as milk or water; and by means of insects, as flies and mosquitoes. These are called "infectious" diseases. There is no sharp distinction between infectious and contagious diseases. All contagious diseases are infectious, but infectious diseases are not necessarily contagious. Why?

Probably all of these diseases can be prevented. All that is necessary is to prevent the escape of the disease germ from those infected by it, and guard the bodies of the well from its attack.

Among the diseases produced by microbes none is more important or dreadful than "tuberculosis." The presence of tuberculosis in a family or community is dangerous, in somewhat the same way that a rotten apple in a basket is dangerous to all the good apples. But there is this difference: it is practically impossibe to make a rotten apple safe to put with the sound ones. But in the case of tuberculosis and other diseases due to microbes or germs, when intelligent care is used, people suffering from them may with a certain degree of safety mingle with well people. But it must always be remembered that a person suffering from a germ disease is dangerous to the people around him unless everybody is very careful to prevent the escape of the dangerous germs from the diseased person, and the entrance of these germs into the body of some one else.

LESSON IV. THE GERM OF TUBERCULOSIS.

Expose a gelatine or agar plate* to the air for a few minutes, then cover it up, and allow it to grow for several days. Growths will appear in the form of "colonies." Each colony represents the decendants of a single germ which fell on the plate. Count the number of colonies, and, knowing the area of the plate and the number of minutes it was exposed figure out the number of bacteria that were falling in the room per square foot per hour.† Draw some of the colonies. If possible, examine some of these germs or mircobes or bacteria under the microscope, and draw what you see. Perhaps your teacher will give you one of these plates to expose at home. When the colonies have grown out, count them and then examine them under the microscope.

Fig. 3.—Robert Koch—This picture was taken of him at about the time he discovered the "tubercle bacillus."

Until late years nothing was known in regard to the cause of tuberculosis. It was only about the middle of the last century that the disease was definitely considered as an infectious disease. Our ancestors thought that it was due entirely to "heredity;" that is, that children were born with it. The credit of discovering the cause of tuberculosis belongs to Robert Koch, of Germany. The discovery was announced in 1882. At the time Robert Koch made his discovery, scientists were just becoming

* These cannot be prepared except by those who have had special training in bacteriology, but the necessary material will be furnished for this experiment, accompanied by full directions for use. These experiments add much to the interest of the work. Write to the Department of Bacteriology and Hygiene, University of Wisconsin.

† For example, if the plate has an area of 12 square inches and develops 20 colonies when exposed 20 minutes the rate of falling would be 12 times 20 or 240 per foot each 20 minutes, or 3 x 240, or 720 per hour.

acquainted with the various disease germs or "bacteria." Bacteria, as you have learned, are forms of plant life in which the individuals are so extremely small, that they are invisible. In measuring them we use, as the unit of measurement, what is known as a *micron*, which is about 1/25000 of an inch. Many of the bacteria are only about one micron in length, and rarely are they more than a micron in width. This means that 250 of such bacteria placed end to end would about equal the thickness of a piece of the paper on which this book is printed.

Different bacteria vary in shape, from spheres through the cylindrical forms, to twisted cylinders, or corkscrew forms. The "bacillus" or germ of tuberculosis is a straight, narrow rod, about half a micron wide, and five or six microns long. Many kinds of bacteria can be grown artificially on food substances made from meat. A broth made very much like a beef consommé is frequently used. To this may be added a gelatine or agar (a vegetable gelatine), and in these substances, or *media*, as the scientists say, most bacteria grow readily. The bacillus of tuberculosis, however, is a very dainty microbe, and it will not grow in the media named above unless a little glycerine is added, in which case it grows well, but slowly. It grows very well upon the fluid or watery part of blood, either human or animal, which has been hardened by heat. Except when introduced into such media as just mentioned above, the "tubercle bacillus" does not grow outside of the animal body. This is very fortunate for us, because, if it did increase in numbers outside of the body, the whole world of men and animals would have been affected long before this.

The tubercle bacilli, or germs of tuberculosis, which come directly from a sick patient, or from "cultures" made in the way described above, where it was shown how to grow bacteria at will, can be studied only under the microscope.

Because they are extremely small, and also because they are almost transparent and without color, it is very difficult to study them. Ordinarily they are examined only when they have been specially treated or stained. When they are viewed under the microscope, they present a characteristic appearance. The fact that the tubercle bacillus takes a stain of its own, makes it possible for those trained to the task to tell this germ from all others which may be somewhat like it. The sputum (or spit) of a person who has tuberculosis contains these germs,

sometimes in very great numbers. By staining this material and examining it under the miscroscope, it is usually possible to early find the germ of tuberculosis. Everyone who suspects that the disease may have fastened itself upon him should have his sputum examined. Many states, and some of the cities of the country, have dispensaries or laboratories where this kind of work is done without charge.

Although the germ of tuberculosis does not grow and reproduce outside of the body, except on special "culture media," still it does *live* outside the body sometimes for very long periods, simply retaining its vitality, ready to grow when the conditions are right. This germ can withstand drying for months and even years. It may live in putrefying (rotting) or decaying material for a long time, and in dark, dirty corners of buildings for years. One of the best ways of killing it is to allow the direct *sunlight* to reach it. It will be killed also more quickly in a *dry* than in a *moist* place. Hence, the necessity of dry, well-ventilated, and light rooms.

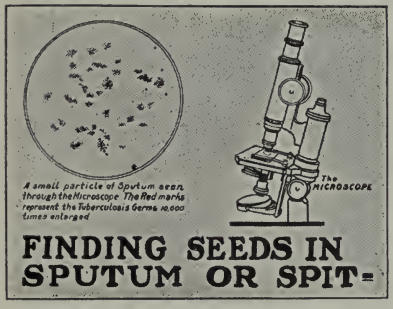

Fig. 4.—The germ of tuberculosis. See last page of cover.

Fig. 5.—Doctor examining the chest of a person suspected of having tuberculosis.

Lesson V. THE NATURE OF TUBERCULOSIS.

Nearly everyone has seen people who were thin, with hollow cheeks and narrow chests, and who had a dry, hacking cough. Such people are sometimes said to be suffering from "bronchitis;" but if the truth is known, it sooner or later appears that they have consumption, or tuberculosis of the lungs. There are few people who have not seen hunchbacks. These people have deformed spinal columns which have been injured and twisted on account of a diseased condition. This is usually the result of tuberculosis. Hip joint disease is common. On account of disease, the hip has been deformed, and the hip joint stiffened so that it can not be moved. If we knew the history of these cases, we should find that almost always this injury to the hip joint had been brought about by tuberculosis. Diseases of the bones in other parts of the body are frequently caused by tuberculosis. Frequently, especially in children, diseases of the intestines, which are serious and difficult to treat, are caused by tuberculosis.

We have already noticed that tuberculosis is a disease caused by the growth in the body of a germ or microbe known as the

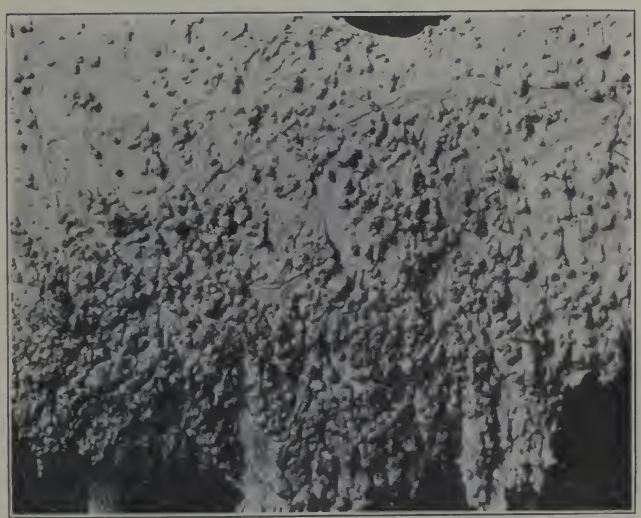

Fig. 6.—The little bunches or "nodules" are the "tubercles" formed on the inside of a cow with tuberculosis. In health this "omentum" is smooth.

Bacillus tuberculosis. When the germ gets into the body, it grows in the tissue, destroying the cells all around it. It also makes certain other cells grow causing the production of "nodules" or "tubercles." These are shown in the accompanying illustration. This formation of "tubercles" is peculiar to this disease, and has given it the name *tuberculosis.* This germ may grow in any part of the body; but in human beings it grows most frequently in the lungs. When tuberculosis occurs in the lungs, and especially after the disease has gone on for some time, it is known as *consumption.* In the United States, about nine people die of consumption, where one dies from some other form of tuberculosis; so that consumption is by far the most important form of this disease. A great many people suffer from various other forms of the disease, however; and children especially are likely to have the disease in the intestines, or in the spinal column, or in the hip joint or other bones, or in the glands of the neck and so on. In times past, these diseases went under different names, but whether the tubercle bacillus attacks the parts of the body named above, or the brain, the spinal cord, or any other part, it is in reality one and the same disease, and is caused by the same microbe.

Fig. 7. —The appeal is to all of us.

Lesson VI. THE EXTENT OF TUBERCULOSIS.

What is the most frequent cause of sickness and death? This is a question any one might well ask. If you were to go to the health officer in your city or town, and ask him what was the chief cause of death in your community, the reply would ordinarily be, "Tuberculosis." If your health officer had a record of the living cases of tuberculosis, as he certainly ought to have, he would tell you that there are far more cases of tuberculosis than of any other disease; and at any one time there would probably be more cases of tuberculosis than there were cases of all other infectious or germ diseases together. So that it is fair to say that tuberculosis is the greatest plague with which the human race is afflicted, because of all diseases common to mankind, it is the most widespread and

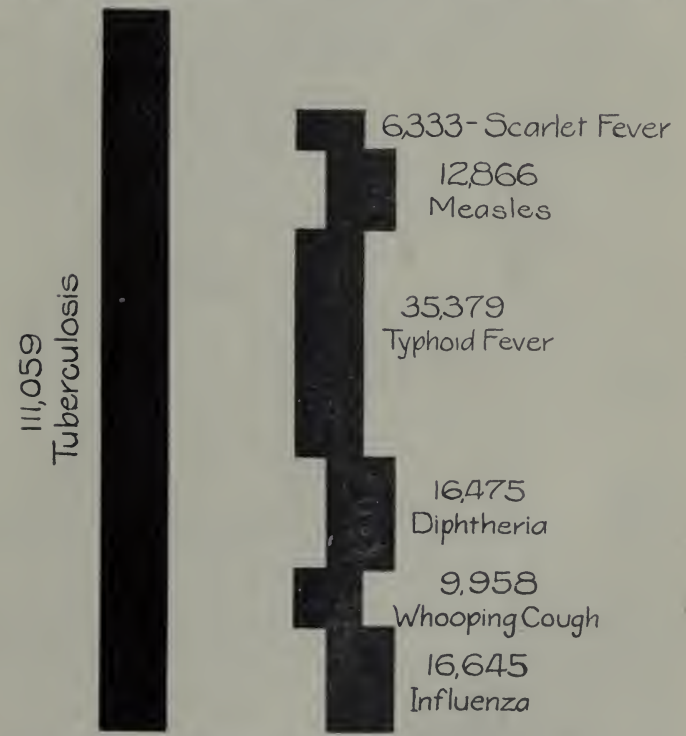

Fig. 8.—This figure shows that tuberculosis is more deadly than scarlet fever, measles, typhoid fever, diphtheria, whooping cough and influenza combined. U. S. Census Report.

the most deadly. John Bunyan spoke of it as the "Captain of the Men of Death." It causes more deaths each year than scarlet fever, measles, typhoid fever, diphtheria, whooping cough, and influenza combined. Study the chart and see how this fact is shown. We think of the terrible loss of life due to war, but tuberculosis kills many more people than war ever has done; and it always keeps on with its work. It never grants a truce. The entire loss of life in the Franco-Prussian war was only about one-half the loss from tuberculosis in Prussia alone for a single year. The loss of life in our country, due to tuberculosis, in any four years, is about three times the loss of men during the four years of the Civil War.

In the nineteenth century there were many terrible wars, and it is estimated that fourteen million soldiers died on the battle field. But while these wars were going on, thirty mil-

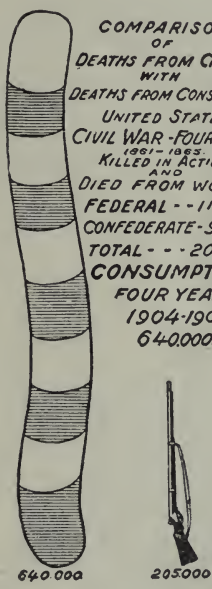

Fig. 9.—The banded object, at the left, represents a germ of tuberculosis. It appears more than three times as long as the gun and this represents the relative destructiveness of this germ as compared with the gun in war time. We must remember that this germ is destroying its victims all of the time, and not merely during war time.

Fig. 10.—About as many people die in Wisconsin each year from tuberculosis as there are soldiers in the State Guard. There are at least six times as many living cases, probably ten times.

lion people in the very same countries died of tuberculosis. The number of deaths in the San Francisco earthquake was only a little over one half of the loss of life every year in San Francisco from tuberculosis. The great earthquake in Southern Italy

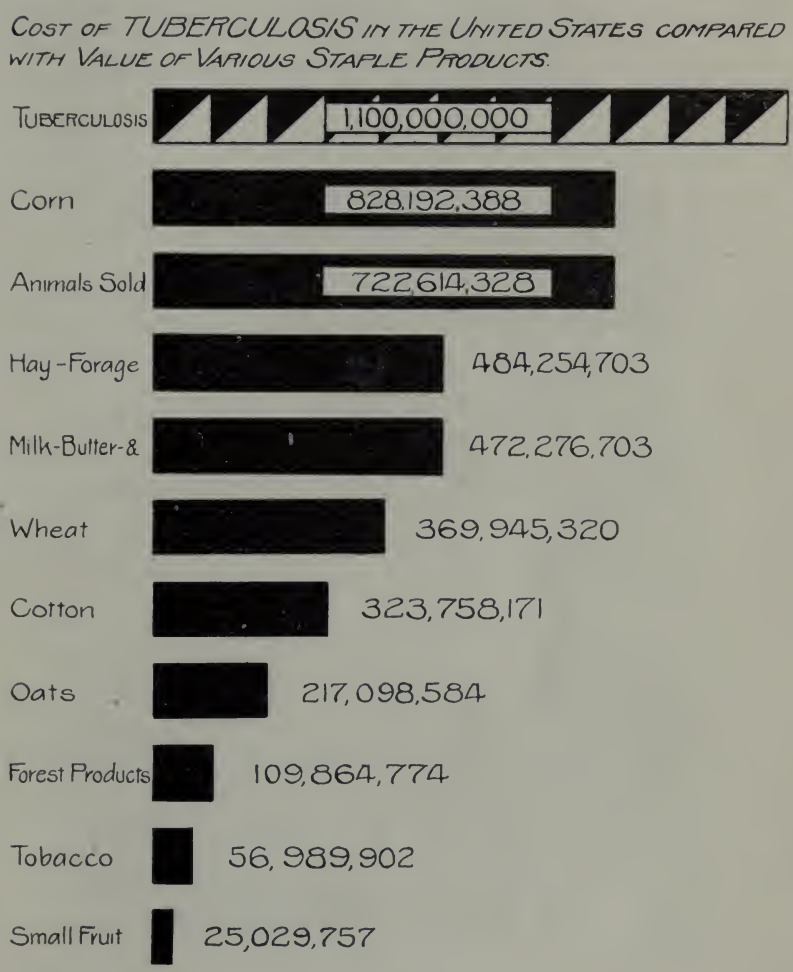

Fig. 11.—The length of the lines indicates what tuberculosis annually costs the people of the United States in dollars in comparison with the value of various staple products.

destroyed scarcely more people than die each year of this disease in the United States. It is estimated that from twenty-five hundred to three thousand people die each year in Wisconsin from this disease. In the United States from one hundred and

fifty thousand to two hundred thousand die every year, and a million and a half in the world. The terrible price we have to pay for the neglect of this disease is impressed upon us if we realize the fact that of the ninety million people now living in the United States over nine million of them will die of tuberculosis, unless conditions are improved; and of these nine million, two hundred and fifty thousand will be in the State of Wisconsin.

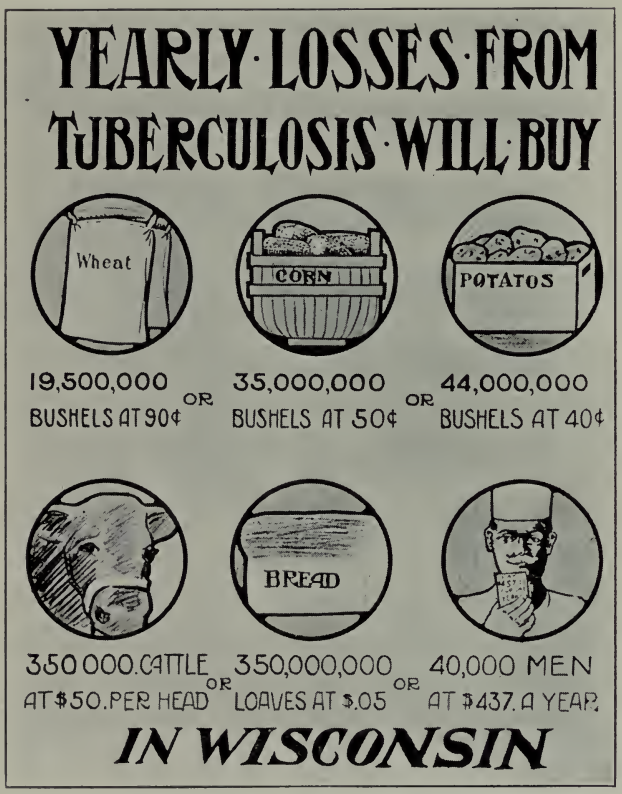

Fig. 12.

The waste in dollars and cents caused by the disease has been estimated by a number of people, and it is probably fair to say that we lose in the United States each year one billion one hundred million dollars ($1,100,000,000) as a result of the disease in human beings; and fourteen million ($14,000,000) more as a result of the disease in cattle. This loss far exceeds

the value of any one crop in the United States. Or, in other words, if we should lose one entire corn crop, and cotton crop, but could save one year's loss from tuberculosis, we should, as a nation, be financially better off than we now are. The loss of the dairy products, the wheat, the forest products, the tobacco, and small fruit of an entire year would scarcely exceed in value the present loss from tuberculosis. Besides the money losses indicated above, the human race has, of course, been made very much less happy because of the ravages of this disease than it otherwise would have been. It has caused poverty and suffering beyond anything that can be measured. It has been the direct or indirect cause of filling our insane hospitals and orphan asylums, our homes and hospitals for crippled children, our reformatories, and our prisons and penitentiaries. It has deprived us at an early age of many of the most brilliant men and women in all periods of the world's progress.

If we had through the misfortunes of war, or the sudden rise of pestilence, or through some awful calamity, the destruction of life that annually takes place on account of the spread of the white plague, we should be appalled. Mass meetings would be held in every community and demand would be made that the most urgent measures should be adopted. It is only because we are accustomed to this waste of life that we can look calmly on and go about our business, paying no attention to this enormous death toll, which our American people are paying.

—*Justice Charles E. Hughes, U. S. Supreme Court*

LESSON VII. THE SPREAD OF TUBERCULOSIS.

In a preceding lesson it was shown that the sputum (or spit) of persons suffering from tuberculosis of the lungs (or consumption) may, and usually does, contain the bacilli or germs of tuberculosis. These germs may be carried from one place to another through the sputum. These germs, in the case of people suffering from tuberculosis, leave the body almost entirely in the sputum. In the case of animals suffering from the disease, the meat and milk may contain the bacilli, and hence

Fig. 13.—The germs that attack us come from the bodies of the sick. From Ritchie's Hygiene, published by the World Book Co.

Fig. 14.—Kiss the baby on the cheek, not on the mouth. Why? From Ritchie's Hygiene published by the World Book Co.

be the means of spreading the disease. In the case of both man and animals, "pus," or the matter coming from the tubercular sores, may serve as a means of scattering the germs. It is generally believed that tuberculosis is very largely passed on from one person to another by means of the sputum. If this material is not destroyed, it dries and becomes pulverized, and is then blown about, and may enter a well person with the air that is breathed. It is estimated that the sputum given off in twenty-four hours by a person in the last stages of the disease may contain as many as seven billion tubercle bacilli

(7,000,000,000). Considering the number of careless consumptives, it is no wonder that the air in certain buildings, or localities, frequented by consumptives, is loaded with the germs.

When one talks, but especially when one speaks forcibly, coughs, or sneezes, there is driven out from the mouth a fine spray, made up of tiny drops of finely divided sputum. These droplets contain, in the case of consumptives, the germs of tuberculosis; and if these are breathed in by a person inclined

Fig. 15.—In droplets of sputum that are coughed out into the air, the germs of tuberculosis, influenza, colds and other respiratory diseases are found.

towards the disease, they may take up their abode in him, and grow vigorously. However, the danger of this is really great only when one remains very near a tuberculosis patient for a considerable length of time. At a distance of three or four feet there is likely to be but slight danger of infection. From a consumptive, these little drops of sputum are constantly falling on the floor and the furniture and even on food, and it is important that this source of danger should be avoided.

In the case of tuberculous ulcers, abscesses, etc., the discharge contains the germ, and must be carefully handled to prevent the spread of the disease.

Cows, even when they have tuberculosis, do not usually cough; hence there is little danger from their sputum. But the milk contains the tubercle germs, not only when the udder is affected, as claimed a few years ago, but also when the infection exists in other parts of the body. The United States Department of Agriculture has recently found that milk becomes infected with disease germs by getting manure in it.

In cattle especially the disease is located in the internal organs, and not in the muscles; hence the danger of infection by eating meat from infected animals it not so great as it otherwise might

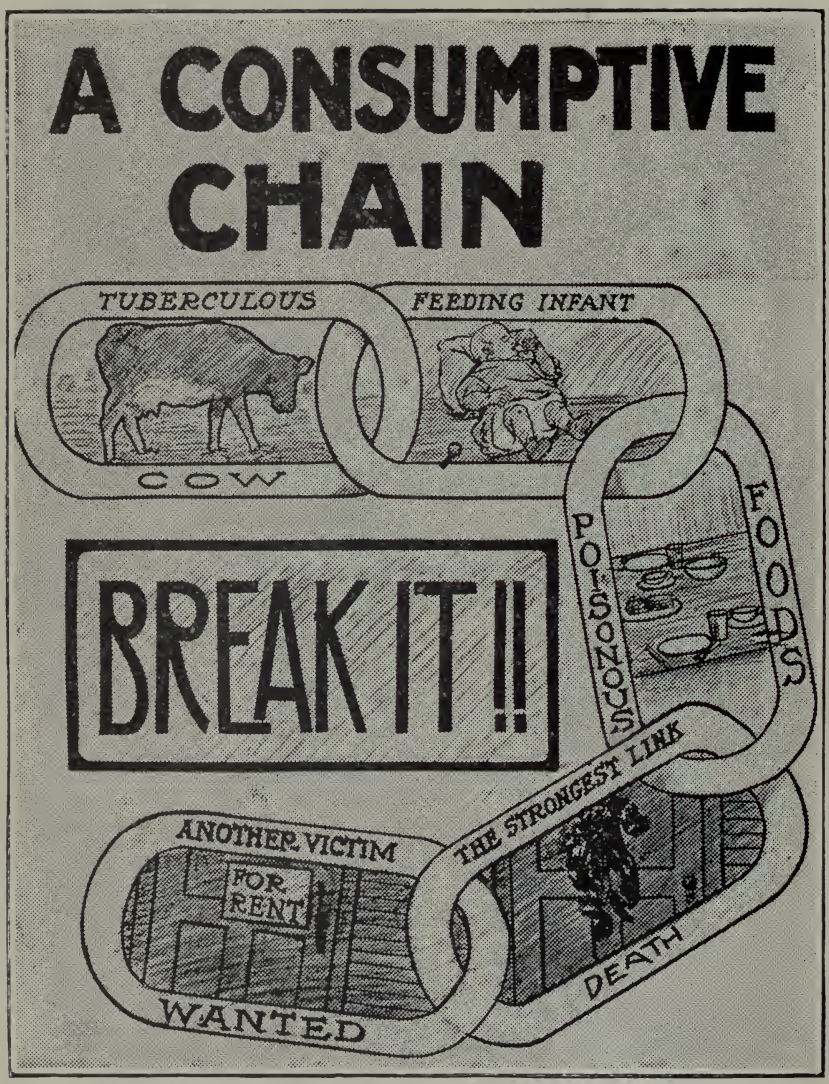

Fig. 16.—Notice the important part that the tuberculous cow plays in this chain.

be. Nevertheless, it has been shown that the germs are present in the meat of cattle which have had tuberculosis, and were it not for the fact that meat is usually cooked before it is eaten thus killing the germs, it would be a more important and dangerous factor than it usually is in spreading the disease.

Does your city or town have an "anti-spitting" law? If so, why was the law made? In what places is it unlawful to spit? Why? Find out whether or not the law is enforced in your community. Do you see people spitting on the street? In street cars, etc.? Copy an anti-spitting placard which you have seen. Tell where you saw it.

Does your city or town have a milk ordinance? If so, does it require that the cattle supplying the milk shall be tested for tuberculosis? Why?

Try this experiment: Darken a room, and then through a pin hole, or other small opening, allow a beam of direct sunlight to enter the room. Ask some-one so to stand that he can cough or sneeze right against and along this beam of light. Then see if you can detect the fine spray of sputum which is given off. Find out about how far away from the body the droplets are thrown. Try also the experiment of holding a mirror before the face while speaking.

LESSON VIII. MEANS OF PREVENTING TUBERCULOSIS.

As we have seen, tuberculosis is not inherited; but in almost all cases it is taken by a "susceptible" person coming into contact with some one having the disease. The need to repeat for emphasis, that if we are to prevent the spread of the disease, we need to see that those who have it *take proper care of themselves,* so that the germs which they are giving off do not make their way to some one else. When one is suffering from consumption, as you have already learned, the germs are given off in the sputum in enormous numbers, and the important thing to do is to prevent this sputum from drying. A consump-

Fig. 17.—A pocket spit cup for the use of consumptives.

tive should never spit on the floor (in fact, no one ever should) or any place where the sputum will become dry. A handkerchief is perhaps the worst thing that a person could use. It is best to have either a spittoon, containing some chemical substance that will destroy the bacteria, or, what is better, to have little paper cups or napkins, which when they have been used, can be burned. *If we could kill all the germs in the sputum of those suffering from tuberculosis, the disease would immediately disappear from the world.* At least this is the view of a great many scientists. The legend, so frequently seen in tuberculosis literature, NO SPIT, NO TUBERCULOSIS, voices this idea, and is largely if not entirely true.

It is possible for the germs of tuberculosis to be transmitted from cows to human beings, particularly children, through the milk. This is generally admitted. In order not to get the disease by drinking milk, it is necessary that all the milk sold on the market or used in the home, should be from cattle known to be free from tuberculosis. Fortunately, it is possible readily to test cattle for tuberculosis by means of what is known as the "tuberculin test." This test does not cost much, is easily used, and is very accurate. Farmers are finding that it pays to have all their cattle tested, because tuberculosis in cattle is as "catching" among cattle as it is among men, and perhaps more so. If the disease once gets into a herd, it will be sure to spread and, in the long run, produce the worst results unless it is promptly checked.

Flies sometimes help to spread this disease. No one knows the proportion of cases that they cause, but it is very important that food should be kept away from flies. This ought to be done by trying first of all to limit the number of flies produced.

Fig. 18.—A fly on a piece of sponge cake. He probably came quite direct from unmentionable filth in the neighborhood to the dining room. Published in Country Life in America.

This can be done by caring for manure, garbage, etc., in such a way that the flies cannot breed in these materials. Secondly, we should screen our houses, and keep flies out of the kitchen and the dining room, particularly. In addition to this, we should take especial care to protect all food from the flies by

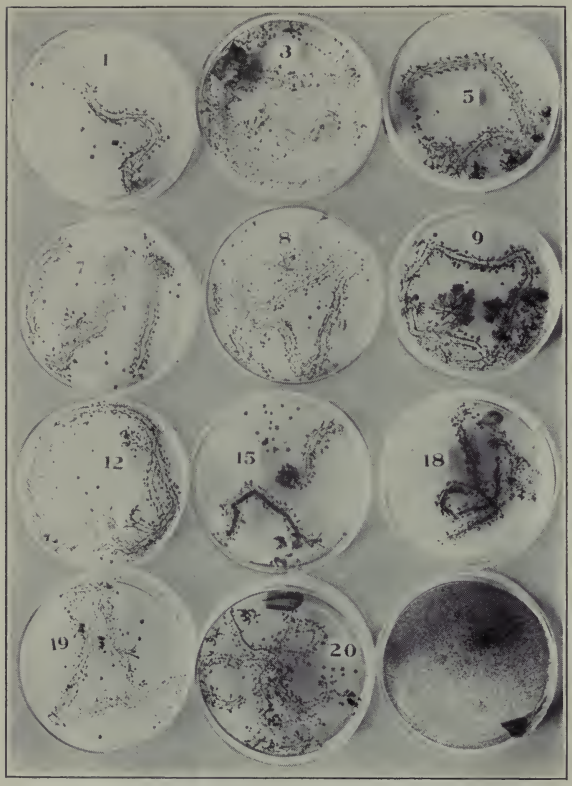

Fig. 19.—Fly tracks on "sterile culture media." These covered glass dishes were first made sterile, or germ free, by high heat. When they were cool there was poured into them a thin layer of sterile gelatin, which soon hardened.

A fly was first allowed to walk on material containing a great many bacteria and thus get its feet dirty. It was then taken and put into these dishes and urged to walk around in them each in turn, twenty in all. Only eleven of the twenty are shown but the others are practically the same. These dishes were then incubated for forty-eight hours. The bacteria left on the gelatin by the fly's feet had in this time multiplied to such an extent that the tracks were visible to the naked eye, and appeared as shown in the photograph above. The fly was killed and the number of bacteria left on its feet and those swallowed was then determined, as shown in the dish in the lower right hand corner.

It was found that this particular fly had enough bacteria left on it, after walking over all of the above dishes, so that every man, woman and child in the United States could have one apiece, i. e., there were 90,000,000 bacteria left.—Original.

screening shelves or other places for storing food. The flies carry on their feet the tuberculosis germ from sputum on the street, or in the gutter, or elsewhere. As they walk over the food they leave these germs, sometimes in very large numbers, and the disease is spread. They also carry typhoid fever germs and spread them. In fact, the common house fly is now known as the "typhoid fly".

One very rarely gets tuberculosis out-of-doors, but almost always in the house, or in the workshop. Hence, it is of the very greatest importance to have houses and workshops most carefully "disinfected" when people having consumption are present, and especially when they leave. Where people having consumption occupy buildings and are careless, these buildings become real tuberculosis nests, or breeding places. It is a matter of extreme importance, therefore, when one moves into a house which other people have lived in, to find out whether the disease existed there, and if it did to have the house properly disinfected before going into it. *This is a matter which must never be overlooked, and no one having a family in his or her care should move into an infected house until it has been properly prepared, by being most thoroughly cleaned and disinfected.*

Fig. 20.

LESSON IX. MEANS OF PREVENTING TUBERCULOSIS (Concluded)

In the last lesson on the prevention of tuberculosis, the emphasis was placed on the need of destruction of the germs that leave the sick person, and the protection of the "portals of entry" (the mouth and nostrils mainly) to the bodies of those who are well. Another very important part of the work of prevention is the development and maintenance of the normal or natural vigor of the body, or the conservation of the "health tone." The person who is in ill health, or in a state of low vitality for whatever cause, is much more liable to be attacked by tuberculosis, as well as by other diseases, than is a person in good health and vigor. Among the things which may be considered as helping to cause tuberculosis are certain kinds of work, overcrowding in homes, schools, workshops, etc., because of poor ventilation, unhealthful conditions, dust, and bad housing for these lower the health tone.

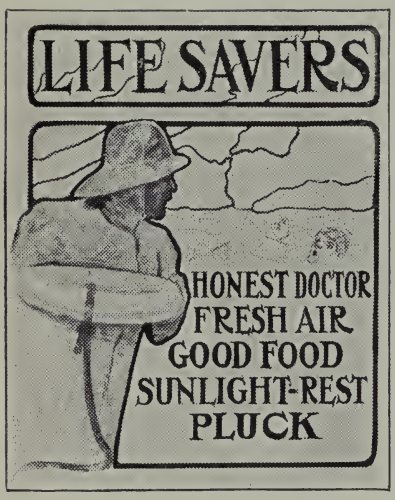

Fig. 21.

The frequency of tuberculosis among people of different occupations has been worked out. Laborers and servants head the list, while farmers and other outdoor workers are lowest in the list.

Where one is free to choose his own work, it is worth while, before he makes a selection, to consider the relative healthfulness of various occupations. It seems probable that many kinds of work can be made less dangerous than they are now. The chief reason why it has not been done in the past is because the importance of *preventing* disease has not been realized. The young people who are growing up should and will undoubtedly do much in this direction. It is not merely a question of indoor and outdoor occupation, for some of the outdoor

occupations have a marked influence in producing ill health. The accompanying figure will show that the percentage of tuberculosis among quarrymen is higher than it is among many indoor workers. Why?

Overcrowding in houses helps to make people more likely to have diseases, especially tuberculosis. If we should count up the number of people who live in one-room apartments, compared with the number who live in apartments of two, three, four, or more rooms, we should find that there are not so very many; but if we should compare the amount of sickness and death among those in the single-room apartments with the amount among those who have more room, we should find that the percentage of sickness and death would be very much greater; and anyone who is obliged to live in crowded quarters, in either the home or the workshop, is taking a much greater risk of contracting disease than the people who have more space. Many people who could have plenty of room if they wanted it coop themselves up in cramped quarters for the sake of convenience, or to keep warm. If they would use their larger space, exercise more, and if necessary, spend a little more money on fuel, they would be much better off.

The lack of fresh, pure air in the house or the workroom or the schoolroom keeps people in such a "run down" state that they are not the best workers and are likely to take diseases. Far too many buildings are without good light and proper means of ventilation. In olden times, methods of constructing houses were much inferior to the present, and on this account buildings were far less tight than they are today. And then, too, the method of heating was at one time almost entirely by means of open fireplaces. Under these conditions, special means of ventilation were not needed as they are at the present time, with our tight buildings and our steam and hot water plants. All buildings, where a number of people are working, should be provided with *special means for bringing in pure air*. The constant change of air in an ordinary living room, (called ventilation,) may take place by natural means, but in larger rooms and buildings, where there are a good many people, mechanical means should be employed to change the air forcibly. This can be done by the use of fans which drive pure air into, or which draw the impure air out of, a room. In some buildings both systems, forcing in and drawing out,

are used. Public buildings, such as factories, workshops, stores, and schoolhouses, as well as private homes, should in these days be built around a good ventilating system, as they were formerly built around the chimney. In case buildings must be used without special means of ventilation, a great deal may be done by bringing pure air in constantly through the windows or other openings.

In order to secure a constant supply of fresh air, it is necessary to train the sense of smell so that it will detect impure air. We are likely to grow careless in regard to this; but anyone who understands the importance of pure air may after a while become so sensitive to bad air that he will be uncomfortable in it. We sometimes think of this latter sort of person as a "crank," but in reality he is very wise, and we ought to do as he does and demand pure air for our lungs, as we now demand pure food for our stomachs, and clean clothes for our bodies.

Our houses are too frequently in an unhealthful condition, due to the lack of proper cleaning. This sometimes occurs because people who have charge of a home have not been brought up to appreciate that cleanliness is next to godliness, and immensely important. But it is probable that such persons are comparatively few. Most people would like to keep their houses clean, but on account of conditions beyond their control, many have scarcely the time or strength for it. We can overcome these difficulties only by helping to change the social conditions for such people; and if we are true friends and neighbors we can do a great deal more than might at first be thought possible.

Our ways of cleaning are not all so good as they might be. For instance, in sweeping with a dry broom we stir up a good deal of dirt from its hiding places; much of this dirt merely gets into the air in the right form to breathe. It is perhaps true to say that dry sweeping, instead of making a place more healthful really makes it more dangerous. The same thing is true in regard to methods of dry dusting. The feather duster, or the dry dustcloth which is shaken in the room, is a very good way of getting dust into the air, and of *not* getting rid of it properly.

The best way to clean is with a good "vacuum cleaner." By this means all of the dirt is taken out of the house without stirring up dust. There are, however, some of the cheaper cleaners

which throw the dirt back into the room, and these, like the broom, must be considered as enemies of health. Where vacuum cleaners are not possible, a carpet sweeper may be used, or something may be put on the floor, such as wet strips of paper, tea leaves, or some of the prepared "dust-layers." For dusting, special cloths may be bought or prepared which hold the dirt, or a *damp* cloth may be used.

Many houses are built over damp and dirty cellars. There is no excuse for a dirty cellar. If only one place in the house can be clean, it should be the cellar. Let the parlor go dirty, if you must, but clean the cellar. Too often the cellars and halls in apartment houses are not properly cleaned, because no *one* person has complete control of them. They are neglected on the principle of "Everyone's business is nobody's business." Damp cellars are very generally regarded as unhealthful. Few landlords would be willing to live over damp cellars themselves, and no landlord ought to be permitted to allow his tenants to live in such surroundings. In these days when cement is so cheap and so generally used, there seems no excuse for it. What we need is merely an aroused public opinion.

Sometimes houses are well kept inside, but have dirty and unsanitary back yards. The back yard ought to be as clean as the front yard, and some means of taking care of the necessary refuse about any building should be provided. The method of hanging bags so that they can be readily filled with old paper, and tin cans is excellent. Garbage should also be carefully taken care of. In the city where it is collected it is important to have cans or boxes for it properly protected from flies. Where the garbage must be cared for on the place, this can be done by burying it or burning it.

Another thing that should be especially attended to about the house, or any building for that matter, and perhaps especially the school, is the *plumbing*. Defective plumbing allows the escape of gases and odors into the room and these are generally considered to be important means of lowering the "health tone."

In considering matters of this kind, it is worth calling to mind the words of Longfellow in his "Builders:"

"In the elder days of Art,
Builders wrought with greatest care
Each minute and unseen part;
For the Gods see everywhere.

Let us do our work as well,
Both the unseen and the seen;
Make the house where Gods may dwell,
Beautiful, entire, and clean."

Fig. 22.—A dust storm. May disease germs be spread by such storms? How? Will oiling streets prevent this?

Dust, either inside or outside of the house or school building, when breathed into the lungs, is harmful. It undoubtedly is the cause of disease, and especially of diseases of the lungs, such as consumption. Some kinds of dust are much more irritating, and so more harmful, than others. *Metallic* dust, especially when the particles have sharp, cutting edges, is likely to be very injurious; the dust caused in making knives and forks, etc., is very bad for the health. Other dusts are not so bad, but they may cause serious changes in the lungs. Hard dust, such as that produced by working on stone, is likely to be harmful. Coal dust acts much in the same way. When these little particles of dust are breathed in, they make their way from the air cells to certain parts of the lungs, where they gather in large numbers. They are carried to these tissues by the white blood corpuscles. The effect of the gathering of these particles in the lungs is the most easily seen where coal dust is breathed in; and if it were possible for us to see the lungs of those who handle coal, and those who live in big cities, especially where a great deal of soft coal is burned, we should notice that parts of the lungs were coal black in color, and in this respect would be very different from the lungs of a person who had always lived in the free, open country. The bad effects of the constant breathing

of dust-laden air are easily shown where the death rate from consumption in different occupations is studied.

The lighting of a house is a matter of no small importance. Houses ought to be so arranged that the sunlight will enter through at least one window, in every room during the course of the day. Those rooms that are the most used should be the best lighted. It is important, then, to build houses with reference to the lighting. It is not at all necessary that a

Fig. 23.—Individual towel distributor in use at the University of Wisconsin. The towels are small and a fresh one is always ready for use. Why is this a good arrangement?

house should face the street, and many houses are now built facing a beautiful outlook. Houses ought always to be faced with reference to the sunlight. The size and arrangement of the windows should depend upon what is the most healthful and not upon what looks best, although it is generally true that houses can be suitable to live in and beautiful to look at, at the same time. *The amount of window space in a room should be at least one-fifth of the floor space.*

Fig. 24.—A sanitary bubble drinking fountain. Is this better than using a common drinking cup? Why?

The necessity for light in buildings was realized long before the real reason was discovered. There is an Italian proverb that says, "Where sunlight does not enter, the physician does." One reason, at least, why this is true, is that the sunlight *kills the disease germs.* Sunlight is, as we say, a good "germicide," or germ-killer. In building a house, the first thing to be thought of should be the effect which the location and arrangement would have upon the health of those who are to live in it. It is not enough, however, to have properly constructed buildings. They must be sensibly used. Windows are of little use if the shades are always drawn, or the blinds are always closed. A large bedroom or living-room may easily be overcrowded. Sometimes people, who have all the room they need, live in a little ill-smelling kitchen in the daytime, and a stuffy, foul bedroom at night. These people, of course, do not realize how bad such a life is for themselves and their children. There are many things worse for health than being cold—for instance, being overcrowded, and having too little pure, fresh air, and bright, life-giving sunshine.

It is sometimes supposed that these ills which we have been talking about are found only in the city, but this is not true. Housing conditions are often as bad in the country as they are in the city. It is true that in the country there is plenty of pure air and bright sunshine, and frequently the houses are large enough; but the people are likely to be overcrowded in certain rooms, as the kitchen and sleeping rooms, for short periods of time in the summer, and long periods in winter. The desire to *save money* has led people to be *careless* about healthful conditions; and small rooms are frequently built and used because they do not require much fuel for heating. This is a poor way of saving, as people would readily understand if they stopped to think of the matter. The cost of a doctor's bill and

perhaps a funeral may easily more than offset the "saving" in fuel and sufficient room.

Fig. 25.—A sanitary drinking fountain is possible wherever there is a well.

THE FENCE OR THE AMBULANCE.

'Twas a dangerous cliff, as they freely confessed,
  Though to walk near its crest was so pleasant,
But over its terrible edge there had slipped
  A Duke and full many a peasant.
So the people said something would have to be done,
  But their projects did not at all tally.
Some said, "Put a fence round the edge of the cliff,"
  Some, "An ambulance down in the valley."

But the cry for the ambulance carried the day,
  For it spread through the neighboring city;
A fence may be useful or not, it is true,
  But each heart was brimful of pity
For those who slipped over the dangerous cliff;
  And the dwellers in highway and valley
Gave pound or gave pence, not to put up a fence,
  But an ambulance down in the valley.

"For the cliff is all right if you're careful," they said,
  "And if folks even slip or are dropping,
It isn't the slipping that hurts them so much
  As the shock down below when they're stopping."

Then an old sage remarked: "It's a marvel to me
  That people give far more attention
To repairing results than to stopping the cause,
  When they'd much better aim at prevention."

"Let us stop at its source all this mischief," cried he
  "Come, neighbors and friends, let us rally.
If the cliff we will fence, we might almost dispense
  With the ambulance down in the valley."
"Oh, he's a fanatic," the others rejoined,
  "Dispense with the ambulance? Never!
He'd dispense with all charities, too, if he could;
  But, no! We'll protect them forever!

"Aren't we picking up folks just as fast as they fall?
  And shall this man dictate to us? Shall he?
Why should people of sense stop to put up a fence
  While their ambulance works in the valley?"

LESSON X. DEVELOPING RESISTANCE TO DISEASE.

One of the most remarkable things in all the world, so the scientist thinks, is the fact that certain animals are "resistant," or "immune," to a disease, while other animals differing very slightly take the disease readily: e. g., the house mouse is immune to glanders, a disease common among horses, while the field mouse is extremely susceptible. The rat is immune to many germs which attack his near relatives. Differences of the same kind are seen in man. Some races take diseases more easily than others; and everyone knows families that are always sick, whose members take every "catching" disease that is about; while other families in the same community are well and strong, and almost always escape the ordinary diseases. The same thing is true of persons; some people are very susceptible to disease, and in later years speak with apparent pride of the fact that they have themselves had all of the ordinary diseases.

Scientists are not agreed as to the reason for this difference between individuals. "Immunity" may be handed down from one generation to another in the family. Perhaps, also, a person may inherit a readiness to "catch" a disease. We do not know whether this is true or not, but we do know that surroundings, habits, and even ways of thinking do have a marked influence upon the disease resistance or susceptibility of a person.

Fig. 26.—Plenty of fresh air.

Fig. 27.—Fresh air at night. "Night air is not dangerous unless it be last night's air."

Fig. 28.—Even the little fellows enjoy the winter hikes.

Fig. 29.—Healthy exercise.

In order to escape disease one must have *healthful* surroundings. This does not mean *elegant* surroundings. In fact, the life of the rich is quite as likely to lead to ill health as the life of the very poor. What is really needed is for all of us to live a simple, wholesome life; and it is easily possible for almost any one, even though he be poor, to keep his surroundings so healthful that they can not do him any injury. This may necessitate moving from one house into another; or changing the rooms in one's house, changing the way one divides his time for work and play, or the like; but these things could be done if the necessity for them were really felt. A good many things necessary to be done depend upon many persons doing them together; but first, people have to be shown that such things are necessary. A great many people do not know that tuberculosis is a germ disease which is "catching" and do not therefore see how necessary it is to take care of the sputum, to disinfect, etc. No child is so small that he cannot help to teach people to be careful about tuberculosis. Children ought to take pride in work of this kind, just as they take pride in succeeding in their school work, or in their games.

In order to keep well, one must have plenty of pure air. We may speak of this again so as to impress it. Health experts are quite agreed now that fresh air is very important in preventing tuberculosis as well as pneumonia, and certain less fatal diseases, such as influenza (or grippe) and colds. Everyone ought to have fresh air in abundance while he sleeps. At

the present time evidence seems to point very conclusively to the desirability of sleeping out-of-doors. If this cannot be done, the bedrooms should have several windows, and they should be kept open—fully in mild weather, and sufficiently in cold weather to insure the frequent change of air in the room. During the day, whether at home, in the schoolhouse, or at work, everyone ought to insist on a good supply of fresh air. The one who does this has an advantage over the one who does not; and the former can resist disease which may attack and conquer the latter.

In order to keep well one must also have *wholesome food, properly cooked, regularly eaten, and completely digested.* Most people can get plenty of good food nowadays; and if they do not know how to cook it, there are many ways by which they can learn. In most cities there are cooking classes. The United States Government also publishes bulletins which are of great value. It frequently happens that people suffer from sickness caused by bad habits of eating, such as not chewing enough, eating too much candy, eating between meals, always eating soft foods, and so on. When such sickness is severe, a doctor should be consulted. It is better to pay a small fee to a doctor who can tell you *how* to live than it is to pay him later for work done at your bedside. But don't take patent medicines, whatever you do. Many people are ailing much of the time because they are constantly swallowing patent medicines.

If one would escape illness he must be careful of his exercise. Children do not usually need to be urged to take exercise, but they do need to be warned against *too much* exercise. There is great danger of taking "cold" after violent exercise, and children ought early to learn how to protect themselves from colds, especially those colds that come from cooling off too fast when one has been working or playing very hard. Colds do not "just happen;" they have a cause. Colds are often caused by the sudden chilling of some part of the body, causing the blood which is usually at this part to rush to the nose and throat, resulting in a congestion there.

Colds are also caused by microbes, and such colds are passed on from one person to another. One should keep away from people suffering from colds, especially colds of a "grippy" nature. Colds in themselves are not usually considered serious,

but when we remember the inconvenience and suffering which they produce, and the loss of time and energy which they cause we can see that there is hardly anything more important. Besides this, they have an influence in making people more likely to take diseases. We very frequently hear people talk about a cold running into this disease or that disease; but this is not true, as tuberculosis, for instance, never comes from a cold, and never follows a cold, *unless the germ of tuberculosis is present.* However, colds sometimes do make people so weak that they easily take tuberculosis, as well as other infectious diseases.

The protection of the body is also a matter of very great importance for one's health. A person ought to wear the right amount of clothing, suited to the season. Too much is as dangerous as too little. If one wears too little clothing, the vigor of the body is likely to be lessened; and the same is true if the clothing is too thick. Children, especially, are likely to object to wearing extra clothing, or "bundling up" even when it is absolutely necessary, because it interferes with their movements or their convenience. But they must remember that the *maintenance of health is the most important thing in the world to them,* and if they do not preserve their health they will bring upon themselves bodily suffering, and bring to their relatives and friends care and anxiety without measure. The necessity for this care has been taught by the experience of the race. Why do children persist in going out without their rubbers when they know that they will get their feet wet? Why do they refuse to wear an overcoat or mittens which they need?

One should get into the habit of looking out for his health; in order to do this he ought to consider the following rules:

Fig. 30.—Girls as well as boys need the "out-of-door" exercise.

Fig. 31.—Little children love the "out-of-doors." It is their best friend.

RULES OF HEALTH.*

1. When you arise in the morning throw the bedding over the foot of the bed so that the bedclothes may have a chance to air.

2. Close the window that has been open during the night if you are to dress in the same room. Otherwise it is not necessary.

3. Cleanse the teeth, especially the places that are out of sight and hard to reach.

4. If you have time, bathe all over (finishing, if not beginning, with cold water). If it is not possible to bathe all over, bathe the face, neck, and chest, and particularly the eyes, ears and nose.

5. Clean the finger nails. This should become a fixed habit.

6. Drink a glass of water. This is a good habit to form, and it seems to aid digestion.

7. Eat breakfast at a regular hour. Eat only what agrees with you. Make an effort to be cheerful at meals.

8. Visit the toilet, if practicable, at home. Have some regular time during the day.

9. Spend as much time in the open air as possible. Create an interest in nature. Make friends with sky, birds, flowers, trees and animals, and be attentive and true to them.

10. Be punctual in all of your duties both in and out of school.

11. Try to have a supply of fresh air wherever you are, and demand this with the same emphasis that you use in demanding sufficient heat in cold weather. Do not be afraid to say: "I need fresh air."

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*Adapted from Allen in "Civics and Health."

Fig. 32.—Dry feet, fresh air, and plenty of sleep help to keep up the power of the body to kill germs. From Ritchie's Hygiene published by the World Pub. Co.

12. Eat punctually at noon. Take time and enjoy your meal and its effects.

13. Breathe air out-of-doors as long as possible, in walking and playing lightly.

14. Resume your duties punctually.

15. Stop work regularly and promptly.

16. Take out-of-door exercise—indoor, only when fresh air is possible—that you enjoy and which agrees with you. If you get "sweaty" in playing,—when you stop put on extra clothes or go into the house. Do not court a cold.

Be especially careful to keep your feet dry. If you cannot help getting them wet, make every effort to change your footwear or to dry it out promptly. *To take care of yourself and preserve your health is most important. It is not a cowardly thing to do. It is the most important and manly or womanly thing you can possibly do.*

17. Eat your evening meal at a fixed time, and do not hurry with it nor eat too much; eat nothing that disagrees with you.

18. Spend the evening pleasantly in ways that are in keeping with the foregoing habits.

19. Go to bed regularly at a fixed hour; make up for any irregularity one night by an earlier hour the next night.

20, 21, 22. Repeat 4, 6, 8.

23. Turn your underclothes wrong side out for ventilation.

24. Open the windows, or sleep out-of-doors if possible.

25. Relax your mind and body and go to sleep.

Suggestions for some practical work are here proposed.

A grown-up person requires about three thousand cubic feet of air every hour. When the necessary ventilation is secured, the required cubic contents can be reduced to two thousand cubic feet or less. In most homes forced ventilation is not provided for. Figure out the number of cubic feet in your liv ing room and divide it by the number of persons who are usually there. Do you have the required amount of air in your living room?

In the same way find out the air space in your bedroom, and the amount of air for each person in it.

Do you sleep with your bedroom window open? How wide?*

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*The teacher should be careful not to make public comparisons which will hurt the feelings of sensitive children whose home conditions are poor because of poverty, sickness, or the like.

Since a room ought to have window space equal to one-fifth of the floor space. Find out the size of the floor in your living room and then determine the area of the window space. Have you as much light as you ought to have? Do the same thing for your bedroom.

Fig. 33.—A hike through the woods. There is plenty of fresh air here.

Does the sun shine directly into your living room and bedroom? For how many hours every day?

How much space is there between your own and your neighbor's house?

Does the teacher keep the window curtains drawn down over the top part of the window? Unless the sun is shining into the room through the window, the curtains should be rolled up to the top. The room is lighted mainly from the upper part of the window. If you get water for school uses from a well, is the well carefully pumped out and cleaned before school begins in the fall? It should be covered so that dirty water cannot possibly run into it, and so that mice and other small animals cannot fall into it.

School authorities should provide seats in the schoolroom suited to the size of the children, so their feet rest on the floor, and so they do not have to stoop over when they sit at the desk, or twist themselves out of shape because the desk is too high. In other words have the seat, desk and child properly matched.

If you live in the country, has the school a ventilating stove that brings in fresh air? Is there an outlet for bad air? If not, why not?

Lesson XI. TUBERCULOSIS A CURABLE DISEASE.

Our ideas of the possibility of curing tuberculosis have been changed a good deal in the last few years. People once believed that tuberculosis was incurable; and to tell a person that he was afflicted with the dread malady was like reading his death warrant to him. Today we look upon the disease in quite a different light. It is curable. This change in our views has not come about, however, because of the discovery of some new

Fig. 34.—Out-of-door school for tubercular children—fresh air—open minds.

medicine, for it still remains true that we do not know of any specific for this disease. Quacks and patent medicines cause much real suffering, because victims are made to think that they can be helped by some skillfully advertised medicine or "cure," which is really not going to give the expected relief, but which is almost certain to delay honest and helpful treatment until the case is *beyond* help. Remember that the modern treatment of tuberculosis requires *open air*, *rest*, and *food*.

It would be difficult to explain just why it is that out-of-door air is better than the air of dwellings, but there is abun-

dant evidence to show that this is true. *A tubercular patient should be in the open air practically all of the time, day and night, summer and winter.* That cold air is not harmful, but in reality helpful, is shown by a saying in the Adirondacks, generally accepted as true, that "One winter is worth two summers." Are you in as good health in winter as in summer? Whatever your answer is, say why. Where and what are the Adirondacks?

Another necessary requirement is *rest.* When there is fever, especially, it is absolutely necessary that there should be *rest,* complete rest, and to this end the patient must occupy the bed and lounging chair constantly. The slight amount of exercise necessary must be taken a little at a time, so as not to overtax the strength. It is quite impossible for tubercular patients to work hard and at the same time take the proper care of themselves. The third thing necessary is plenty of food, especially *proteid* food, such as meat, eggs and milk.

Climate is not now considered a very important matter in the treatment of tuberculosis. By this is meant that tuberculosis can be cured in almost all climates, and many persons cannot afford to go to some other climate. It seems best, therefore, to

Fig. 35.—A Sanatorium for the treatment of tuberculosis. Here the patients have fresh air day and night.

treat tuberculosis at home or in "sanatoriums" close by. Note the arrangements for treatment in the accompanying pictures of sanatoriums.

The cure for tuberculosis is really *only a healthful way of living,* and the more nearly one holds himself to the rules the better are the chances for recovery. This is borne out by the fact that patients in prisons make the highest percentage of recoveries, soldiers next, and persons in ordinary life last of all. Why, do you think?

Look up in the dictionary the meaning of the words sanitarium and sanatorium.

Where is the Wisconsin State Sanatorium for tuberculosis?

Tell what railroads, or other means of conveyance, you would have to take to get there, and what the probable cost would be.

Do you know anyone who has ever been there? If so, get him to tell you about the life there.

If you sleep out-of-doors, tell how the bed is arranged and the amount of clothing which you use. If you do not now sleep out-of-doors find out the best way to arrange for doing it. Find out the amount of bedding which you would need. What would be the cost of a tent in which you might sleep all summer?*

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* Teachers might find it profitable to have a little exhibit illustrating tuberculosis or hygiene. Miss Goldie Whipple, of Superior, Wisconsin, prepared such an exhibit which was sent to the International Congress on Tuberculosis at Washington and attracted wide attention.

Boys could be asked to make a model of a sanitary tent with floor and means of ventilation. Girls could make a small model of a sleeping bed or a hood and dress up a doll to show the way the clothes should be arranged for out-door sleeping.

Charts could be prepared and pictures from bulletins mounted so as to make a very creditable showing. They could be arranged to show that tuberculosis is a communicable, a preventable, and a curable disease.

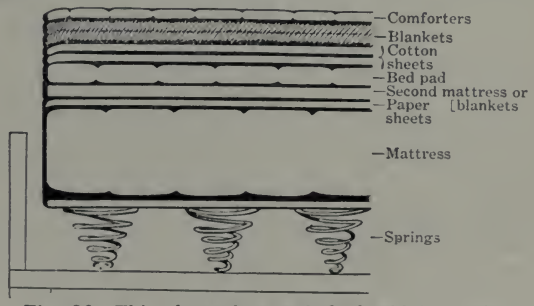

Fig. 36—This shows how a bed should be made up for out-of-door use.

Fig. 37.—This little family is ready for bed.