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T H E S I S

on

BACTERIAL PROBLEMS IN THE HOME

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**AUTHORITIES.**

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- Sedgwick- - -Principles of Sanitary Science and Hygiene.  
Caufield- - -Hygiene of the Sick Room.  
Conn- - - -Bacteria, Yeasts, and Molds.  
Woodhead- - -Bacteria and their Products.  
Sternberg- - Infection and Immunity  
Abbott- - - -Principles of Bacteriology.  
Bulletins- - Michigan State Board of Health.

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## INTRODUCTION.

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"The making of a true home is really woman's peculiar and inalienable right. A woman who creates and sustains a home and under whose hands children grow up to be strong pure minded men and women is a creator second only to God."

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In all the whirlwind of discussion of the pros and cons, the ways and means of industrial education, there has been much use of the terms youth and young people, but comparatively little mention of our girls and young women.

Some apprehension has been felt for the future of our girls in the problem of thoroughly educating them in business and trade. Parents in the mad scramble of wage earning have pushed their daughters out, and have received from them their small earnings; yet have given little thought to the important matter of special instruction for their daughters.

It has only been in the last few years that the crying need of educating our girls to vie with their brothers in the battle of life has forcibly come before the American

people. Our country is passing through a critical stage of its existence; and the home and fire-side must be protected if we are to maintain the proud position we occupy as a nation.

Great as has been the demand made upon man, that made upon woman has been greater. In this day and age when there is such an alarming tendency among our young women to leave the home and join the great multitude in professions, of business, and wage-earning it behooves us to urge upon them the necessity of home makers. The men and women of our nation have recognized this fact and opened to us domestic science departments in our colleges. Here we may study the problems of the human body, its needs, the home and its relation to the family.

In the educational wave that is sweeping our country from ocean to ocean, technical education is at its crest, and no phase is more popular than domestic science. Indeed it has such a hold upon public opinion that it is quite the fashion, a commendable fact, for as soon as it begins to wear the mantle of gentility it deserves to wear quite as much as any other science we may look to see it installed in all the larger and more conservative colleges. Already great

institutions like Cornell, Columbia, University of Illinois, and many others have given it the recognition it deserves.

What is House Technology, or Domestic Science,--? The old conception, cooking and sewing is left far behind. Long years ago the college recognized the value of science and its practical application. Women have been slow to note its close relation to home affairs, and by some strange oversight little provision has been made for them to study and apply science to this kingdom peculiarly their own. Yet is there any good reason why a woman should not apply her knowledge of chemistry and bacteriology to home problems as her brother does in his profession or industry? An answer to this question is found in a review of the work of our greater or more prominent colleges all over the land. The field the college alone has thrown open to women is of bewildering extent and charm. Friendship, athletics, the professions, and scientific research have brought us their novel attractions.

Social influence and accomplishments, physical vigor and education,----- these are our weapons for the battle of life. They are not success nor do they insure it. The woman of the future will hold her education at its due

worth. The stigma so long resting upon labor must some time  
be removed as that resting upon trade has been.

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## THE HOME.

"Man for the field and woman for the home", says Tennyson. Since woman dominates the home it follows that womanly influence and the domestic ideal ought to find due expression in the family and municipal activities.

The most valuable asset of any community or nation is healthy, strong inhabitants, and these are obtained only by protection from pernicious and improper culture. It should go without saying that most of the ills of which we complain are those for which we ourselves are to blame. We are ignorant, careless, indifferent, reckless it may be, and should not be surprised when brought face to face with our folly. Prevention is easier than cure. It is also less expensive in dollars and lives. It is estimated that in this country alone, every day in the year, four hundred persons perish miserably with consumption. For lack of proper knowledge or care uncounted victims of this great "White Plague" die before their time.

Since the life of an individual is always more or less closely related to the lives of others, every human being is in a way responsible for the family and public welfare. The human infant is absolutely dependent upon parental care; and among all civilized people the sick and aged are dependent upon the ablebodied for protection and support. In these and many other respects are the family relations constantly interlaced. The household, although essentially a private establishment has certain public relations of which we shall speak later.

Savages and the lower class of men, content themselves with homes in caves, trees, hovels, and wigwams; while on the other hand the highly civilized races build carefully planned homes. In these are <sup>found</sup> the problems with which we have to deal, and to this class of people will we appeal for the application of the science of bacteriology.

An important feature of the establishment of a home first is the site for the house. This may appeal to the uneducated as <sup>of</sup> a minor importance; but it is of vital importance to family health. One should select a high, well drained site,--a gravelly sandy loam is preferable in order to secure good drainage. Good light and abundant sunshine are important hygienic factors, both as aids to happiness and powerful sanitary agents. Too

often however the site of a house is determined by necessity, taste, or convenience. If in addition to the above named requisites beautiful and attractive surroundings can be had-- they are of great benefit, since gratification of the aesthetic is of distinct health value.

Good drainage is of no less importance than air and sunshine perhaps more. In this day and age in abundant use of water, in washing, bathing, and cleaning, and sewerage disposal, large amounts of dirty water are to be disposed of; and this fact must be kept in mind in considering the sanitary aspect of a home. It appeals to reason, if you are out of the city and not in close proximity to a sewerage system, that you must select some elevation of site.

As <sup>the</sup> a prime object of any house is shelter from the elements, it should be wind proof, water-proof, and nonconducting to heat as far as it is consistent with proper circulation. Much circulation of air takes place even through walls or partitions of wood and plaster and this so-called natural ventilation explains why so many families live and thrive in seemingly unventilated houses. It also explains how the damp, pungent odor of a cellar finds its way into the rooms above no matter how tight the floor.

The furnishing of a house plays a conspicuous part in home sanitation. Walls are best made of wood, painted or plastered so that thorough cleansing is an easy matter. Paper has been tabooed for three reasons: first, sanitary cleaning is impossible; and, notwithstanding what we may do after a contagious or infectious disease, the most deadly bacteria may still be lurking there. Secondly, wall papers are condemned because so many now on the market contain arsenic. Third, the paste decomposes and forms food for bacteria.

Hardwood floors are to be recommended owing to the easy possibility of keeping them clean and free from dust. The iron bedstead is a great improvement over the heavy wooden bedsteads or four posters of our forefathers.

The hangings and draperies of our modern homes are not to be recommended, unless kept thoroughly dusted and cleaned. Houses even when closed become dusty and dirty, because the air which finds its way into them is more or less charged with dust; while the occupants of inhabited houses carry more or less dirt and dust. The ignorant housekeeper will wonder at all this discussion of sewerage, dirt, and dust. He should be told that dirt and dust sometimes contain the germs of the most dangerous

and malignant diseases and that those who live in dirty, unsanitary houses are at all times exposed to their ravages. In regard to light, the home maker must insist upon a means of permitting an abundant amount of sunshine, nature's great germicide to permeate the house.

As to the means of artificial heat much might be said, but the object of this article is to consider the subject matter only from a bacterial standpoint. The open fireplace is to be commended on account of its great aid to ventilation. The draft of the chimney constantly sucks away the vitiated air of the room. The air thus removed is replaced from outside or adjoining rooms driven in by atmospheric pressure through open doors, windows, or the walls themselves. Hot air furnaces are a good source of warmth and are sanitary if the air driven through the pipes is not vitiated or drawn from a musty furnace room, but from out of doors. The systems of warming by steam, hot water, and stoves have little to do with ventilation. In their case the ventilation must come from open doors or windows.

The air supply of a house is a greatly neglected feature. Any other bodily necessity is usually costly and hard to procure, yet we make strenuous efforts to obtain the necessities and even the luxuries, but pay little attention to

the crying need of our bodies for pure air. When we consider that the human body requires for its use regularly about five hundred cubic inches of air per minute, and discharges the same amount of vitiated air, we can realize how soon the air in the vicinity of the nose is used up, and how important the need of a constant stream of pure air to remove and supply fresh air for respiratory movements.

Air, good or bad, pure or impure,---what does it signify? Air is not a chemical compound, but a mixture of gases containing when pure, varying amounts of nitrogen, oxygen, carbon dioxide, ammonia and water. Impure air contains all these gases and any other gas capable of mixing with them. Air may be dangerous from a deficiency of oxygen, excess of carbon dioxide, or from poisonous gases and infectious organisms. It is the last that we will discuss and which concerns us most. Air may contain the germs of many diseases as tuberculosis, scarlet fever, diphtheria, measles, etc. It is easy to see and comprehend the necessity of ventilation, and the importance of keeping the air of our houses pure.

Sedgwick says--"Pure air is any portion of the atmosphere free from noxious gases or vapors and infectious micro-organisms." This does not refer however to the higher portions of

OLD HAMPSHIRE BOND

the atmospheric ocean in which aeronauts have ventured and found difficulty in breathing though the air was pure, but too thin to support human life.

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## SANITARY SCIENCE.

Sedgwick says, "Sanitary science is the science of health. It includes those hygienic facts and theories which have been so thoroughly verified by repeated observation and experiment as to have become worthy to rank as scientific principles."

"The methods and processes by which the application of the principles of sanitary science or hygiene are effected are the sanitary arts." These include the practical processes involved in all sanitation, engineering, and architecture,-- for example, water supply, sewerage, heating, municipal sanitation, school hygiene. Among the most important are the construction and operation of reservoirs, filters, conduits, sewers, purification fields and hygienic school houses, the inspection of foods and drugs, the examination of drinking water, the disposal of garbage and refuse, the cultivation of vaccine and the manufacture of antitoxine, etc.

The sanitarian must have sound working theories if he is to maintain the public health. He must be familiar with the cause of disease and the avenues along which it travels. In order to prevent disease he must know if possible just what disease really is. Today all civilized and scientific people regard disease as a state or condition of disturbance or abnormality which the body has unfortunately assumed or been placed in.

The environments of man consist of two principal and very different parts --one near and chiefly personal including his clothing, house and family, the other more remote including his neighbor, town, or State. Plagues, pestilences and epidemics are the most striking examples of influences affecting both personal and public health. Only wars, riots and great conflagrations are capable of throwing communities into such terror as has often been caused by some swiftly fatal disease. But thanks to the science of bacteriology for teaching us that such outbreaks are simple extensive epidemics of infectious or contagious diseases which may be controlled and even prevented.

The discoveries of Pasteur, Koch, and their successors in the last half of the nineteenth century have brought to light the remarkable fact that typhoid, malaria, diphtheria,

scarlet fever and many colds are due to the invasion of the body by micro-parasites called microbes.

Sedgwick divides microbes into three classes:

- 1.- Nature's scavengers, removers of organic waste matter.
- 2.- Ordinary agents of decomposition, putrefaction, and decay of foods.
- 3.- Among them are found many micro-parasites and especially those germs which cause infection or disease.

MICROBES AS SCAVENGERS.--Whenever the dead body of a plant or animal, or any part of it, is left upon the ground, in water or buried in the earth, it soon crumbles, decays and disappears, turning as we say to dust and ashes. It was formerly believed that this change was due to slow combustion or oxidation alone. But it is now known that the oxidation is due to the influence of microbes.

MICROBES AS AGENTS OF DECOMPOSITION AND DECAY.--The peculiar property which makes them useful as scavengers, makes them troublesome, if not dangerous agents of decomposition, decay, and consequent destruction of useful organic substances, such as foods. Milk for example is soured by lactic acid microbes -- but on the other hand, the very change wrought by microbes, though dreaded by the milk man, is desired by the cheese maker. The spoiling of almost all forms of food is due to the vital activity of bacteria. Cold or freezing

kills or retards their growth; while intense heat destroys them altogether. Upon the former fact is based the important arts of refrigeration and cold storage; upon the latter the great modern industry of canning.

Bacteria have a wide and useful employment in the world. This suggests the fact that we should attack them from an intelligent stand-point, and in this, the microbe age, not look upon them all as being injurious, as is popular opinion today among the unschooled. They are necessary in cheese making. It is due to molds that it owes its delicate flavor. The conversion of manure into fertilizers, the fixation of nitrogen in agriculture, are all due to their vital activity--but on the other hand spoiled foods are not only disagreeable but dangerous, owing to formation of toxic ptomaines. Ptomaines are due to the growth of certain micro-organisms forming a by-product of great complexity. But it is microbes as disease germs that are of the greatest hygienic importance.

Whenever bacteria obtain a foot-hold in the body they multiply more or less rapidly; <sup>they</sup> have the same general power of forming decomposition products and secretions as they have when growing in lifeless matter. The toxins are formed in this way. Toxins are either decomposition products or bacterial

secretions. They are absorbed by the blood and the body is thus poisoned by them. Similar results are true of all disease producing bacteria. They produce poisons that are absorbed by the body, thus causing the direct injury characteristic of their specific diseases.

Two important factors are to be considered in the subject of bacteria and disease, first the vigor of the bacteria, secondly the resistance of the person, also a specific disease germ or micro-organism and a person susceptible to the disease. Without the bacilli the disease cannot exist, no matter how favorable the condition may be. On the other hand the microbe is powerless to induce disease unless the condition of the person is favorable for its reception, life, and activity. The attack of an infectious disease may almost invariably be traced to a weakness in the system before the attack.

Oliver Wendell Holmes, a Doctor himself, consciously or unconsciously explains this in the following extract from the "One Hoss Shay."

"Now in the building of chaises, I tell you what,  
There is always somewhere a weaker spot.  
In hub tire, felloe in spring, or thill,  
In panel, or cross bar, or floor, or sill,  
In screw, bolt, through brace,--lurking still,  
Find it somewhere you must and will,--  
Above or below, or within or without,--  
And that's the reason beyond a doubt,  
A chaise breaks down, but doesn't wear out."

Diseases which arise from some invasion of the organism, may possibly be warded off as they proceed from the environment which in theory at least is under our control. Prevention is the main point of attack--a statement easily made but hard of fulfillment. The bacillus is your true democrat and no respecter of persons.

Knowledge so often brings its responsibility. Every woman understands the value of beauty in her home and surrounds her family with objects of refinement as her disposition suggests or her means will allow. As queen of the kitchen and empress of the household, she must bestir herself to make war upon dirt and disease.

Cleanliness is the first essential of good housekeeping, and the first external condition of health. Early in this work I referred to the furnishing of a home in order to keep it in sanitary condition. Now it is for the housekeeper to keep out the dirt and dust. "Earth is not

dangerous because it is of the earth earthy" says the scientist, "but because it is too often 'dirt' or excrement." The dust in your home may contain the most deadly bacilli. We have tried experiments in well kept houses by exposing plate cultures while sweeping and found in them all sorts of organisms, these having been brought in or having been blown in in the dust. The passing of the feather duster is a boon to the sanitarian. It only served to stir up and scatter the dust giving it an opportunity to settle back again. Housewives have found the damp cloth far superior; it gathers up the dust and may be sterilized-- thus eradicating all germs that may be lurking in it. Inasmuch as dirt and dust are really laden with microorganisms, the agents of fermentation, putrefaction and decay, it is plain that the absence of these must go far towards preventing those processes.

If conditions are to be bettered, it is the woman who is to better them. It lies with her to get things out of the rut. She must be brought to realize and understand the principles of sanitary science. Right here it might be well to call attention to the fact that the so called microbe theory is wonderfully exaggerated; and if people as a whole

could be brought to a correct understanding of the real dangers from bacteria and how their growth is increased, they would exercise more severe precautions as to the means the ignorant have of scattering them wholesale.

Filth is looked upon by the sanitarian of today therefore as dangerous, chiefly because it may contain the more or less attenuated germs of disease and not so much as formerly a "breeding place" for such germs. It is a vehicle rather than a source; and when it is pulverized it may cause <sup>the</sup> atmosphere in its vicinity to become contaminated. When handled, it may find its way into the mouth, or when occurring upon fruit and vegetables, in milk, in water or any other substance likely to enter the mouth without first being sterilized.

Cleanliness therefore is not merely an aesthetic adornment, it is a sanitary safe guard,--the importance of which has been learned by hard experience. Cooking probably is the greatest sanitary step ever taken by the race-- for in the application of high temperature, the sterilizing effects are far more important than any increase in the digestibility or nutritive improvement. In the preserving and canning of fruit this fact is clearly demonstrated. The following methods must be observed.

Fruit and vegetables must be the best possible, neither too green nor too ripe and perfectly sound. Wash clean, add sugar and cook. Jars and lids must be sterile. Fill Jars with boiling fruit and all air bubbles must be allowed to come out. Seal.

The same principles of sterilization applies to meat and vegetables. The secret in their preservation being to destroy all putrefactive micro-organisms, and by sealing cut off the possibility of new infection.

Bread making is an interesting bacterial problem. The subject of yeasts and molds is one that the majority of people are not familiar with. In bread making we must needs understand the action and different stages through which the yeast must pass and of what advantage <sup>it is</sup> to the bread. Conn says, "Yeasts are nature's natural agents which produce the phenomenon called fermentation. Yeasts must be looked upon as servants rather than enemies. They are the allies of the housewife in a number of directions. It is only in the fermentation of sugary substances that the housewife is troubled with undesired fermentation." This evil is easily corrected since yeast cannot withstand the boiling point. Merely heating and protecting from the air no further fermentation

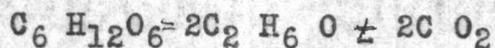
will occur.

The alcohol produced by yeasts is the foundation of the great fermentative and distillery industries. Yeasts are the agents which produce the alcohol found in all alcoholic beverages. In the home, yeasts are sometimes used solely for the alcohol they develop, for example in the making of home-made wines produced from grapes, currants, blackberries, etc. Cider is an apple wine. The principle of the home-made wines is the same as the production of commercial wines. The fruit juice is left to ferment spontaneously under the influence of wild yeast. The carbon dioxide produced is allowed to pass off into the air, and the solution is soon saturated with the alcohol formed.

Vinegar.-- After the yeasts have expended their energies bacteria develop in the product and change its taste and nature and vinegar is formed.

The chief use of the yeasts in the home are not to produce fermented drinks but to raise dough. The use of yeast depends entirely upon its fermentative power. Conn says "the essential phenomena of fermentation are the destruction of sugar and the extraction from it of two other substances, alcohol and carbon dioxide."

Chemists represent the action that takes place as follows:



Fruits ferment because they contain some sugar. Flours contain large amounts of starch, these are converted into sugars--then acted upon by yeasts. Yeast grows best at the temperature 75° to 90°F. Boiling kills it. Sour bread is due to the growth of bacteria. The reason why bread sours quickly at high temperatures is that certain forms of acid producing bacteria grow best at these temperatures.

Molds.--Molds are minute vegetable organisms threadlike in structure and reproduced by spores. Their general appearance is well known to every housekeeper. It is not my purpose to discuss them scientifically but to point out to the house wife their origin and a means of extermination.

The molds which appear on foods in the household are not always alike by any means, although the difference is not easily detected.

It is quite unnecessary for the housekeeper to attempt to distinguish them. The problem for her to understand is that all molds start from spores and if she keeps these spores away no trouble arises. Since the spores are con-

stantly floating in the air, any exposed food is liable to their contamination. Moisture, warmth and darkness are most conducive to their growth or development.

While it is almost impossible to keep bread, cake, and cheese from molding any length of time, fruits, jellies and preserves may be kept from it by the exercise of a little precaution. Since high heat destroys the germinating power of the spores, the process of cooking will destroy all native spores so the only problem is to prevent contamination from foreign elements.

To Prevent Mold on Jellies.--After the jelly has hardened if the surface is moistened with alcohol or brandy and a clean white paper be fitted in closely to the top, and another tightly glued over the edges of the tumbler, molding may be prevented. White of an egg or paraffin may be used with the same result.

Molds are preceded by some acid formed by organisms. Mold is not confined to food in the pantry. Any substance which contains organic matter is subject to their action. The results of mold are that they injure the taste of foods, make food unsightly, effect the odor and in the end totally ruin it by producing decomposition, putrefaction and decay.

Molds are not unhealthful. It is not necessary to throw away moldy foods, provided the mold has not extended too far. Simply clean off the mold and the food will be found unimpaired.

In order to prevent mold, we must understand the conditions most favorable to its growth. Moisture is one of the primary factors in its germination. When it is possible, substances liable to mold must be kept dry. Dried fruits, leather, books, and cotton clothes, all come under this list. Molds are aerobic, but grow best where air is not moving and in dark places. This fact was clearly demonstrated in the laboratory with samples of moist bread. This too, will explain the musty conditions of poorly ventilated cellars.

Molds grow well in the light, but we rarely find them growing well in bright sunlight. They require a warm temperature; low temperature retards their growth.

Experiments tried with materials placed in the ice box proved that mold refused to grow or grew slowly. In considering the relation of temperature to molds we find they are killed by heat. A temperature of boiling absolutely destroys them.

There is no successful remedy for the decay of fruits.

This can only be done by process of canning or other methods of preserving, as drying or by aid of chemicals.

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## MILK AND HUMAN LIFE.

Walter Weyl says, "If babies had a vote, the milk supply would be reformed. But babies are inarticulate and the slaughter goes on."

The milk supply and its purity is rapidly claiming private and public opinion and well it should. The purity of milk is a matter of vital importance both from an economic and hygienic standpoint. It is better for the inspection to begin at the dairy farm. The enemy of milk is bacteria. These minute organisms invade it from the air, the hands of the milker, the teats of the cow and the caked dirt on her flanks; from the dirt in the cow yard and even from the water the pail was washed in. The first step in purifying our milk supply then lies with the milker. He must have interest enough in it to wash his hands before milking and see to it that his clothes are clean as well as the cow, the stables, and the milking utensils. Above all he must refrain from "handling" the milk if there <sup>are</sup> ~~is~~ in himself or the family any infectious diseases as diphtheria, scarlet fever, typhoid, or tuberculosis. Among all the vehicles of infectious diseases,

there is none perhaps more dangerous than milk. This fact perhaps is more evident because milk is the most used of human foods.

The principal diseases transmitted by milk are tuberculosis, diphtheria, and typhoid. Typhoid has been proved capable of living in butter. The diphtheria bacillus has not thus far been proved to be transmitted direct from the cow to man; but cows inoculated with the diphtheria bacillus exhibit the germs in the milk. Those epidemics of diphtheria, the spread of which has been attributed to milk, have probably been due to contamination through the handling of milk by milkers or dairymen having the disease themselves or <sup>when it was</sup> in close proximity. Typhoid fever bacilli have been proved to have found their way into milk from water used for washing the utensils and not from the cow or otherwise. Cases have been traced to farms where the buckets were washed at wells, the water of which upon examination showed typhoid bacilli in large numbers.

There is an old custom "more honored in the breach than the observance" of throwing your milk upon the water and letting it return to you. When milk is diluted with the cheaper beverage from the "cow with the iron tail" there is

new danger--for a man who does not scruple to water his milk, will not be careful as to the water he uses.

By "Normal" milk is meant milk from a well fed and healthy mammal". (Sedgwick) "Such milk as a rule is free from bacteria". Good clean milk should keep sweet in a room at 68<sup>o</sup>F. for forty-eight hours."

"Scientists show there are ten different varieties of bacteria which are capable of exciting lactic acid fermentation in milk sugar, to "sour" and curdle milk, but not all develop carbon dioxide and alcohol." Large proportions of the bacteria in milk rise with the cream. The first step towards the process of fermentation, the formation of lactic acid is a preliminary to normal digestion of milk--but the second, acids formed by bacteria is abnormal and interferes with it.

As prophylaxis against milk infection, certain precautions are necessary and it should be the business of the bacteriologist to educate public sentiment in regard to its importance as a means of restricting the spread of infectious diseases as well as lowering the large mortality among infants.

One of the principal causes of this needless slaughter

of babies in the great cities is, because we have not solved the problem of giving the baby its primal food. In every city and town of this country we are feeding helpless infants, as well as our sick and convalescent, a mass of liquid filth,--the refuse of the stable, barn yard, the dirt and contamination of man and animals, the myriad germs, typhoid, diphtheria, scarlet fever, and tuberculosis. No wonder children fret and cry, languish and die.

We have only begun to study the question of bad milk. But the nation is beginning to realize what is the trouble and nation, state and city, farmer, dairyman, railroad distributor, housewife and bacteriologist are becoming informed and alarmed. And in this intelligent alarm there is new hope. Walter Weyl reports finding "as high as ten million bacteria per drop in milk. One lone bacterium produces three thousand in thirty-six hours." It is easy to figure how milk, with but slight contamination when first milked, soon contains hundreds of bacteria.

Inasmuch as milk is one of our most widely distributed foods, while cows are known to have tuberculosis as well as human beings, milk has fallen under the gravest suspicion as a vehicle of tubercle bacilli. Cows forced to live in

miserable, unclean sheds with insufficient air and light may infect each other and us as we infect the cow. Not all milk from tubercular cows produce<sup>s</sup> tuberculosis, otherwise we would be a nation of consumptives. But where the cow has tuberculosis of the milk gland, the danger is imminent.

The reform in milking is slow, but it is uninterrupted. There are and always will be many men who believe that the old methods are good enough and who consider all reforms as fads and fancies. Nothing is harder to eradicate than long cherished beliefs. But once a farmer or dairyman has produced good milk,--not accidentally or occasionally but as a rule--once he has made it pay, he will take no backward step.

The city and state government<sup>s</sup> are contributing to the bettering of milk by sending out inspectors. Inspection is carried on by state government sometimes successfully, and sometimes, through ignorance, partiality, or bribery, with an unsuccess that makes the whole inspection a farce if not a crime.

An important step must be taken in the elimination of tuberculosis in cattle. We must maintain a higher standard of barns for housing our cows. We must cure the milk at its source; we must cleanse the channels through which it flows;

we must teach the consumer what milk to buy and drink. Last of all, the mother and housewife must be educated.

As long as milk is used raw or uncooked there will always be danger in its use; and from the standpoint of sanitary science raw milk is always an unsafe food. In order completely to eradicate this trouble, it should be cooked or treated in some way to destroy the disease producing bacteria it may contain. In the processes, pasteurization and condensation there is no question as to the efficient destruction of germ life. There is however objection to the "cooked" taste, and digestibility of milk so treated. But a substitute is better than nothing at all, just as a life preserver is better than a frock coat when you are in the middle of a lake. And until the lacteal millennium arrives, and we can have pure milk, we shall do well to encourage pasteurization.

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## CONTAMINATION OF THE WATER SUPPLY.

Of all the substances admitted into the alimentary tract, the most abundant and perhaps the most trusted is water. "A cup of cold water" meets a want necessary to life. It is more important than food and nearly as necessary as breath.

Pure water is composed of hydrogen and oxygen, usually contains traces of nitrogen, carbon dioxide, ammonia and various organic substances. Good drinking water is water with an agreeable taste, free from odor and not contaminated with anything injurious to the system. Natural waters, such as those from springs, brooks, and other streams from uninhabited districts should contain and ordinarily do, no infectious material. But it is very different with waters from those sources in thickly settled communities, which have been exposed to pollution by sewage.

The purity of the domestic water supply should be above suspicion. It is well worth remembering that all water upon the earth was originally rain water. This either remains upon top of the ground and flows off in streams and rivers

or percolates through the ground and is known as ground water. No explanation is necessary in order to convince the public of the contamination of streams by surface drainage. Ground water on the other hand, although subject to pollution by percolating through filth and by surface waters through cracks or fissures in the earth, is subject to great purification through filtration.

Well water has an ancient reputation and has long been celebrated in song and story. Many wells are absolutely innocent of all contamination and yield excellent water. On the other hand the most disastrous outbreaks of cholera and typhoid fever have been traced to wells. It has been proved in the laboratory that one c.c. of water may contain as high as 63,580 germs, or a teaspoonful which is five c.c., would contain 317,800. All these germs may not be disease producing; but how great is the risk even if a small per cent of them are pathogenic. Even though the germs are not disease producing, the continued introduction of large numbers of them into the system, lowers vitality and increases our susceptibility to infectious disease.

Perhaps one of the most common sources of infection is the open privy vault. Drainage from these to a well con-

taminates the water with any bacterium common to man. If a house is not connected with or out of reach of a good sewerage system and the family is compelled to use a privy, the vault should be of concrete in order that no sewage therefrom should reach water veins. A septic tank connected with a privy is the best remedy for this evil. Now that the septic tank has reached such a high degree of perfection, it is to be recommended to every household not in connection with a sewerage system.

Wells are not altogether contaminated in the above manner. When an open well is used, a great deal of filth falls in from the top, no matter how much care we use to prevent this. Receptacles of this kind should be securely sealed at the top.

Water should never be used from a well near a barn unless it is sterilized. The best means of sterilizing water is to boil it, then keep closed up in vessels away from the air.

In connection with the danger of drinking water comes the evil of the common drinking cup. Magazines and newspapers of today blaze with the headlines--"The Cup that Kills", "Children in Peril", etc. Not only acute maladies, like

scarlet fever and diphtheria, but loathsome diseases are communicated by the deadly drinking cup. Parents who will safeguard their children from dangers more clearly obvious, but less serious by far, view with indifference the nasty drinking cup, passing from mouth to mouth.

Every common drinking cup, from the tin dipper of the boy who passes the drinking cup in the country school, to the granite ware cup chained beside the faucet of our public fountain is a poison cup. Who shall say to what extent these drinking cups have been responsible for the mortality among our school children? Doctors have traced epidemics of tonsillitis, severe colds, sore-throats, and diphtheria to this medium.

The human mouth is a natural lurking place for bacteria, both harmless and dangerous. Bacteriologists have conclusively shown that a considerable number of people in good health harbor in their mouth virulent germs. It has been estimated that nearly one per cent of well persons carry in their mouth true diphtheria germs. The germs of tonsillitis, pneumonia, and dreaded tuberculosis are harbored in the same way.

What does this mean? Simply that the system of these

persons being in a state of perfect health, are proof against attack; but if these germs gain entrance to a susceptible person, serious, and even fatal illness may result. The drinking cup must go. It is the individual duty of fathers and mothers to see to its abolishment.

Ice is another source of water contamination very often overlooked. The popular impression that ice purifies itself in freezing is incorrect. Disease germs are found in ice identical <sup>with</sup> those found in the water from which the ice was formed. These organisms are not destroyed by freezing, their action is only retarded. When the ice melts they resume their normal functions. Animal and vegetable matter are also held in suspension in ice. As soon as these elements are liberated by melting the ice, decomposition sets in and putrefaction results. Epidemics of typhoid fever have been directly traced to use of impure ice.

The purity of food and drink is of vital importance in the preservation of health. It is a well established fact that, whatever is taken into the body has much to do with its condition. This being true, all should be thoughtful about what they eat and drink. No one should think of going to a polluted pond, river, or lake and drinking the water. Every

housewife should make sure that the family drinking water  
is above suspicion.

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## FLIES.

"Flies!

House flies!

Disease-bearing flies!

Screen your house and remove the manure pile, which is the best breeding place for flies."

"Wealth and imperishable fame await the man

Who can banish the fly from the earth."

Bul. Kansas Board of Health.

Scientists have proved beyond a doubt that house flies are filthy disease carrying pests. It has been suggested accompanied with good arguments that this pest should be named the "typhoid fly" in order to further warn the ignorant of its disease carrying qualities.

The female house fly, is a bird of great perseverance and marvelous productive powers. Bacteriological investigations have proved that she can rise in the morning, shake the dust from her wings, and by evening be the mother of seven million anxious and energetic children. By the third day all of these offspring are ready to start a business of their own. The house fly has no redeeming traits of character. She is a foe to health and religion. She scatters disease and provokes unseemly profanity.

She goes directly from feasting upon the discharge of typhoid patients to our best as well as our humblest homes. She crawls upon the plates and dishes on the table; upon bread, fruit and various articles of food and leaves infectious matter and discharges. These unobserved, are taken into the stomach and bowels and often serve as the mysterious and unaccounted for causes of many diseases.

As a safeguard against flies carrying disease, cleanliness should be so displayed as to be secure against the possibility of any contamination. Screens and "fly-paper" should be used in all instances.

It is believed by "doctoring" the breeding places of the fly, her eggs can be destroyed before they are hatched, and in this way the species exterminated. It is a well known fact that the principal breeding place or rather hot-bed for flies is the manure pile. This is often a mass a crawling maggots, they are the larvae of the fly. In the warm weather they mature into the fly and come directly into our homes, carrying with them the organisms directly from the excreta to our food. "It has been definitely proved that the organisms the flies take into their bodies from the excreta are not destroyed by their digestion, and passing from their

bodies with the excreta, the germs utilize this excreta for food and multiply. Therefore, a flyspeck containing fifty germs increases its number fifty fold. If the organisms happen to be the typhoid bacillus, a fly speck upon any food may eventually contain thousands of germs."

Crude oil is said to be fatal to the offspring of the fly. Crude oil mixed with the manure heap would make it impossible for the fly to build her nest there. Another prevention would be to use screens around and over these places.

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## Communicable and Infectious Diseases.

.Tuberculosis--the Great White Plague. For ages tuberculosis was regarded as an inherited disease and nothing was done to prevent it. Twenty years ago consumption in its most dangerous form was not regarded as transmissible. Dr. Koch discovered the tubercle bacillus, and gave to the world its mode of living and habits. From his discoveries science has furnished the fullest directions how to pursue and annihilate this enemy of mankind, and has demonstrated that the disease is not only preventable but curable.

Tuberculosis is caused by the tubercle bacillus. It is a minute creature of the lowest scale, visible when highly magnified. It thrives best at blood temperature, and multiplies in the interior of the body. It reaches the outer world chiefly in the sputum of persons afflicted with the disease, and in the milk and meat of diseased animals.

The bacillus is most efficiently destroyed by high temperature in the presence of moisture, as by boiling. It can not long resist the action of sunlight. Tuberculosis being a disease caused by specific bacillus, it is our duty to prevent the spread of the disease as far as it lies in our

power; this we can do in a large measure by preventing the spread of the bacillus. While we cannot manage all those patients who go about and carelessly spread the disease, we must turn our attention to those under our control. Dr. Koch has taught us that the greatest danger lies in the sputum. If proper care is used in the disposal of the sputum and other discharges, the patient is no menace to his environment. The following rules gleaned from a careful study of the best authorities will suffice in a home.-----

Do not permit any person suspected of having tuberculosis to spit upon the floor, a filthy habit in any case, or upon cloths unless they are to be burned at once.

Do not sleep in a room occupied by a tubercular patient. The living room of such a patient should have as little furniture as possible. The use of carpets should be avoided.

Wash thoroughly all eating utensils, using boiling water. Do not mingle unwashed clothing of tubercular patients with clothing of other persons.

Catch all bowel discharges of such patients in a vessel containing corrosive sublimate, one part to one thousand of water.

Tubercular mothers should not nurse their offspring; and

under no condition kiss it.

All floors, walls, ceilings and furniture of living and sleeping rooms of consumptive patients should be thoroughly cleaned very often.

Since owing to the thoughtlessness of a careless public, we are exposed to this disease, our main safe-guard is immunity. This is only brought about by obeying the rules of health, thus making our bodies unsusceptible to the ravages of the disease. No perfectly healthy body will allow the bacillus to grow.

**Typhoid Fever.**-----Typhoid fever is a preventable disease, but to be successful in our war against it we must begin at the bedside of the patient. Destroy all excreta, and thoroughly disinfect all clothing, and after recovery the sick room should be fumigated with formaldehyde and permanganate.

**Water supply.**-----As drinking water is the most common medium for conveying the typhoid germ into the system, where typhoid exists the water supply may be looked upon with suspicion, and until the source of contagion is determined water should be boiled before using.

**Diphtheria and Scarlet Fever.**-----These both being highly contagious diseases, all known precautions should be

used to prevent their spread and stamp out their existence. Since they are germ diseases, isolation and disinfection are the most important measures.

#### General Rules for Disinfection.-----

a---.Thoroughly disinfect or destroy whatever is removed from the sick-room. All discharges from lungs, nose, and throat should be burned. All other discharges from patients should be received into vessels containing a solution of mercuric chloride in quantity equal to or greater than the discharge.

b---.Disinfect the sick-room after removal of patient whether by death or recovery.

c---.Plan of Disinfection--Burn whatever has been in connection with patient, when not too valuable. Blankets, sheets, and garments, should be boiled for half an hour. Subject the room and all its contents to vapors of formaldehyde. Close room tightly, plugging all openings with cotton cloth or old newspapers, volatilize in the room thirteen ounces of Permanganate of Potash to one quart of forty per.ct. formaldehyde, for each two thousand cubic feet of air space. Leave room closed twenty-four hours.

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## Immunities and Protection from Disease.

Having considered some of the principal causes of disease, and having discussed how universally scattered about disease germs are, it naturally suggests to one to ask why we do not all have every disease and what protects us when we escape.

Bacteriology has taught us that the germs of some contagious diseases are in the air and may be inhaled and produce disease. Diphtheria, whooping-cough, pneumonia, and tuberculosis are undoubtedly due to inhalation of germs of the diseases.

Fortunately for us nature has erected a series of barriers against such an enemy as inspired dust, and in exposing us to this danger, has given us a protection that repels attacks not unusually severe.

"In persons who breathe as they should, all inspired air passes first through the nostrils, and is warmed to the proper temperature for the throat and lungs, not only warmed, but the moist walls serve as a sieve by which the air thus inhaled is as far as possible relieved of dusty impurities." This shows the importance of correct breathing.

Since the bacteriologists have proved that bacteria

exert their deleterious action not so much by their presence as by poisons which they secrete from their minute bodies, and that each specific bacterium has its own peculiar product, which in the case of pathogenic or disease producing germs is a poison, this complicates the struggle between the bacteria and the body cells. Then there is an actual struggle between the cells and bacteria. All bacteria do not produce disease even after gaining entrance to the body---for in a strong healthy system the powers of resistance are great and the bacteria cannot thrive.

How important then that we should have good food. Too much or too little food, bad food, food improperly cooked, may all pave the way to disease, even when the body is in a state of health.

Science teaches us that we, ourselves are responsible for most of the ills from which we suffer, caused by our willful disobedience of the rules of proper living.

"The quality which you put into your work will determine the quality of your life. The habit of insisting upon the best of which you are capable, of always demanding of yourself the highest, never accepting the lowest or second best, will make all the difference to you between failure and

success, health and happiness."

FINIS.

OLD HAMPSHIRE BOND