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FARM SANITATION.

Farm sanitation deals with the prevention of disease and the promotion of healthy conditions on the farm. It differs radically from municipal sanitation, for in the city the municipality assumes charge of and responsibility for sanitary conditions, while in the country the individual is responsible for the sanitary or unsanitary surroundings of his own residence.

The country has always been considered a healthy place, and under natural conditions, its scattered settlements, its wholesome springs and the loose soil which rapidly absorbs all organic waste justify this consideration. Consequently rural sanitation does not as a rule receive much attention, and surroundings which could be maintained in satisfactory condition with little effort often become the source of serious epidemics by contaminating the milk and water supply. Thus the health of the city is in a measure dependent upon healthy conditions on the farm.

It is only within the past 50 years that infectious diseases have been shown to be due to the multiplication of minute organisms, or germs, in the tissues affected, and that by the destruction of the specific germs which produce a disease its spread can be thereby prevented. With this discovery the science of preventive medicine may be said to have originated. The importance of this discovery and the success of its application in preventing disease is shown by the fact that in all the more civilized communities such terribly infectious diseases as the plague, cholera, small pox, and yellow fever are now very effectively held in check, and epidemics which in times past carried off in such a short time so many thousands of people probably will never again make much head way in those countries where the knowledge gained in combating these

diseases is put into practice. These results give encouragement and show what is to be gained in continuing the fight against preventable diseases of which the most prevalent in rural districts are tuberculosis and typhoid fever.

Disease germs thrive in the filth of dark, damp places. Sanitary surroundings must therefore be clean, well-lighted and dry. Such surroundings tend not only to prevent the spread of disease, but also aid greatly in recovery from disease when once contracted. For the immediate destruction of disease germs in infected surroundings, the two most effective agents are heat and chemical disinfectants.

CHEMICAL DISINFECTANTS.

Many chemical preparations have wide application on the farm in destroying not only the germs of disease but also insects, fungi, and vermin. Those that are best suited for destroying germs are called disinfectants. The most commonly used are carbolic acid, cresol, bichloride of mercury, milk of lime, sulphur and formaldehyde.

Carbolic acid and cresol have similar properties and are largely used for treating wounds. Many preparations have been placed on the market containing cresol, of which some of the most efficient are known as Creolin, Lysol, and Kreso. Directions are given on the labels for their use not only in washing woodwork, floors, and utensils, but also in disinfecting garbage, sputum and excreta.

As is well known, but not always practiced, the disinfection of sputum is of particular importance in the case of consumptives, for which purpose cresol preparations are well suited. Bacteria are not able to rise of themselves from a moist surface, but get into the air only after drying, hence the advisability of using sputum cups containing a liquid disinfectant. In this connection it should also be pointed out that care taken to prevent the infection of the premises by the proper use of disinfectants, and other sanitary precautions, during the illness of the patient is much more important than disinfection after recovery or death, since the spread of the infection is thus checked in the beginning.

Bichloride of mercury, called corrosive sublimate, is the most powerful disinfectant known. A single application of a 1 to 500 solution in water is sufficient to kill the most resistant organisms in a few minutes. A solution one-half this strength is the one most commonly used. It is specially suited for washing the hands after handling infected materials, and is also suited for washing floors and articles of furniture. This is often done in addition to fumigating as an extra precaution. The principal disadvantages in the use of corrosive sublimate are that it is a very dangerous poison; it acts injuriously upon metals; and its power is de-

stroyed by albuminous matter, so that it cannot be used for the disinfection of excreta or sputum.

Lime is used for many purposes on the farm. It is the cheapest of all the disinfectants, and is very useful when applied as white wash for the disinfection and sweetening of cellars, privies, barns, stables, poultry houses, and other buildings. Unless it can be kept from the air, lime wash should be made up fresh before using. Air-slaked lime is of no value as a disinfectant.

DIRECTIONS FOR THE FUMIGATION OF HOUSES.

Disinfection by means of a gas is called fumigation. The most efficient gases used for this purpose are sulphur dioxide, the gas formed from burning sulphur, and formaldehyde. These gases are very powerful germ killers when properly applied, but both possess certain qualities which are not understood by all, and as a result many attempts at fumigating have accomplished no fumigation at all. The following principles are to be remembered in fumigating with these chemicals:

A sufficient concentration of the fumes of any disinfectant to kill the microorganisms in the air must make the air entirely unfit to breathe. Consequently burning a small amount of sulphur on the stove, placing saucers of chloride of lime under the bed or about the room, or hanging up sheets dipped in some non-volatile disinfectant is of little value. Similarly fumigation with medicated lamps, or burning pastilles, is useless for disinfection, but simply serves to deodorize.

In a dry atmosphere both formaldehyde and sulphur dioxide have little value for fumigating purposes. Before attempting to fumigate a a room when the air is dry it is therefore imperative to sprinkle water on the floor or about the room in order to increase the humidity of the air.

The efficiency of formaldehyde becomes greatly decreased below 60° F, therefore it should not be used for fumigating unless the air in the room can be raised above this temperature.

Fomaldehyde in the gaseous, as well as in the solid form, burns very readily and is thereby destroyed. Consequently any method of fumigation which causes the formaldehyde to ignite will not accomplish any fumigation.

Fumigation with Sulphur: Sulphur dioxide, the gas given off from burning sulphur, not only destroys the germs of infection but is fatal to animal life. It quickly kills rats, mice, roaches, fleas, mosquitoes, and other vermin. It is for this reason particularly suited for fumigating cellars, vaults, stables, outhouses and similar places. Formaldehyde which is such a powerful germ killer is not poisonous to animal life and in the strongest concentrations of the gas has no effect on roaches, bugs

and other insects. Places infected with such diseases as plague, yellow fever and malaria which are carried by animal forms should therefore be fumigated with sulphur.

If the sulphur is only used as an insecticide about two pounds to a room 10x10 feet is usually sufficient, and in this case sulphur candles are suitable providing enough of them are taken to furnish the weight of sulphur specified, for in almost every case the amount of space which they are stated to fumigate is greatly exaggerated. If disease germs are to be destroyed as well from 3 to 5 pounds of sulphur must be taken for the same space, and in this case the ordinary flowers of sulphur will be found more satisfactory. This should be placed in several shallow metal dishes in order that the depth of sulpur in each dish will not exceed one inch. The dishes are in turn placed in a vessel of water, and a little alcohol sprinkled over the sulphur which is then ignited.

The fumes of sulphur are injurious to cotton and linen fabrics; they bleach substances colored with vegetable dyes, and attack almost all metals. They moreover have little penetrating power and are therefore not suited for disinfecting mattresses, pillows, quilts and articles of furniture which need more than a surface fumigation. On account of these serious disadvantages, sulphur is not desirable for fumigating furniture or rooms of dwelling houses, and has been largely displaced for this purpose within the last few years by the still more powerful germ killer—formaldehyde.

Fumigation with Formaldehyde: Formaldehyde has been used as a disinfectant for only a few years, but is now recognized as the most efficient germicide known for fumigating closed rooms and apartments. It is not poisonous or dangerous to work with, and is not injurious to delicate fabrics, paints or metals. It is a gas but may be obtained in the form of a solution, called formalin, or condensed into a solid known commercially as paraform. Two ounces of the solid, or 10 ounces of the solution should be taken for each 1000 cubic feet of space. In the various makes of candles, the solid paraform is almost always used. A candle selling for 35¢ contains as a rule one ounce or less of the solid which the directions usually state is sufficient to fumigate a room 10x10 feet. Repeated experiments by bacteriologists have shown that under ordinary conditions it is advisable to take double this amount for a room of this size, and in a dry climate like that of Arizona where rooms are not particularly tight, an even larger quantity might be used to insure thorough disinfection, particularly in a room infected with the germs of tuberculosis, which are more resistant to chemical disinfectants in general than the germs of most other common diseases. Formaldehyde is given off rather slowly from candles of all kinds, and in order to maintain the necessary

concentration for a sufficient length of time, care should be taken to close up as tightly as possible by stuffing with cotton, or pasting over with paper, all doors, windows, fireplaces, keyholes and other openings; otherwise the fumes will escape, particularly on a windy day before the proper concentration of the gas is reached.

Formaldehyde candles are particularly suited for fumigating small spaces such as closets and bathrooms. Some of the most highly recommended of these candles are known as DePree's Formaldehyde Fumigator, and the Dolge Formaldehyde Disinfecting Candle. Candles, such as Wood's Fumigator, are intended for deodorizing purposes and for driving away mosquitoes, but have no value as germ destroyers. Various makes of candles contain both sulphur and formaldehyde. These usually are of little or no value and therefore should not be used.

A second method of fumigating with formaldehyde, which for Arizona conditions is undoubtedly the most satisfactory and efficient known, consists in setting free the gas from formalin by means of potassium permanganate. One pound of formalin for each 1000 cubic feet of space is put in a three gallon metal pail which in turn is placed in a pan to catch any material that might boil over. One-half to three-quarters of a pound of potassium permanganate crystals is then added. In a short time a violent action with rapid evolution of gas will take place. This method has the following advantages:

1. When the same quantities of the two reagents are mixed they will always give off the same amount of gas. This is not always true when candles are used, for with certain makes the formaldehyde ignites and no further evolution of the gas will then take place.

2. The heat formed by the chemical reaction causes steam to be liberated at the same time as formaldehyde and increases the disinfecting power of the latter.

3. The gas is evolved almost instantaneously and being more concentrated is consequently more effective than when candles are used. For the same reason less care need be taken in making the room tight.

4. No smoke is given off during the process as in the case of some candles.

5. The method is very simple to operate.

The reagents required for this method are put up by Parke Davis & Co., in convenient form under the name of the Formanganate Disinfector. A sufficient amount to thoroughly fumigate a room 10x12 feet retails for $1.00. In case the packages put up by Parke Davis & Co., are not carried in stock, the reagents may be obtained separately for about the same price at any drug store. This method of fumigating is thus more expensive than candles, but when the reagents are obtained

from a dealer in chemical supplies the expense becomes approximately the same.

A third method sometimes used in setting free formaldehyde conconsists in heating the solution in a shallow metal pan. When done properly this method is satisfactory but often the heat applied is not great enough and the formaldehyde, instead of being driven off, is converted into the solid form and remains in the dish. Consequently this method is not recommended.

If a room to be fumigated contains articles of furniture, they should be spread out as much as possible; linens should be hung up on clothes lines in the middle of the room; window shades unrolled; cupboards and drawers opened; and mattresses so placed that both sides are exposed. Formaldehyde has considerable power of penetration so that when the fumigation is carried out in the way recommended it is not usually necessary to open either mattresses or upholstered furniture, but when articles of this kind are to be fumigated special care must be taken to make the room tight. The time that a room should remain closed while being fumigated is variously recommended from six to twenty-four hours, although it is very probable that the organisms on exposed surfaces are mostly killed during the first hour if they are killed at all. The longer exposures are recommended to permit the gas to penetrate into the interior of bedding and other articles requiring more than a surface disinfection.

DISINFECTION WITH HEAT AND LIGHT.

The application of heat is the most reliable as well as the most economical of all methods of disinfection. It is for this reason that refuse, garbage and all articles of little or no value when infected should be destroyed by burning. It is not at all necessary, however, that articles should be burned in order to insure absolute destruction of any infection they might contain, for fortunately germs of all kinds in washable articles may be completely destroyed with certainty by boiling in water. The germs of most common diseases, as diptheria, cholera, typhoid fever, pneumonia and tuberculosis, are instantly killed by boiling water, but linens and all articles of clothing which are infected in this way should be boiled for fifteen minutes to insure that all air spaces are heated to the temperature of the water. If it is desired to take extra precautions, a small amount of formalin, or one of the cresol preparations may be added to the boiling water. In general the effectiveness of chemical disinfectants when used for purposes for which they are suited is greatly increased by using the solution while hot.

Light is the great natural disinfectant. None of the pathogenic bacteria are able to develop in sunlight, or even ordinary day light, but

thrive best in dark damp places. It is for this reason that well-lighted rooms are so frequently and wisely recommended. The time required for light to cause the death of any particular class of bacteria cannot be stated definitely, as this depends on the intensity of the light, and the thickness of the stratum containing them; thus the time required for sunlight to kill the germs of tuberculosis is variously stated to be from a few minutes to several days.

SEWERAGE DISPOSAL.

The disposal of sewerage may be said to be the most important sanitary problem on the farm on account of its relation to the transmission of typhoid fever, and various "summer complaints". Because of the scientific disposal of sewerage in most cities, typhoid fever is now less prevalent in the city than in the country in proportion to the population. In fact typhoid fever has come to be regarded as a rural disease, and many outbreaks in cities have been traced to contamination of the water supply by improper disposal of infected sewerage in the country.

In rural districts, or even in small towns, it is usually impractical to dispose of sewerage by water. What is considered to be the best substitute is called the dry earth closet. This should have a vault underneath made of brick, cement or other water tight material. The contents of the vault should be kept covered with enough dry soil to absorb all liquid. The soil acts as a deodorizer, and when enough is used a closet of this kind is not offensive and need not be built at a distance from the dwelling house. Moreover, so long as the vault is kept tight no danger of contamination of the water supply is possible. The mixture in the vault has considerable fertilizing value and may be disposed of for this purpose as the vault becomes filled. A tight closet of this kind prevents the breeding of flies which are now known to be instrumental in transmitting many diseases.

Kitchen slops are best disposed of by allowing them to flow over loose soil which is removed at intervals for compost, or better still by piping directly to the garden where it is used for irrigation.

BARN YARD SANITATION.

Sanitary conditions in the barn yard are much more easily maintained in Arizona than in most places. Muddy and damp surroundings are not common, and the open way in which most barns and poultry houses are made is an excellent aid in maintaing healthy conditions by affording ample light and ventilation. A reasonable amount of cleanliness is thus the only remaining requisite.

If infection happens to occur the open buildings make fumigation impossible, but the bright sunlight of Arizona is a very good substitute. For direct application hot lime wash containing one-fourth pound of

carbolic acid to each gallon is the cheapest and one of the most efficient disinfectants, and should be used for washing the interior of infected stables including floors, stalls, chicken roosts, and all articles which have been exposed to infection. The use of lime wash once or twice a year is also recommended for the interior of poultry houses as a preventive measure against the development of insects and parasites as well as diseases.

WATER SUPPLY.

The question of a rural water supply in Arizona differs materially from that of more humid countries. Wells of considerable depth as a rule constitute almost the entire water supply, and the wholesomeness of the water is likely to be impaired not so much by underground contamination from the barn yard, which so often happens in countries having a greater rain fall, as by the amount of mineral salts which are present in solution.

Water which contains more than 100 parts of these salts in 100,000 parts of water is not desirable for drinking and although some salts in solution improve the taste, and are supposed to increase its wholesomeness, yet an excessive amount of soluble material in water is apt to be injurious to some people at least.

Soil acts as a filter in removing organic impurities from water, but when situated at some depth below the surface it is not able to maintain this property indefinately. It thus happens sometimes on account of the proximity of the well to the barnyard or cess pool that the underground soil becomes finally so saturated that the removal of impurity no longer takes place.

Owing to the comparatively great depth to water level in most places in Arizona, contamination of wells in this way is not so likely to occur as surface contamination by flood waters, or by dry dust and dirt from the corral during wind storms. To insure a good water supply, therefore, a well should be situated on higher ground than the barn yard or cess pool and at least 100 feet away; the surface of the well should be covered so as to prevent entrance of impurities through flood water or dust storms; and the mineral constituents of the water should not exceed 100 parts in 100,000.

If a water is suspected of being contaminated with impurities it may be rendered harmless by heating to boiling, for it fortunately happens that the germs of all diseases which are likely to occur in water are instantly killed at this temperature. Boiling, if continued for a time, likewise removes some of the mineral salts which cause the hardness of water.

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