Safe Drinking Water
Michigan State University Extension Service
W. L. Mallmann
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SAFE DRINKING WATER

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Not drinking water, but safe drinking water, is a necessity for man. Drinking water must not only be palatable, but it must be free from germs that may cause illness. The clarity, sparkle, or coolness of a water is not, in any sense, a measurement of the safety of a water supply. Many epidemics have had their origin in clear, sparkling, cool water. Not even an expert can determine the sanitary quality of a water supply by the senses of smell, taste, and sight.

All water supplies, irrespective of their sources, should be checked for their sanitary quality by submitting samples to a bacteriological laboratory at least once a year.

The Bacteriology Department is ready and willing to aid both urban and rural dwellers in improving their private water supplies. This service has been available at no charge for many years, and will continue to be available so long as unsafe private water supplies are found.

The value of pure water to health is vividly demonstrated by merely scanning any state's vital statistics and noting the death rates before the introduction of safe water supplies in the large cities and the death rates since the introduction of purification systems. In 1900, before the advent of safe water, Michigan had a typhoid fever death rate of 37 deaths per 100,000 persons. In 1908, the first filtration plant was installed at Grand Rapids and this was followed by others; later the water was treated with chlorine to destroy bacteria that might survive filtration. Rapidly all urban water supplies were either changed from questionable sources or the questionable water was treated to render it safe. By 1928, the death rate from typhoid fever had dropped to less than two deaths per 100,000 persons. In 1940, practically every public water supply in Michigan is safe. Today, water-borne typhoid fever is spread by private or semi-private water supplies.

However, despite all the progress in sanitation, in the last 17 years in the United States and Canada, with a combined population of 138,000,000, there were 500 epidemics, 125,000 people were ill, and 1,200 people died as a result of drinking sewage-contaminated water.

MICHIGAN STATE COLLEGE
EXTENSION DIVISION
R. J. Baldwin, Director

Cooperative Extension Work in Agriculture and Home Economics, Extension Service, Michigan State College and the U. S. Department of Agriculture Cooperating.

CONTAMINATION OF DRINKING WATER

Water taken from deep in the ground is generally safe water, but frequently the methods of obtaining the water are faulty. Waters from shallow wells or surface sources are easily contaminated. If water comes in contact with sewage, that water becomes potentially dangerous. Even though sewage has been diluted or has passed through some means of purification such as a septic tank, its presence in a drinking water supply is attended with danger.

DISEASES CARRIED BY WATER

All diseases of the bowels may find their way into water supplies through contamination of the water by sewage. The most dangerous is typhoid fever, but dysentery, both amebic and bacillary, are not uncommon and also very dangerous. The most common disease spread by water is so-called "diarrhea". In some water-borne epidemics, practically everyone in the effected areas was ill.

SANITARY QUALITY OF VARIOUS WATER SOURCES

Rivers and Lakes

The degree of pollution in a lake or a river is directly proportional to the amount of sewage entering the same. A stream passing through a populated area is invariably an unsafe source of water. Few lakes and rivers within Michigan are safe water supplies unless the water is purified previous to use.

Springs

Generally, springs are safe water supplies if the collection is properly constructed. There are three types of springs: surface, hillside, and underground. Many springs are polluted, not because the water as it emerges from the ground is unsafe but because the method of collection is undesirable. The use of open reservoirs should be avoided. If the water is conveyed from the depths of the spring into a closed reservoir, surface contamination is eliminated and a safe water can be obtained. Hillside springs should be regarded with suspicion unless the high ground is uninhabited by man and animal. The presence of out-houses in the water-bearing area should condemn the supply.

Dug Wells

The dug well should be a thing of the past. The "old oaken bucket" is beautiful in song, but in practice it is obsolete and dangerous. A safe dug well water supply is a rarity. Most dug wells have porous walls that allow the entrance of surface drainage that may carry undesirable bacteria. Many dug wells have planked tops that allow the seepage of waste water from the pump to return to the well cistern.

Driven Wells

Driven wells obtain their source of water from the same stratum of earth as do dug wells. A properly constructed driven well should meet the following requirements: 1. The location should be such that the ground slopes away from the well, rather than toward it. 2. A concrete platform should be placed at the base of the well and should be equipped with a drain to remove any waste water. 3. A cylinder type pump should be used. 4. The well should be at least 25 feet deep, and deeper, if possible, to prevent the seepage of surface water into the pipe. 5. The well should be located at least 75 feet from any source of pollution, such as out-houses, slop dumps, seeping cesspools, septic tanks, etc. For a detailed discussion of well construction, the reader is referred to Engineering Bulletin No. 14, issued by the Mich. Dept. of Health, Lansing.

The water should be examined bacteriologically at least once each year.

Deep Wells

Deep wells are drilled and, in most cases, penetrate the bedrock. These wells are the best sources of water known. Water entering such wells comes from beneath the rock and is free from surface water. The water is practically bacteria-free. If such wells are properly constructed, with tight connections at all joints, proper frost pits, and tight gaskets in all valves, the water is generally safe. These wells should be tested regularly once each year for sanitary condition.

THE SANITARY EXAMINATION OF A WATER SUPPLY

For the benefit of urban and rural dwellers, who desire to ascertain the purity of their water supplies, directions for the proper collection of samples are presented. A questionnaire is presented which should be filled out completely and returned with the sample. No charge is made by the Bacteriology Department for this service.

METHOD OF COLLECTING WATER SAMPLES FOR BACTERIOLOGICAL EXAMINATION

The collection of a water sample should, if possible, be performed by a person trained in bacteriology. A great deal of care should be exercised in collecting the sample in order to prevent outside contamination from entering the sample. The most important precautions to be observed are:

1. The sample bottle and stopper must be prepared as described below.
2. The sample should be representative of the supply.
3. Nothing should come in contact with parts of the bottle that come in contact with the water sample.
4. The sample should be shipped immediately after collection and at a time when the sample will reach the laboratory in the shortest time period.

The Sample Bottle

The best container available in most homes is a pint Mason fruit jar. A new cover and a new rubber should always be used and, if possible, a new jar. **Sample bottles are not supplied by the laboratory.**

Preparation of the Sample Bottle

The best method of preparation is boiling. Place the jar, with the rubber attached, and the cover, in a pan of boiling water. Boil vigorously for at least 10 minutes.

Removal of Bottle from Boiling Water

Remove the bottle from the water bottom side uppermost. Secure the cover by the outside only.

Collecting the Sample

If the water supply is from a well, pump the well for about 15 minutes before taking the sample, unless the well has been in use just previous to collecting the sample. If the sample is from a tap of a water system, allow the water to run for 10 minutes to clear the system of stagnant water. If the sample is taken from a stream or still body of water, plunge the jar beneath the surface of the water and keep moving up stream or forward while filling. This prevents the water coming in contact with the hand from entering the jar. Collect the water directly into the jar, prepared as described, filling the jar about three-quarters full. Seal at once. **Be sure that nothing comes in contact with the parts of the bottle that come in contact with the water.**

Shipping

Pack well, using ice if possible, and ship at once by parcel post or express. When possible, ship the sample during the early part of the week so the sample will reach the laboratory before Saturday. **All samples should be shipped immediately after collecting.**

The samples should be addressed to

DEPT. OF BACTERIOLOGY AND HYGIENE
MICHIGAN STATE COLLEGE
EAST LANSING, MICHIGAN

History and Description of Well

The questionnaire which is appended should be filled out completely and mailed with the sample.

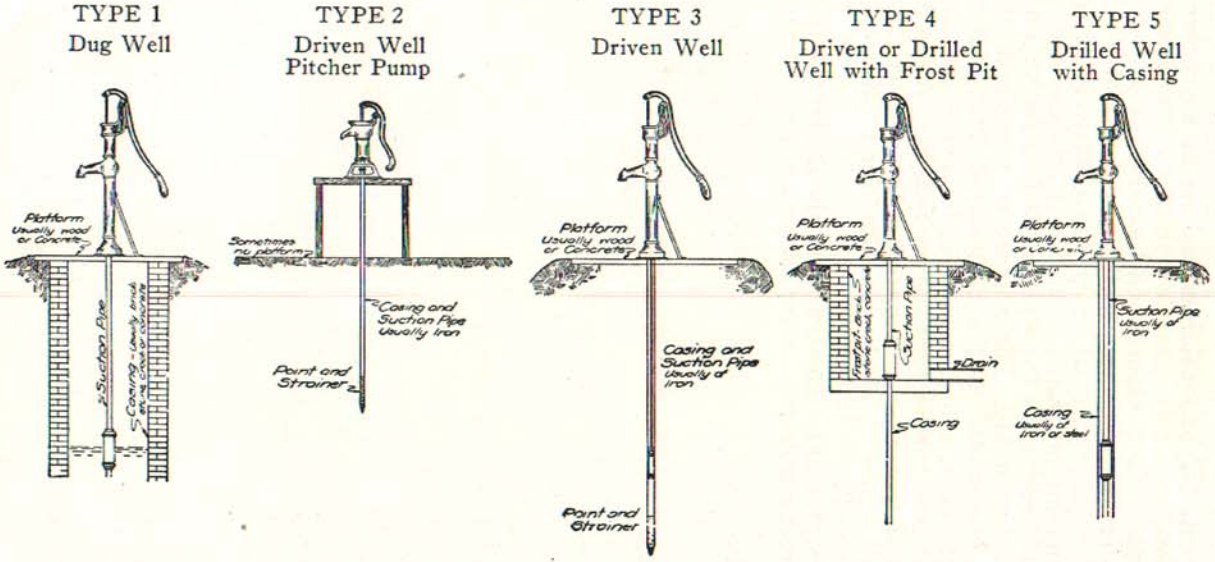
Method of Disinfecting a Water System

Occasionally, although the water entering a well from the water-bearing stratum of earth may be of good, sanitary quality, the well system may be contaminated by colon organisms. This is particularly true of new installations. The resulting water, upon bacteriological examination, will be reported as unsatisfactory. It is impossible by

means of bacteriological procedure to differentiate between pollution of the ground water and of the well system itself. To rule out contamination from the well system, the following procedure should be used:

Procure a small can (12 oz.) chlorinated lime at a grocery store. Remove the well head so access can be gained to the well cistern; dump several tablespoonfuls of chlorinated lime directly into the well. A two-inch casing should receive two to three tablespoonfuls. As one part of chlorine to a million parts of water will effectively destroy the colon bacteria, the amount suggested is purposely an excessive amount. Allow the chlorinated lime to act for a period of four to six hours, and then pump the well thoroughly. The absence of a medicinal taste in the water indicates a removal of the chlorinated lime. After using the water for several days, collect a sample, following the directions given in this circular, and submit for sanitary analysis. An unsatisfactory report on a well treated as suggested indicates a contaminated water supply. A well driller should be consulted for repairs, or for the installation of a new well.

All new wells or pressure water systems should be chlorinated in this manner to assure a sterile system for the water to traverse.



Select the type of well nearest the one from which this sample was taken and give its type number on the other side of this sheet.—Wells with open top pitcher pump are Type 2.

If the well is a dug well (Type 1) state kind of wall (Brick, stone, crock, etc.).

Make any notations or drawings you wish on this side to explain as fully as possible what kind of a well the sample was taken from.

WATER SAMPLE QUESTIONNAIRE

Note: This sheet must be filled out completely as possible and returned to the laboratory before a report can be sent to you on the sample submitted, as this information is necessary in passing judgment on your supply.

Name.....Date of shipping.....19....(A.M., P.M.)

Address.....Date received.....19....(A.M., P.M.)

Source of sample:

Lake; river; dug, driven, or drilled well; spring.....
(See page 6 for type of well).

1. LAKES OR RIVERS:

Does sewage or other insanitary water empty into your supply?.....

Describe conditions fully.....

.....

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2. WELLS: Type and diameter of well (see diagrams).....

Depth.....Kind of soil.....Kind of subsoil.....

Depth to bedrock.....Slope of land relative to well.....

If dug well, state kind of wall.....Kind of platform.....

Do you prime the pump?.....Are walls and top water-tight?.....

Is frost pit dry?.....Do you have drain for waste water?.....

Is there air in the water when pumped?.....

Distance of well from surrounding objects:

House.....Manure piles or other refuse.....

Barn.....Dumping grounds for kitchen slops.....

Privy.....Type.....Pig pens.....

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3. SPRINGS:

Open reservoir.....Closed reservoir.....

Describe surroundings.....

.....

Do you have a water system?.....Pressure or gravity.....

Location of storage tank.....

What trouble have you had with this water?.....

Has the water been tested before?.....Report.....

Remarks:.....

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Types of wells:

(Diagrams and accompanying explanations are taken from Michigan Department of Health circular).

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