



BEGINNING
FARMERS

Produce Safety

Water Sampling

In this two-part activity, you'll learn how to take a water quality sample, practice taking samples of different water sources, and review test results.

KEY TERMS

Bacteria: single-celled microorganisms that can multiply in environments outside of a host organism as well as inside a host organism, such as a person, farm animal, or wild animal. Most can multiply very quickly, reaching high numbers in a short period of time if they are in the right environment. Examples of bacteria include *E. coli*, *Salmonella*, and *Listeria monocytogenes*.

Generic *E. coli*: A type of bacteria found in the intestinal track of animals, including humans. Testing water for Generic *E. coli* is the standard protocol for produce safety as generic *E. coli* is considered to be an indicator of the likelihood that water contains disease-causing microorganisms.

Microorganisms: organisms including yeasts, molds, bacteria, viruses, protozoa and parasites that are so small they can only be viewed through a microscope

SUPPLIES NEEDED

- Water sampling kit
- Handwashing station with soap, water, paper towels and waste basket
- Hand sanitizer or alcohol wipes
- Ice

Alternate Supplies

- Sampling pole (if sampling a pond, river, stream)



How do you do this?

Part 1 - Taking the Sample

1. Wash hands (wet hands, apply soap, scrub for 20 seconds, rinse, dry with paper towel, turn off faucet with paper towel, dispose of paper towel in waste basket)
2. Have ice on hand so that the sample can be immediately placed on ice.
3. Open the test kit but do not take out the bottle yet
4. Turn on the faucet or hose to let it run for several minutes. This is to flush out any dirt or debris from the system that could affect the sample.
5. Apply hand sanitizer or wipe hands with an alcohol wipe
6. Take out sample collection bottle but do not open yet. There is usually a preservative tablet or powder in the bottle. Do not remove this. If you think it's going to fall out when you are taking a sample that requires plunging the bottle into water, you can gently tip the bottle so that it goes into the cap for safe storage while you sample. Remember not to touch the inside of the bottle, cap or the preservative.
7. Open the bottle, being careful not to touch the inside of the bottle so as not to contaminate the sample.
8. Place the bottle under the hose or faucet stream to collect at least 100 mL.
9. Replace the cap and place the sample on ice immediately. E.coli bacteria can either grow or die off in the sample between the time it is collected and the time that it is delivered to the lab, so it is important to store it properly on ice and deliver it to the lab within 6 hours of taking the sample.

If sampling surface water (ex. pond)

1. Follow steps 1-7 in the above section
2. Secure the bottle to a sampling pole. Quickly plunge the bottle into the water, avoiding any plants, algae or bottom sediments that may be present. Make sure to collect at least 100mL of water in the bottle.
3. Replace the preservative and cap and place the sample on ice immediately.

Part 2 - Reviewing the Sample

1. Compare all the test results that the group has taken and discuss together why certain locations might be more likely to have generic E. coli bacteria present.



What does it mean for my farm?

Questions for discussion with co-learners:

- Where does the water used on your farm come from? (ex. city water, pond, well)
- How do you and your crops access water? (ex. spigot, hose, watering wand, drip irrigation, sprinkler sink)
- Can you think of ways in which bacteria might get into your water supply?
- Do you think you might want to test the water used on your farm?

Where to get supplies and testing for your farm:

County health departments have water sampling kits for the Drinking Water Laboratory at the Michigan Department of Environment, Great Lakes and Energy (EGLE). MSU Extension also maintains a list of water testing laboratories that meet FDA Food Safety Modernization Act requirements at https://www.canr.msu.edu/agrifood_safety/produce-safety-education/water.

RESOURCES FOR ADDITIONAL LEARNING

- Irrigation Methods Handout
- Probability of Water Contamination Handout





Water Testing

Water testing can be tricky. If done correctly, water testing can yield accurate results that will both save you money and ensure safe food. If done incorrectly, a false positive can require a costly fix to keep from using contaminated water.

The first step in getting a water sample is understanding what tests you need. A widely accepted thing to test for in irrigation water is generic *E. coli* bacteria. Labs use different methods to test for generic *E. coli*. The results of some of these methods are labeled as colony forming units per 100 ml water (CFUs/100 ml) and others are labeled as Most Probable Number (MPN). For folks wanting to use safe water in farming, these labels are roughly equivalent.

Now that you know what to test for, you need to find out where the labs are. County health departments all have bottles and forms for the Michigan Department of Environment, Great Lakes, and Energy (EGLE) Drinking Water Laboratory. In this factsheet we'll talk about water testing using the EGLE forms and materials. When using supplies from another testing facility, addresses and forms may change, but how the test should be taken and how quickly you need to get it to the lab will not.



On the EGLE request for water analysis, choose Test Code NPEC-LO regardless of the sample source. The results will be reported in colony forming units (CFU) per 100 ml of water. Results from the state lab will be on record at both the state and the county. Record all sampling information (including results) on the water testing log sheet.

When opening the sampling bottle, it is important not to touch the inside of the bottle. We often carry *E. coli* on our skin and may inadvertently contaminate the sample. Even if your hands are washed, you may still have trace amounts of bacteria on your skin that can alter the test results. It is best to use an alcohol wipe or hand sanitizer prior to opening the bottle.

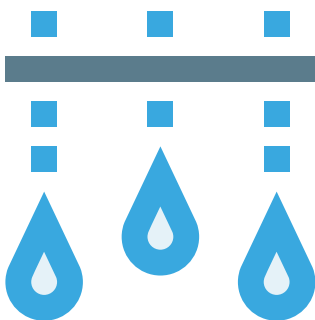
A curated list of water labs that do generic *E. coli* testing for farmers can be found at go.uvm.edu/waterlabmap.



Water Testing, cont.

Remember that accurate results depend on proper sample collection and handling. Without an accurate test, you may need to spend a lot more time and money on food safety than you have to.

Once you get your results back, the next step is figuring out what they mean. The water testing results below are an example of what you might get back from a testing agency. As reported on the test results, the water sample had 1600 Most Probable Number (MPN) of coliform and 45 MPN of E. coli per 100 ml. Take a minute to find each of these numbers on the report. It's very easy to look at the wrong number and use it to make management decisions. The coliform number is a measure of total coliform. Some of these coliform might be from poop in the water, and some might just be living in the soil. It's a pretty good bet that MOST of the coliforms measured will not make a person sick.



The E. coli number tells us a little bit more about the quality of the water. First, any E. coli in the water sample lets us know that there is definitely poop in the water. There also is a greater chance that some of the E. coli might make a person sick. That said, does this mean the grower has to do something to reduce the E. coli? The answer is that it depends.

If we are using water for irrigation or crop sprays, 45 MPN will likely be alright. If you are using the water source for postharvest washing, however, it's not acceptable. Likely a grower would either need to find an alternative water source that has no detectable generic E. coli or they need to treat the water.

Testing water can give you information you can use to better assess what to use that water for. Knowing the quality is the first step, implementing practices to mitigate any risks is the next step. Recording what you did is the final step. If a grower has specific questions about reading a water test or has difficulty tailoring food safety practices to their farm, they are welcome to contact the Agrifood Safety Work Group at gaps@msu.edu or (517) 788-4292.



Steps to taking a good water sample:

1

Do not open the sampling bottle until you are ready to collect the sample. Airborne bacteria can also alter test results.

2

When sampling from your irrigation system, water should be collected directly into the sampling bottle. Water that is collected into another container could pick up contaminants along the way. Run the water for several minutes to flush dirt and debris out of the system.

3

When taking a sample from a pond, lake or stream, secure the bottle to a sampling pole. quickly plunge the bottle into the water, avoiding plants, algae and bottom sediments. Make sure there is at least 100 ml in the bottle. Keep in mind that there is usually a preservative tablet or powder in the bottle. Keep the preservative safely stowed in the cap while you sample, then add it to the water.

4

The sample must be put on ice immediately and delivered to the testing lab within 6 hours. E. coli can grow or die off in the sample between the time it's collected to the time the sample is delivered to the laboratory, so it's important to collect, store and transport the sample properly within 6 hours, on ice.

