

Bacterial Water Sample Collection and Submission to a Water Quality Lab for Compliance with the Food Safety Modernization Act's Produce Safety Rule

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Why Should Produce Growers Test Water for Bacteria?

Understanding the quality of water used in every aspect of production is an important step in protecting the safety of fresh fruits and vegetables. Bacteria responsible for foodborne illnesses can be found in water which can then contaminate produce. Produce growers may need to test water for bacteria to ensure that water used on farm meets a standard for its intended use and limits microbial contamination to produce during growing, harvesting, holding, or packing activities.

Produce growers should first evaluate if they are subject to the Food Safety Modernization Act (FSMA) Produce Safety Rule (PSR) before determining if they need to follow the water testing requirements. All farms should understand the safety of water used for growing, harvesting, packing, and holding produce and should, at a minimum, test each well water and surface water source at least annually.

The next section will help growers understand the federal FSMA PSR minimum requirements for agricultural water for farms that must comply with the rule. Compliance dates to meet the agricultural water requirements have been extended and are determined by farm size. Farms are required to comply with the agricultural water requirements in Subpart E by the following dates:

Large farms, greater than \$568,125⁽¹⁾ in annual (three-year average) gross produce⁽²⁾ sales **by January 26, 2022**;

Small farms, greater than \$284,063 but less than \$568,125 in annual (three-year average) gross produce sales **by January 26, 2023**; and

Very small farms, greater than \$28,406 but less than \$284,063 in annual (three-year average) gross produce sales **by January 26, 2024**.

Small farms and very small farms may qualify for an exemption:

- If a farm has less than \$568,125 in annual (three-year average) gross food⁽³⁾ sales, and
- a majority of the food (by value) is sold directly to "qualified end-users"

Qualified end-user as defined by Section 112.3 means:

- the consumer of the food or
- a restaurant or retail food establishment (i.e., grocer) that is located
 - in the same State or the same Indian reservation as the farm that produced the food; or
 - not more than 275 miles from such farm

If you need assistance in determining if your farm is subject to the FSMA PSR, please contact your county extension office.

⁽¹⁾Inflation adjusted by 2020 values from the Implicit Price Deflators for Gross Domestic Product

⁽²⁾Produce: means any fruit or vegetable (including mixes of intact fruits and vegetables) and includes mushrooms, sprouts (irrespective of seed source), peanuts, tree nuts, and herbs.

⁽³⁾Food: means food as defined in section 201(f) of the Federal Food, Drug, and Cosmetic Act and includes seeds and beans used to grow sprouts.

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Farms are still responsible for ensuring that the food they produce is not adulterated under the Food, Drug, and Cosmetic Act. For more information on complying with the water regulations, view our fact sheet [Food Safety Modernization Act Produce Safety Rule: Microbial Water Quality Compliance](#).

To receive an accurate water quality bacterial analysis, the individual conducting the testing needs to know what supplies are necessary, how to properly take a sample, and where to send the sample for analysis.

What Supplies Do You Need to Collect Water Samples?



1. Sterile bottle – provided by a public or private laboratory, a [local county extension office](#), or a [local county health unit](#)



2. New and sterile nitrile or latex gloves



3. Permanent marker (e.g., Sharpie)



4. Cooler and ice or ice packs (check recommendation of the water testing laboratory, e.g., dry ice) – bacteria may degrade in route to testing; temperature control increases stability of the sample



5. Alcohol wipe or bleach solution with paper towel



6. Sample submission form or chain of custody –

obtained from the water testing laboratory

Additional supplies needed (optional):



7. Extension pole – if collecting from the bank of surface water to avoid sediment contamination in your sample



8. Additional Collection bottle (new, unused, and empty bottle of water) – if your sterile bottle contains powder or tablet that needs to remain in the sterile bottle (usually used for sampling water treated with chlorine). For more information, refer to note⁽⁴⁾ under “Instructions for collecting water” and contact your water testing laboratory.



9. Water boot waders – if collecting in surface water

How to Collect Your Water Samples

All water sources fall into one of the following categories: municipal, ground (e.g., well), or surface (e.g., pond, stream, or reservoir). Each source presents a different level of risks for contamination and requires a specific method of collecting your water sample. Since municipal sources are already treated, they do not need to be tested unless there is some reason to suspect a distribution line concern (e.g., decayed water inlet plumbing or backflow). Ground and surface water will need to be tested. Depending on your water source, the instructions to collect your water sample will slightly vary.

1. Well Water Sampling Method

If you use well water directly from your well tap, collect your sample from that location. If you use well water that goes through your home plumbing, collect your sample from an indoor or outdoor faucet.

If you collect from an indoor or outdoor faucet, you might be interested in the source of the water (the well), or you might be interested in the “standing water” in your pipes and the influence that the pipes have on your water quality. Sample collection for these two purposes will be almost the same, but the amount of time you allow your water to run before collecting your sample will be different.

If you treat water for certain uses but use untreated water in the field, collect the water sample before it goes through treatment. If you want to know the quality of the treated water, collect an additional sample after the treatment process.

Instructions for collecting water from a well or faucet:

1. Wash your hands thoroughly with soap and water.
2. Put on nitrile or latex gloves (if these are not available, make sure that your hands are clean and add extra care to avoid touching the inside of the bottle and the inside of the lid).
3. With a permanent marker (e.g., sharpie), label the sample container with your name, the type of sample, the location on the farm (e.g., Well #1), the date, and time.
4. Select the tap you will sample from; if collecting from an indoor tap, avoid swing or swivel faucets if possible.
5. Prepare the faucet:
 - a. To test the quality of well water, remove any screens, filters, aerators, or splash guards; these items can trap bacteria. Thoroughly wipe the end of the tap with disinfectant for one or two minutes (using alcohol or bleach solution). Turn on water and leave running for at least five minutes; this flushes water

from the well line or household plumbing so the water tested is from fresh well water.

- b. To test the quality of your entire system (well, plumbing, faucet components), do NOT remove faucet components, do NOT disinfect the tap, and do NOT run water before collecting your sample.
6. Reduce the flow rate to avoid splashing.
7. Remove the lid of the sterile bottle⁽⁴⁾. Do NOT touch the inside of the container or the inside of the lid. Do NOT lay the lid down. Do NOT rinse the sterile bottle.
8. Fill the sterile bottle to the indicated line (usually to the 100 mL line); do NOT fill over or under the line.
9. Replace the lid tightly and put the sterile bottle upright in a cooler with ice coming up to the sample level.
10. Deliver the sample and submission form or chain of custody form to the water testing lab as soon as possible. Check the water testing lab delivery time and temperature requirements. Time between collection and testing is critical to get an accurate test result.

⁽⁴⁾If you want to test your treated (chlorinated) water, the water testing lab will provide you with a specific sterile bottle that contains a sodium thiosulfate tablet or powder used to neutralize chlorine.

In this case, the water sampling methods will vary slightly, and you will need to use an additional collection bottle. The collection bottle can be any type of new water bottle that has been emptied, but make sure to not contaminate it. Do NOT drink from the bottle. Do NOT touch the inside of the lid or bottle. Do NOT lay the lid down.

You will use this bottle to collect your water sample after rinsing it three times with your water source and then transfer the water sample from the collection bottle to the sterile bottle.

2. Surface Water Sampling Method

For produce farmers who use surface water, carefully collect your sample close to your intake area. If you treat this water before use, and you want to know the quality of the treated water, collect your sample after the treatment process.

Instructions for collecting a sample from a stream, pond, or other surface water source:

1. Wash your hands thoroughly with soap and water.
2. Put on nitrile or latex gloves (if these are not available, make sure that your hands are clean and add extra care to avoid touching the inside of the bottle and the inside of the lid).

3. With a permanent marker, label the sample container with your name, the type of sample, the location on the farm (e.g., Pond #1 and Pond #2), the date, and time.
4. Position yourself to collect the water sample:
5. If you plan to wade into the waterbody⁽⁵⁾:
 - a. Go to the collection site; face upstream or up current (the water should be moving toward you).
 - b. Wait a moment to allow time for any kicked-up sediment to settle to the bottom; also, be sure to avoid leaves, sticks, or other debris.
 - c. Remove the lid of the sterile bottle⁽⁴⁾. Do NOT touch the inside of the container or lid. Do NOT lay the lid down. Do NOT rinse the sterile bottle.
 - d. Tilt the opening of the sterile bottle down toward the water; dip straight down into the water until submerged a few inches from the surface. While submerged, tilt upright to fill to the indicated line of the sterile bottle.
 - e. Remove the sterile bottle from the water and replace the lid tightly.
 - f. Put the sterile bottle upright in a cooler with ice coming up to the sample level.
6. If you plan to use an extension pole:
 - a. Stand on the stream bank next to the area where you will collect your water sample.
 - b. Fix your sterile bottle⁽⁴⁾ to the pole and remove the lid. Do NOT touch the inside of the container or the inside of the lid. Do NOT lay the lid down.
 - c. Extend the pole and submerge the sterile bottle into the water; rinse 3 times.
 - d. Bring the bottle in and replace the lid tightly. Put the sterile bottle upright in a cooler with ice coming up to the sample level.
7. Deliver sample and submission form or chain of custody form to the water testing lab as soon as possible. Check the water testing lab delivery time and temperature requirements. Time between collection and testing is critical to getting an accurate test result.

⁽⁴⁾If you want to test your treated (chlorinated) water, the water testing lab will provide you with a specific sterile bottle that contains a sodium thiosulfate tablet or powder used to neutralize chlorine.

In this case, the water sampling methods will vary slightly, and you will need to use an additional collection bottle. The collection bottle can be any type of new water bottle that has been emptied, but make sure to not contaminate it. Do NOT drink from the

bottle. Do NOT touch the inside of the lid or bottle. Do NOT lay the lid down.

You will use this bottle to collect your water sample after rinsing it three times with your water source and then transfer the water sample from the collection bottle to the sterile bottle.

⁽⁵⁾Avoid sampling from deep or fast-moving surface water and use instead an extension pole.

Where to Send Your Water Sample for Microbial Analysis

Be sure to send the water sample to a laboratory that uses a detection method that is equivalent to “Method 1603: *Escherichia coli* (*E. coli*) in Water by Membrane Filtration Using Modified membrane-Thermotolerant *Escherichia coli* Agar (Modified mTEC)” (December 2009) ([list of FDA FSMA PSR equivalent methods](#)).

Water testing laboratories perform different microbial tests at different cost and might have different instructions to follow for water sampling and sample delivery. You can find a short list of laboratories that use approved methods and are conveniently located for Arkansas produce growers at the end of this document.

If you treat your water, inform the water testing laboratory before collecting your samples. They may have slightly different procedures or give you another type of sterile bottle.

Before you send your water samples, make sure you specify to the water testing laboratory:

- What you want to detect: **Generic *Escherichia coli* (*E. coli*)**
- What type of results you want: **Quantitative results** (numerical values of *E. coli*, in MPN/mL or CFU/mL). The numerical values cannot be preceded by the “greater than sign” (>) because you need to know the specific number of *E. coli* present in your water, not an estimation.

You can ask for qualitative results (absence/presence of *E. coli*) as well, but ONLY FOR postharvest/harvest water. Quantitative results are allowed FOR BOTH postharvest/harvest water and production water, so it is easier to ask for quantitative results to avoid any confusion (see [Microbial Water Quality Profile \(MWQP\): Alternative Laboratory Methods](#)). Most labs will automatically run qualitative detection methods. Avoid having to send them another sample and paying twice by verifying that they will run the quantitative detection method.

- Which equivalent testing methodology for Agricultural Water need to be performed by the lab: [list of FDA FSMA PSR equivalent methods](#).

How to Interpret Your Results

The acceptable amount of *E. coli* in water samples can vary based on the intended use of that water (Table 1). For produce farmers who are subject to the PSR, additional information to assist you in interpreting the results of the agricultural water samples can be found in our fact sheet [Food Safety Modernization Act Produce Safety Rule: Microbial Water Quality Compliance](#) and in our [Microbial Water Quality Profile \(MWQP\): How-to Guide](#) document.

Once you have your water results, use the number of *E. coli* to calculate the geometric mean (GM) and statistical threshold value (STV). For more information on these calculations, see our fact sheet [Food Safety Modernization Act Produce Safety Rule: Microbial Water Quality Compliance](#). For help building and maintaining your MWQP see the [Arizona State University’s free Ag Water tool](#) or the [Western Center for Food Safety’s free Excel tool](#). To know the number of water samples required to build your initial MWQP (depending on your water source and water use) and the threshold criteria that must be met for your water samples to be considered safe, see our [Microbial Water Quality Profile \(MWQP\): How to Guide](#) document.

Table 1. *E. coli* limits for various intended uses of a water resource.

Water Use	E. coli Limit	Information Source
Human consumption	zero	U.S. EPA Primary Drinking Water Standards
Preharvest activities for covered produce ⁽⁶⁾	GM < 126 CFU/100mL, STV < 410 CFU/100mL	See FSA9901
Harvest and Postharvest activities for covered produce ⁽⁶⁾	Zero detectible generic <i>E. coli</i>	See FSA9901

⁽⁶⁾Covered produce refers to the harvestable or harvest portion of the crop(s) subject to the requirements of the FSMA PSR.

Resources

Implicit Price Deflators for Gross Domestic Product: <https://www.fda.gov/food/food-safety-modernization-act-fsma/fsma-inflation-adjusted-cut-offs>

Food Safety Modernization Act Produce Safety Rule: Microbial Water Quality Compliance: <https://www.uaex.uada.edu/publications/pdf/FSA9901.pdf>

Local County Extension Offices: <https://www.uaex.uada.edu/counties/>

Local County Health Units: <https://www.healthyarkansas.gov/health-units>

FDA FSMA PSR Equivalent Methods: <https://www.fda.gov/media/107656/download>

Microbial Water Quality Profile (MWQP): Alternative Laboratory Methods: <https://www.uaex.uada.edu/farm-ranch/crops-commercial-horticulture/horticulture/arkansas-produce-safety/microbial-water-profile.aspx>

Microbial Water Quality Profile (MWQP): How-to Guide: <https://www.uaex.uada.edu/farm-ranch/crops-commercial-horticulture/horticulture/arkansas-produce-safety/microbial-water-profile.aspx>

Arizona State University's free Ag Water tool: <https://agwater.arizona.edu/>

Western Center for Food Safety's free Excel tool: <https://www.wcfs.ucdavis.edu/resources/>

Appendix Table 1: List of Water Laboratories Available for Arkansas Produce Growers and Water Sampling Protocols⁽⁷⁾

Water Lab ⁽⁷⁾	Contact Information	Sterile Bottle availability ⁽⁸⁾	Submission Form and Account	Method requested	Holding Time and Delivery Day	Cost per sample
ARKANSAS DEPARTMENT OF HEALTH (ADH) WATER MICROBIOLOGY LABORATORY	201 S. Monroe St. Little Rock, AR 72205 501-661-2218 adh.lab@arkansas.gov OR local county health units	Use only ADH sterile bottles. Sampling kit available at your local county health unit	Fill out the submission form included in the sampling kit	Standard Methods 9223 B IDEXX Colilert Test Kit with Quanti-Tray/2000. Check mark "raw water with count" on the submission form; if this is not checked, the ADH lab will only analyze for presence/absence	Collect and deliver samples on the same day. Monday through Thursday (excluding holidays) from 8 am to noon. Contact your local health unit for delivery hours information.	\$17 Only checks; no cash
AMERICAN INTERPLEX CORPORATION	8600 Kanis Road Little Rock, AR 72204 501-224-5060 www.americaninterplex.com	Sterile bottle available at your local county health unit	Submission form available at the lab	Standard Methods 9223 B IDEXX Colilert Test Kit with Quanti-Tray/2000	< 6 hrs on ice	\$55 Credit card or check in advance
ARKANSAS ANALYTICAL, INC.	11701 I-30, Bldg. 1, Suite 115 Little Rock, AR 72209 501-455-3233	Sterile bottle available at the lab	Chain of custody available at the lab and need to create an account	Standard Methods 9223 B IDEXX Colilert Test Kit with Quanti-Tray/2000	4 hrs, < 6°C Samples not accepted on Friday, Saturday, or Sunday or the day before a holiday	\$25 Preferred payment method by credit card
ARKANSAS TESTING LABS	204 E. Lincoln Ave. Searcy, AR 72143 501-268-6431	Sterile bottle available at the lab	Submission form and additional instructions available at the lab	Hach Method 10029 for Coliforms – Total and <i>E. coli</i> , using m-ColiBlue 24 Broth PourRite Ampules	< 8 hrs on ice	\$36
ARKANSAS WATER RESOURCE CENTER (AWRC) WATER QUALITY LABORATORY (WQL)	1371 W. Altheimer Dr. Room 133 Fayetteville, AR 72704 479-502-9843 awrcwql@uark.edu https://arkansas-water-center.uark.edu/water-quality-lab.php	Sterile bottle available at the lab	Submission form available here	Standard Methods 9223 B IDEXX Colilert Test Kit with Quanti-Tray/2000	< 24 hrs on ice Monday-Thursday excluding holidays	\$23
CHEM LAB	4302 Wheeler Avenue Fort Smith, AR 72901 479-646-1585	Sterile bottle available at the lab	Chain of custody available at the lab	Hach Method 10029 for Coliforms – Total and <i>E. coli</i> , using m-ColiBlue 24 Broth PourRite Ampules	< 6 hrs on ice at 4°C	\$45 per sample + \$35 processing fee

⁽⁷⁾Information retrieved in October 2020. Please contact water laboratories to make sure the information is still up-to-date.

⁽⁸⁾If you treat your water, inform the water testing laboratory before to collect your samples. They might have slightly different procedures or give you another type of sterile bottle.

(Cont.) Appendix Table 1: List of Water Laboratories Available for Arkansas Produce Growers and Water Sampling Protocols⁽⁷⁾

Water Lab ⁽⁷⁾	Contact Information	Sterile Bottle availability ⁽⁸⁾	Submission Form and Account	Method requested	Holding Time and Delivery Day	Cost per sample
DATA TESTING, INC	3434 Country Club Ave. Fort Smith, AR 72903 479-649-8378	Sterile bottle available at the lab	Chain of custody available at the lab	Hach Method 10029 for Coliforms – Total and <i>E. coli</i> , using m-ColiBlue 24 Broth PourRite Ampules	< 8 hrs on ice	\$20
GREEN COUNTRY TESTING	6825 East 38th Tulsa, OK 74147 800-324-5757 www.greencountrytesting.com	Sterile bottle available for pick up Monday to Friday 8 am to 5 pm or shipped to you. Use one 100mL bottle if requesting the membrane filter method or two 100mL bottles if requesting the IDEXX-method.	Register on the website and fill out the chain of custody form. You can set up an account when you come in or when you ship your sample.	Hach Method 10029 for Coliforms – Total and <i>E. coli</i> , using m-ColiBlue 24 Broth PourRite Ampules and the Standard Methods 9223 B IDEXX Colilert Test Kit with Quanti-Tray/2000. Notify the lab in advance if you want the IDEXX method so they can have all the supplies needed for this method	< 8 hrs on ice	\$50
WAYPOINT ANALYTICAL	2790 Whitten Rd Memphis, TN 38133 Toll Free: 800-264-4522 901-213-2400 supporttn@waypointanalytical.com https://www.waypointanalytical.com/	Sterile 125 or 150mL plastic bottles available at the lab after creating an account.	Chain of custody available here	Standard Methods 9223 B IDEXX Colilert Test Kit with Quanti-Tray/2000. Clearly indicate that you need quantitative results	< 8 hrs on ice	\$50

⁽⁷⁾Information retrieved in October 2020. Please contact water laboratories to make sure the information is still up-to-date.

⁽⁸⁾If you treat your water, inform the water testing laboratory before to collect your samples. They might have slightly different procedures or give you another type of sterile bottle.

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