

Testing Well Water

This fact sheet is part of a series about food safety on the farm for fruit and vegetable growers. Developed by the University of Minnesota On-Farm GAPs Food Safety Team, Annalisa Hultberg and Michele Schermann. Reviewed by Dr. Cindy Tong.

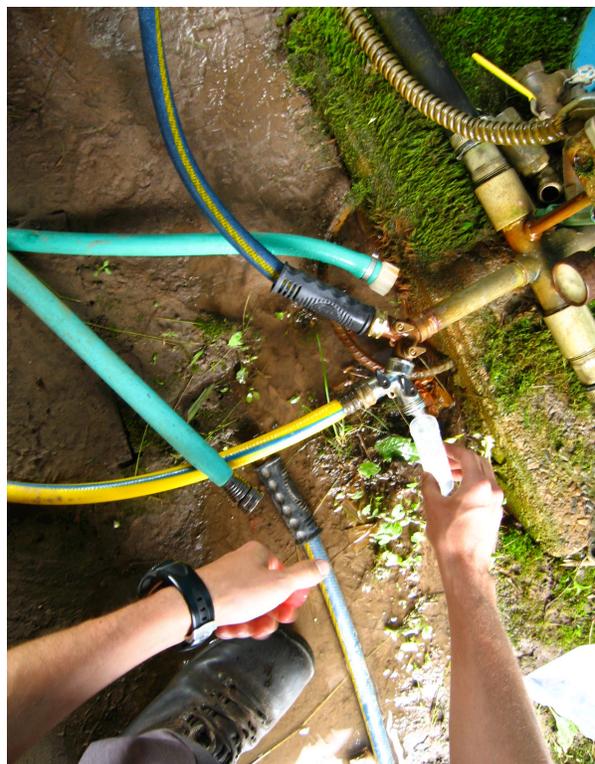
Testing your farm's water for the presence of pathogenic bacteria, nitrate and nitrite is an important part of your farm's Food Safety Plan. Water tests also help you determine a baseline so you know if something has changed in your water.

Salmonella and *E. coli* are examples of harmful pathogens that can be present in water and cause foodborne illness, making people sick. Water used for handwashing, produce washing and rinsing, frost protection, irrigation, drinking and other uses on the farm should be tested. The frequency of water testing is determined by the source of the water.

Well water should be tested at least one time per year by a certified laboratory at the beginning of the season. (For a list of certified labs, go to the MDA web address shown on the reverse side.)

Municipal water does not need to be tested, but a water bill proving that water comes from a municipal source will be needed if your farm is seeking a GAP audit inspection

Surface water should be tested at least three times per season. It should be tested at the start of the season, during peak use,



Let the water run for 3 minutes before taking a sample to ensure you are testing the water from the well.

and prior to harvest. Regardless of testing, surface water should be used only with great caution, and applied only with drip irrigation.

There are three things that you will need your water tested for: **total coliform bacteria, nitrites and nitrates.**

For more information on
Water Testing on the Farm

- Bacterial Safety of Well Water, Minnesota Department of Health
- Nitrate in Well Water, Minnesota Department of Health
- Water Quality Testing, University of Vermont Cooperative Extension
- Water Testing for Growers, North Carolina State University Cooperative Extension
- Code of Federal Regulations: Coliform Sampling, Environmental Protection Agency

Testing Well Water

How to Collect Water for Testing

- Water should be collected as close to the source as possible (from the pump or hydrant).
- Call ahead to the lab you will use for the testing. The lab will send you collection bottles or whirly bags (separate ones for coliform bacteria and nitrates/nitrites).
- Follow the directions included with the sample containers.
- Keep the sample cool and return it within 30 hours of taking the sample.
- Labs can be private or county-operated. A complete list of certified laboratories is available from the Minnesota Department of Health <http://www.health.state.mn.us/divs/eh/wells/>

How to Interpret the Results

Coliform bacteria are everywhere. Water is tested for total generic *E. coli* as an “indicator bacteria” group. Presence of coliforms in well or municipal water typically indicates that the well or distribution system is compromised in some way, and that surface contamination is present in the water.

There may be pathogens in the water that can make people sick and it could be a

contamination risk when used to irrigate or wash produce. You want your report to show no total coliforms, which are often reported as “less than one.”

Water containing total coliforms should not be used for drinking, or washing and rinsing produce.

Depending on the levels, source and how the water is used, corrective action may be needed, including a disinfection procedure for the well. Retest the water after treatment to ensure that water returns to safe levels.

Nitrites and nitrates are dangerous for infants and pregnant women. The state Health Risk Limit for nitrate is 10 mg/L (10 ppm) of nitrate-nitrogen.

The lab results are often combined and will say Nitrite+Nitrate. You are looking for results less than 10.

Water with greater levels of nitrites and nitrates should not be used for drinking, but can be used for washing and rinsing produce. Repairing your well or constructing a new, deeper well often results in a significant reduction in the nitrate level.



Photo: M. Schermann. Support for this project was provided by the Minnesota Department of Agriculture and the United States Department of Agriculture (USDA) Specialty Crop Block Grant Program through a grant to the Minnesota Fruit and Vegetable Growers Association. These institutions are equal opportunity providers. (2012)

Cleaning and Sanitizing Tools and Harvest Containers

This fact sheet is part of a series about food safety on the farm for fruit and vegetable growers. Developed for the Minnesota Fruit and Vegetable Growers Association by Annalisa Hultberg and Michele Schermann. Reviewed by Dr. Cindy Tong.

Using clean containers and tools can help decrease postharvest losses on sensitive products like summer squash, tomatoes and berries, as well as reduce the chance of spreading foodborne illness-causing pathogens.

All reusable harvest containers and tools should be kept as clean as possible and regularly disinfected. At least weekly, or as often as needed, reusable produce bins, buckets, totes and other containers, should be cleaned of excess soil, vegetable matter and other debris. Tools should be cleaned daily or as needed to keep them clean.

Sanitize tools and totes several times throughout the growing season, and at the end and beginning of each season. A sanitizing solution, such as a weak (50 - 150 ppm) bleach solution, should be applied to harvest tools and containers after cleaning and as needed to kill pathogens.

Cleaning Procedure

Clean harvest containers, tools and food contact surfaces before sanitizing. Sanitizers are more effective if the surfaces are clean and free of soil and other debris.

- Rinse surface or container to remove soil and debris.



Wash harvest totes and tools as often as needed to keep them free of excess debris and soil.

- Wash surface of container with soap and water. For harvest containers, use a high-pressure sprayer hose.
- Rinse with clean water.

Any soap can be used for the wash step as long as it is safe for food. You still need to do the final sanitizing step even if you use an antibacterial soap in the cleaning step.

**For more information on
Cleaning and Sanitizing**

- Cleaning and Sanitizing Guide, Iowa State University Extension.
- Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables, FDA.
- GAP: A Self-Audit for Growers and Handlers, UC Davis

Cleaning and Sanitizing Tools and Harvest Containers

Sanitizing harvest containers, tools and food contact surfaces

- Apply a fine mist of sanitizer solution to surfaces using a sprayer. (See below for sanitizing products)
- Let containers, tools and surfaces air dry. Do not dry with towels.

Sanitizing Products

Sanitizing can be done with a number of products. Many companies, such as EcoLab, have hydrogen peroxide-based products that are formulated specifically for sanitizing hard surfaces.

Bleach solution (50 ppm is about 1.5 tablespoons of household chlorine bleach per five gallons of water) is an inexpensive and commonly used sanitizing solution.

Vinegar is not an acceptable sanitizer, as it does not adequately sanitize surfaces.

If you are certified organic, there are many allowable solutions to use, but make sure you check with your certifying agency first.

Whatever sanitizer you use, you will need to monitor the concentration to make sure that it is the correct strength. In the case of chlorine bleach, use test strips¹ to make sure the solution is at the needed strength.

Other sanitizers will have different recommended concentrations. Follow all label directions carefully, and wear protective gear (e.g. gloves, goggles) when pouring all sanitizers; they are dangerous when undiluted.

Many companies have formulations that are specific to hard surfaces.

Sanitizers for Use on Hard Surfaces²

Chlorine bleach (*hypochlorite*): Assuming a 5.25% hypochlorite in household bleach, use 1 cup per 50 gallon or 1.5 tablespoon per 5 gallon and check with chlorine tester strips for ~50ppm.

EcoLab: numerous hard surface formulations: <http://www.ecolab.com>

Sanidate 5.0: <http://www.johnnyseeds.com/p-8467-sanidate-5-0-liquid-sanitizer-og-2-12-gal-.aspx>

StorOx 2.0 hydrogen peroxide- based sanitizer (Biosafe Systems): <http://www.biosafesystems.com/Product-Ag-StorOx.asp>

¹Test strips for chlorine are available at restaurant supply stores, and online. Test strips for other products are available from the product supplier.

²These are commonly used sanitizers. This list is for information and should not be viewed as an endorsement of a product by the University of Minnesota, the Minnesota Fruit and Vegetable Growers Association, Minnesota Department of Agriculture, or the USDA.



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Wash Water Sanitizers

This fact sheet is part of a series about food safety on the farm for fruit and vegetable growers. Developed for the Minnesota Fruit and Vegetable Growers Association by Annalisa Hultberg and Michele Schermann. Reviewed by Dr. Cindy Tong.

Washing fresh produce with potable water treated with a sanitizing agent reduces illness-causing pathogens, such as *E. coli*, *Cyclospora*, and *Salmonella*. Use sanitizer in your wash water on leafy greens (e.g. lettuce, spinach), peppers, green beans, green onions, melons, cucumbers, and zucchini. Do not wash berries (e.g. strawberries, blueberries, blackberries, raspberries) or tomatoes.

Keep chlorine and other sanitizers away from children and pets and in tightly closed and labeled containers away from heat and direct sunlight. Read and follow label instructions; sanitizing chemicals can be toxic at full strength.

How to use sanitizer in your wash water.

Step 1. Remove excess soil and organic matter before washing.

Lightly brush produce with thick skins or rinds (e.g. melons, potatoes, carrots) or prewash in plain water (e.g. leafy greens).

Organic matter reacts with the sanitizer solution to lower its effective concentration. The more organic matter in a water/sanitizer solution, the less effective the sanitizer is.

Step 2. Measure and mix solution for rinsing.

If you are using household chlorine bleach, measure 1.5 Tablespoons of bleach per 5 gallons, or 1 cup for each 50 gallon.

If you are using any other sanitizer, follow directions on packaging.

Water used for washing must be clean and potable (drinkable).

Water should be a medium temperature; if it is too cold the sanitizer will not be effective, if it is too warm it may encourage the growth of some pathogens and disease. If the water temperature is more than 10 degrees C cooler than

the interior of the produce, water and any pathogens in the water can be sucked inside and no amount of sanitizing will kill the interior pathogens.

If using household chlorine, use only plain, unscented household bleach without added thickeners or fragrances.

Step 3. Rinse products in solution.

Be very gentle with leafy greens and other items. Let the water remove the dirt, not your hands. Do not immerse tomatoes.



For more information on Wash Water Sanitizers

- Postharvest Chlorination, UC Davis, Publication 8003
- Disinfection of Produce Wash Water, Michigan State Univ, AES 652
- Guidance for Industry: Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables, FDA.

Wash Water Sanitizers

Tomatoes should be wiped with a clean cloth that has been dipped in sanitizer solution, or wiped with single-use paper towels.

Step 4. Rinse product in fresh potable water.

Step 5. Change water frequently.

Used wash water can be poured onto non-edible crops, grasses or shrubs if you don't have a drain. Make sure to change water when it becomes dirty and when a new crop is added. After dumping old water, refill container with clean water, re-measure the sanitizer and test for concentration.

Step 6. Monitor pH and sanitizer levels.

To maintain levels that are appropriate for your sanitizer, use test strips or another method to verify the concentration after each addition of sanitizer. Chlorine based sanitizer should be kept at 50-100 ppm.

Other sanitizers will vary - follow the instructions on the package. pH level should be maintained between 6.0 and 7.0 to provide for greatest effectiveness. You can buy chlorine test strips at restaurant supply stores. Test strips for other products are generally available where those products are sold.

Step 7. Always document the sanitizer levels on a logsheet.

Keep a logsheet with the date, time, and concentration levels near your washing station. You should check the sanitizer level in the water after each addition of sanitizer and document the level on the logsheet.

DO NOT add sanitizer at random times or in unmeasured amounts. This is not effective and the levels will vary greatly.

Sanitizers for produce wash water*

Chlorine bleach (*hypochlorite*). Assuming 5.25% hypochlorite in household bleach, for concentration of 50-100 ppm, use 1-2 cups per 50 gallons of water and test with chlorine test strips to check.

Pro-San citric acid-based sanitizer.

www.millertechintl.com/prosan.htm

SANOVA acidified sodium chlorite-based sanitizer.

Available from Ecolab. Call Ecolab Inc., 651-293-2233.

Tsunami 100 paracetic acid-based sanitizer.

Available from Ecolab. Call Ecolab Inc., 651-293-2233.

StorOx hydrogen peroxide-based sanitizer

(Biosafe Systems) www.biosafesystems.com

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Handwashing

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You may not think of it often, but your health and hygiene practices and actions directly affect the safety of produce because you handle the fresh fruits and vegetables that the public consumes.

Handwashing is one of the most important steps you can take to reduce the risk of contaminating your fruits and vegetables with foodborne illness-causing pathogens. Proper handwashing is an often overlooked aspect of worker hygiene. You may think that you and your workers know how and when to wash their hands, but often more training and encouragement is needed. Make handwashing an important part of every day, and lead by example!

Importance of handwashing

Thorough handwashing before handling produce and after using the toilet is very important. Many of the diseases that are transmissible through food may be harbored in an employee's intestinal tract and shed in feces. Contaminated hands can then transmit pathogens onto produce.

Alcohol-based hand sanitizers should only be used in addition to proper handwashing, not in place of it.

Handwashing with soap and water is **REQUIRED** before harvesting produce; after breaks, eating or smoking; touching



Always wash hands before handling produce. Hand sanitizer may be used after handwashing with soap and water.

the face; coughing or sneezing; using the toilet; and any time hands are dirty or have touched dirty objects or surfaces.

**For more information on
Handwashing**

- Wash Your Hands, CDC Features
- How to Build a Handwashing Station for Under \$20, UMN, safety.cfans.umn.edu
- Handwashing, Minnesota Food Code Fact Sheet, MDA

Handwashing

Proper handwashing technique:

1. Wet hands with water (it does not have to be hot).
2. Apply soap and scrub for 20 seconds. Clean under your fingernails and between your fingers. Make sure to wash your thumbs, wrists, and tops of hands.
3. Rinse your hands, letting water drip down, not up and over your hands.
4. Dry hands with a clean, unused paper towel or a cloth towel. Do not reuse hand towels.
5. Throw towels in properly covered receptacle.

Handwashing areas on the farm

Handwashing stations should be near all portable toilet units and in your packing or storage shed. Have a handwashing station near work areas and convenient for everyone handling produce to use. If your farm is large, you might consider mounting a handwashing station on a trailer so it can be moved around your farm as the workers move between areas.

OSHA requires you to have at least one handwashing station for every 20 employees. Even if you only have 2 employees, you should have handwashing stations where they are needed.

Handwashing stations should be equipped with the following items:

- A clean enclosed container to hold potable water (water that is suitable for drinking). The container should have a spigot that can be turned on and off, not a push button-type spigot.
- Single-use paper or cloth towels.
- Liquid or bar hand soap (does not have to be antibacterial).
- Covered trash receptacle.
- A gray-water container to catch the water used to wash hands.

Make your own handwashing station

Place a large, closed, plastic container with a continuous flow valve (available at home improvement stores, camping stores, and some hardware stores) filled with potable water on a shelf, stand, pick-up bed or other surface at a comfortable handwashing height. Use another large container or bucket to catch the wash water. Place hand soap on the stand and single-use towels in a drawer or other covered container next to the stand. Complete instructions can be found at: <http://safety.cfans.umn.edu/>

Portable handwashing stations are also available for rent from many companies that rent portable toilets.



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Toilets on the Farm

This fact sheet is part of a series about food safety on the farm for fruit and vegetable growers. Developed for the Minnesota Fruit and Vegetable Growers Association by Annalisa Hultberg and Michele Schermann. Reviewed by Dr. Cindy Tong.

Clean and accessible toilet facilities must be available on the farm site for all workers and visitors to use. Proper field sanitation helps reduce the potential for contaminating produce and helps protect workers and consumers from foodborne diseases. Teach all workers the importance of using toilet facilities and how doing so can reduce the potential for contaminating fields, produce, other workers, and water supplies.

Location and Number of Toilets

Toilet facilities should be within 1/4 mile of all workers, including those working in the fields. If there are no portable toilet facilities near the growing fields, workers should have access to transportation to travel to the toilets. Driving to a gas station or other non-farm location to use a public restroom is not acceptable because cleanliness of those facilities is often variable.

Field toilets should be located away from the growing fields and packing and storage areas. There must be at least one toilet facility and one hand-washing facility for every 20 workers.*



Always put a handwashing station next to the toilets.

Toilets should be accessible

Location, location, location. The easier it is to use the toilets, the greater the likelihood that they will be used. Workers should always have the opportunity to use

For more information on
Toilet Facilities on the Farm

- Guide to Minimize Microbial Food Safety Hazards for Fresh Fruits and Vegetables, FDA
- How to Build a Portable Handwashing Station for Under \$20, Univ of MN, Ag Health & Safety

Toilets on the Farm

the toilets when they need to, not only when they are on break. Having a toilet nearby reduces the likelihood of workers using inappropriate locations, such as the produce growing fields and surrounding areas.

Toilets should be properly sited

Toilet facilities in the field should be placed in areas where they will not cause contamination to produce growing and handling areas from runoff in case of heavy rains or being accidentally knocked over. They should not be placed near irrigation or wash water source areas. Runoff from improperly constructed or located toilets can contaminate soil, water sources, produce, animals, and workers.

Toilets should be clean and well-supplied

Make sure that toilets are well-stocked with toilet paper and clean. Schedule regular cleaning times and adjust cleaning frequency as needed.



Handwashing units must be adjacent

Workers should NOT have to enter or exit a building to wash their hands after using an outdoor toilet facility.

Handwashing stations should have potable water, a catch basin for used water, soap, enough hand towels for single use (paper or washable cloth) and a container for used hand towels.

Rental companies

Portable toilets can be rented for only a few hundred dollars per season. You can rent handwashing units too, and for an extra fee the company will clean and re-stock the toilet facilities and handwashing station on a regular schedule.

If you don't want to rent a handwashing station, you can build your own. See the Handwashing Fact Sheet in this series.

**Growers should operate farms in accordance with the laws and regulations that describe field and facility sanitation practices. The field sanitation laws prescribed under the Occupational Safety and Health Act 29 CFR 1928.110, subpart I, describe the appropriate number of toilets to the number of workers, proper handwashing facilities, maximum worker-to-restroom distance, and how often such facilities should be cleaned.*



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