

# H<sub>2</sub>O ops

COLIFORM PRESENT! NOW WHAT?

FALL 2018

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## COLIFORM BACTERIA

The water flowing out of the tap may look, taste, and smell great, but is it safe to drink? We can only be sure if water system operators monitor for disease-causing microbes and disinfect the system as needed. However, testing for all possible pathogens is complex, time consuming, and expensive. So we require every public drinking water system in Washington to test periodically for coliform bacteria.

Coliform bacteria make up a group of microscopic organisms found in soil, vegetation, and the intestines of animals. Most coliforms are harmless; but some strains of fecal coliform may cause illness or even death. Coliform monitoring is easy, inexpensive, and provides a safety margin by indicating sanitary conditions of water supplies.

Coliform bacteria in water systems are generally either the result of failure to maintain a "closed" system or a treatment failure. Coliform bacteria also enter drinking water distribution systems through backflow from a contaminated source. This may include the end of a hose in a sink top, bucket of water, or puddle. Reduced pressure, or suction, in long water lines can draw bacteria-laden water or soil into pipes through leaking joints.

Coliform-present raises the risk of customers contracting waterborne illnesses. If sampling confirms coliform bacteria, water systems must assess their system operations and facilities. This assessment is a thorough examination of any facilities and operational practices that could allow contaminants to enter the system.

### Public Notification

If your lab **confirms** total coliform bacteria, your water system must conduct an assessment to find out how the contamination got into the water. If the assessment identifies contamination causes, the water system can usually correct the problem with repairs, treatment, or improved operation and maintenance practices. Public notices explain what the system is doing to correct the problem, when the system anticipates resolving the problem, and what customers may need to do until then.

*E. coli* confirmed in a water system indicates recent fecal contamination. This poses an immediate health risk to anyone who consumes the water. The water system must issue a "health advisory" within 24 hours to alert all water users of health risks associated with the water supply. The advisory usually recommends using boiled or bottled water for drinking, preparing food, and brushing teeth. It also outlines the steps underway to correct the problem and explains when the system expects to resolve the problem.

Responding to health emergencies is our highest priority. We will inspect the system as soon as possible to help resolve problems. We ask the operator to collect more water samples to find and eliminate potential contamination sources. We also may ask an operator at an unchlorinated system to chlorinate and flush to remove microbes. The health advisory remains in effect until the situation is resolved and the water is safe to drink. 💧

## THREE GROUPS OF COLIFORM BACTERIA

**Total coliforms:** Found in the soil, water influenced by surface water, and human or animal waste. They are usually harmless. However, detecting total coliform bacteria in a water sample could indicate the presence of disease-causing pathogens. It indicates a sanitary issue with the water system that requires follow-up.

**Fecal coliforms:** A subgroup of total coliform found in the intestines of warm-blooded animals. Fecal coliforms detected in a water sample, are an accurate indication of animal or human waste.

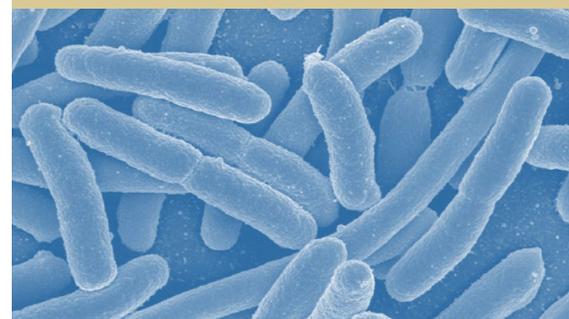
**Escherichia coli (*E. coli*):** A subgroup of fecal coliform. Most *E. coli* bacteria are harmless and exist in the intestines of people and warm-blooded animals. However, some strains can cause illness. The presence of *E. coli* in a drinking water sample usually indicates recent fecal contamination.

Call your regional office for more information on coliform bacteria.

Eastern 509-329-2100

Northwest 253-395-6750

Southwest 360-236-3030 💧



*E. coli* bacteria.

# COLIFORM SAMPLING PROCEDURES

BY CHARESE GAINOR, COLIFORM PROGRAM MANAGER, SOUTHWEST REGIONAL OFFICE

A nice cold glass of water is one of the most refreshing things on a hot summer day. But, how do you ensure the water you serve is safe? You test the water! But it may be more complicated than you think. Does your coliform monitoring plan (CMP) answer all the questions below?

- ◆ Where do you collect the sample?
- ◆ Where do you submit the sample for testing?
- ◆ When do you collect the sample?
- ◆ When do you need to submit the sample to the lab?
- ◆ Who collects the sample?
- ◆ Who tests the sample?
- ◆ What do you use to collect the sample?
- ◆ How do you collect the sample?
- ◆ Why do you collect bacteria samples?

## Let's dive deeper into the sampling aspect of your CMP.

Imagine you plan to take a vacation with no cell phones, no Wi-Fi, or other electronics, for several weeks. You've delegated your coliform sampling tasks to someone and provided a copy of your CMP, including your sampling procedures. This will be their FIRST time collecting a sample. They might ask—

**Where do I collect the sample?** You might think, "Oh, that's easy," because it's in the CMP. Most CMPs have the address of the sampling locations used for routine and repeat samples, such as 1011 Main St. However, what tap at that location

did you choose as a good sampling tap? Is it representative of the system? Your delegate might want to choose the easy hose filling a pool or watering the lawn, or a hose bib with a "Y" attachment.

Your CMP should explicitly identify the location and tap as adequate sampling locations. Avoid frost-free hose bibs and ensure hoses or other attachments are removed from the tap.

**How do I collect the sample?** As the regular sampler, you might feel like you could do this task with your eyes closed. But do you remember the first sample you ever collected? Has your process changed over time?

Your sample collection procedure (standard operating procedure or SOP) should include the following.

- ◆ Use cold water only.
- ◆ Amount of time to flush the tap before sampling.
- ◆ Disinfectant used (bleach solution spray, mist, or steam), if any, and how.
- ◆ Procedure to measure free chlorine, if necessary.
- ◆ Water flow rate when collecting the sample vs. flushing the tap.
- ◆ Best practices for holding the bottle and lid without contaminating either.

## When do I collect the sample? When do I submit to the lab?

You delegated your duties and let the sampler know a sample is required before

the end of the month. Here's a few things that could go wrong:

- ◆ Your designee, not wanting to forget, collects the sample on Thursday. However, they don't know your normal lab doesn't accept samples on Thursdays or Fridays.
- ◆ Your designee, wanting to ensure the sample is collected before Monday morning, collects the sample Saturday evening to turn in Monday morning. The sample would be expired by then and rejected by the lab.

Clear and detailed CMPs and SOPs lead to a frustration-free process and prevent the extra time and effort both these situations would require.

If you have any questions about sampling procedures, contact your regional office coliform program manager.

### Eastern Region

Joseph Perkins 509-329-2100

### Northwest Region

Ingrid Salmon or Carol Stuckey  
253-395-6750.

### Southwest Region

Charese Gainor 360-236-3030

## Resources

[\*The Coliform Distribution System Sampling Procedure \(331-225\)\*](#) brochure contains an 8-step coliform sampling guide. Available at [doh.wa.gov/ODWpubs](http://doh.wa.gov/ODWpubs).

# 2019 WATERWORKS CERTIFICATION ONLINE RENEWAL SYSTEM OPENS IN NOVEMBER

Washington Certification Services (WCS) administers renewals of waterworks operator certificates for DOH. You no longer need a notice to renew; however, eligible operators will still receive several email reminders. Visit WCS at [wacertservices.org](http://wacertservices.org) to update your contact information, check professional growth reports, and renew certification.

The online certification renewal system won't allow operators to renew if they haven't met professional growth requirements. **All waterworks operators certified before January 1, 2016, must meet professional growth requirements**

**by December 31, 2018, to be eligible for 2019 certification renewal.** Do not wait until the deadline to check professional growth reports and schedule needed training.

Most waterworks operators meet requirements by earning at least 3.0 continuing education units or college credits for completing relevant training. All training applied toward this requirement must meet state evaluation criteria. You must complete it during your professional growth reporting period. You can also meet requirements by passing a certification exam for cross-connection

control specialist, water distribution manager, or water treatment plant operator if you are eligible and not already certified at that level.

**Check your professional growth transcript, confirm your completion status, verify contact information, and renew certification at [wacertservices.org](http://wacertservices.org).** Use the quick link to *View Professional Growth Report*, and follow the instructions to create your username and password. If your contact information or employer information has changed, use the *Waterworks Contact Information Change Form* to submit changes. ◆

# THE BIG REVEAL: WHAT HAPPENS TO YOUR WATER SAMPLE AT THE LAB?

BY NINA HELPLING, WATER QUALITY SPECIALIST, LABORATORY LIAISON

You may be familiar with labs and water sample analyses for analytes like chlorine, pH, and turbidity. But what happens to the water samples you drop off at a certified public laboratory? This article unravels the mystery behind the certified public laboratory.

It all starts with water system personnel. You are the front line of defense in supplying your customers with safe and reliable drinking water. We collaborate with you in this effort by supplying you with helpful compliance tools like your Water Quality Monitoring Schedule (WQMS). Your WQMS provides a schedule of water sampling criteria for each of your water sources, lets you know what type of samples to collect, and sets a timeframe for collecting them.

Coliform is the most common sample a water system will take. "Coliform" is a broad drinking water term used to capture total coliforms, fecal coliforms, and *E. coli*. In most labs, it all starts with a simple 125mL sampling bottle. Who knew such a tiny bottle could play such a large part in

your water system's monitoring compliance?



You follow your WQMS. You collect your prescribed coliform sample using acceptable procedures for the sampling and the location of the sample. Then you deliver it to the lab. Now what? Your lab has many options. They can leave your sample in the bottle you delivered it in and run a presence/absence test, they can run your sample through a filter with microscopic holes in it and grow a culture, or they can grow your sample in various

test tubes. Each test has advantages and disadvantages, but all are acceptable for different monitoring requirements.

The biggest disadvantage for any of these testing methods is time; the time it takes to prepare the analyses and, most importantly, the time it takes to report out validated results. Because coliforms are acute contaminants, time is of the essence. 💧



## WATER SYSTEMS: TAKE THESE EASY STEPS TO MAKE COLIFORM SAMPLING SUCCESSFUL FOR YOU AND YOUR LAB.

- ◆ Give the lab at least 100mL of sample.
- ◆ If there is a liquid or powder inside your sampling bottle, don't rinse it out! It's there to preserve the sample.
- ◆ Follow [How to Complete a Coliform Lab Slip \(DOH 331-247\)](#) when filling out your lab slips.
- ◆ Mark only one box (from box 1-5) for the purpose of the sample.
- ◆ If you mark box 3 or 4, please include a source number.
- ◆ Have clear and concise handwriting.
- ◆ Take your samples early in the compliance period to allow time for incidentals.
- ◆ When in doubt, call your regional coliform program manager or contact your lab before sampling. 💧

### Presence/Absence Method



Total Coliform Positive



Total Coliform Positive, *E. coli* Negative

Total Coliform Positive AND *E. coli*

### Filter Method



Total Coliform

Fecal Coliform

### Test Tube Method



Positive Brilliant Green Test

# EMERGENCY DISINFECTION OF SMALL WATER SYSTEMS

BY STEVE DEEM, ENGINEER/DISTRIBUTION SPECIALIST, NORTHWEST REGIONAL OFFICE

Water system operators may need to provide emergency or increased disinfection as a protective action based on test results or if the system loses pressure. Sodium hypochlorite (chlorine bleach) is the most common chemical used. The hypochlorite should not have any additives and should be "NSF/ANSI Standard 60: Drinking Water Treatment Chemicals—Health Effects" certified. The container should bear a stamp with "NSF 60" on it.

Always notify **all** of your customers before you add or increase disinfection levels in the system. Water with higher chlorine levels can harm people with certain medical needs, harm fish, and affect the water quality delivered to

customers. Some customers have billed water systems for damaged laundry resulting from unanticipated high chlorine levels.

If your water system practices continuous chlorination, you can increase chlorine levels by increasing pump stroke length or stroke speed, or by increasing chlorine-feed solution concentrations. You can carefully control this method of emergency disinfection. Depending on source capacity and size of the system, it may take days to achieve desired disinfection levels throughout the distribution system.

If your water system doesn't continually chlorinate, or if you need to increase disinfection in the distribution system

more rapidly, follow the instructions in the article below.

Always contact our nearest regional office before conducting emergency disinfection.

Like all emergency planning, it is best to prepare for emergency disinfection before an emergency occurs. Be sure your water system can notify customers in a timely manner and that you know volumes and sizes of your water system components.

## Resources

[\*Emergency Disinfection of Small Water Systems \(DOH 331-242\)\*](#) contains information for systems without storage and has tables to help systems determine how much chlorine bleach to add. ♦

## DISINFECTION STEPS: WATER SYSTEM WITH A STORAGE TANK

First, decide what your target free-chlorine dose must be. Generally, a residual of 1–2 mg/L free chlorine is sufficient for a coliform incident or precautionary increase in disinfection because of pressure loss in the distribution system. You can determine specific levels for a given event with your DOH regional office staff.

Second, calculate how much chlorine solution you must add to the water in the storage tank to reach your target dose. Chlorine bleach solutions range from 6 percent to 12 percent strength. Six percent is equal to 60,000 mg/L concentration of chlorine. You can use this concentration with the equation below to determine how much chlorine to add.

**Volume of liquid bleach solution needed,  $V_1 = (C_2 \times V_2)/C_1$ , in gallons, where:**

$C_2$  = desired chlorine dose, mg/L.

$V_2$  = water volume to be treated, in gallons.

$C_1$  = concentration of bleach solution, mg/L.

When you know about how much chlorine to add:

- ♦ Draw down the water level in the storage tank, but keep enough for fire flow, if required.
- ♦ As the tank refills, pour the chlorine in so it mixes.

- ♦ Use a blow-off, fire hydrant, or other outside faucet to draw chlorinated water from the tank into the distribution system. Then, flush water from all faucets in the water system until you detect chlorinated water. You probably will smell the chlorine, but to be more accurate, use a chlorine test kit to measure chlorine residual. Record the chlorine residual levels that you measure.
- ♦ Allow the chlorine to remain in the water system at least 6 hours (consult with DOH regional office for specific time based on event). It takes time for chlorine to disinfect effectively.
- ♦ After sufficient time passes, use hydrants, blow-offs, or outside faucets to flush the highly chlorinated water from the distribution system and replace it with normal water from your source or sources. If you changed your chlorine pump or solution strength to increase chlorine levels, remember to return everything to normal operations.
- ♦ Never discharge chlorinated water into any water body, wetland, or drainage ditch because it is extremely toxic to fish. You must dechlorinate the water before discharge. Depending



- on the chlorine levels in the water, you also may depend on normal water usage to replace the chlorinated water more slowly with normal water.
- ♦ Use a chlorine residual test kit to measure chlorine levels throughout the distribution system to confirm that chlorine returned to pre-emergency disinfection levels.
  - ♦ If you collect coliform bacteria samples as one of the final steps of your event, the residual level must be normal throughout the system before collecting samples. In a system not continuously disinfected, the residual must be zero.
  - ♦ Notify customers when normal operations resume. ♦



## BILL'S COLUMN

### PREPARING FOR THE GRAY TSUNAMI

Our mission is to work with others to protect the health of the people of Washington by ensuring safe and reliable drinking water. As operators of water systems across this great state, you are key partners in achieving our mission. Nothing we do can be effective without a strong workforce of well-trained and dedicated certified operators.

One of the challenges we will face together is what some people call "the gray tsunami." In a recent workforce survey of Washington certified operators, 30 percent indicated they would retire in the next 5 years, going up to 50 percent in the next 10 years. This unprecedented retirement rate is scary because we'll need to find 2,000 new operators in the

next 10 years. It also represents a daunting loss of institutional knowledge.

We need to prioritize a more targeted and coordinated approach to:

- ◆ Train our new and existing operators to understand expectations, develop core competencies, and better adapt their skills for new demands and technologies.
- ◆ Help local decision makers understand the value of waterworks operators and ensure water utilities are fully staffed and funded.
- ◆ Develop succession plans so "the next person up" after a retirement is qualified, experienced, and eligible for certification at the required level.

- ◆ Promote greater public visibility to waterworks operators and the needs of our workforce.
- ◆ Connect water system capacity development and asset management projects to daily operations and operators.
- ◆ Attract and retain a skilled and diverse workforce into the water industry.

Thanks for everything you do on a daily basis. I look forward to working with all of you as we tackle future challenges together.

Bill Bernier  
Operator Certification and Training  
Section Manager

## AWARD HELPS WOMEN GET BAT CERTIFICATION

### THE NEW GLASS HAMMER AWARD!

Are you a woman who wants to become a Backflow Assembly Tester (BAT)? Apply now for the BAT Certification Glass Hammer Award. Created by Washington Certification Services (WCS), the award supports women's involvement in the BAT field.

To be eligible, you must be a woman who:

- ◆ Holds a high school diploma or GED.
- ◆ Is not currently a certified BAT in Washington.
- ◆ Is not currently enrolled in a future BAT certification exam.

This award covers the cost of the practical portion of the BAT Certification Exam. In addition, WCS is partnering with Washington Environmental Training Center for a week-long BAT certification training course to each award recipient.

First review of applications begin January 14, 2019. Two BAT Certification Glass Hammer Awards may be awarded each year.

For more information or to apply, visit [wacertservices.org](http://wacertservices.org), click on **Backflow Assembly Testers**, and then **BAT Financial Awards**. ◆

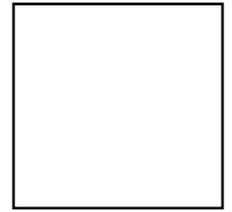


## DRINKING WATER WEEK 2019

Is there a water system you're proud of?  
Do you know an outstanding waterworks operator? Nominate them for an award!

We are accepting nominations now until mid-February 2019. Fill out a [nomination form](#) online. For more information and a link to the form, visit our Drinking Water Week page at [doh.wa.gov/DWWeek](http://doh.wa.gov/DWWeek). ◆





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Olympia, WA 98504-7822

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♻️ Printed on recycled paper.

## HIGH 5: WALLACE RIVER SALMON HATCHERY & THOUSAND TRAILS AND TROUT UNLIMITED

CONGRATULATIONS! TWO SMALL WATER SYSTEMS TACKLE BIG PROBLEMS WITH SOLUTIONS THAT BENEFIT PEOPLE AND FISH.

### **WALLACE RIVER SALMON HATCHERY**

Operators at the Wallace River Salmon Hatchery drinking water system realized their system needed many improvements due to aging infrastructure. Sample results periodically showed bacteria in the drinking water that served the hatchery viewing area and some buildings. A Level 2 assessment identified several sanitary defects, including well integrity issues, waterlogged pressure tanks, persistent low-pressure, and potential cross connections.

In 2017, manager Brad Hostetler agreed a long-term fix made sense. He asked upper level managers for help—and they delivered. The fixes were made; disinfection treatment was designed, approved by DOH, and constructed at the hatchery to serve the drinking water needs of residents, employees, and many fish-focused visitors.

### **THOUSAND TRAILS AND TROUT UNLIMITED**

The Thousand Trails campground near Leavenworth was using treated surface water from Clear Creek to serve its campers. While it was functional, Thousand Trails preferred a simple groundwater system. In addition, a nonprofit group, Trout Unlimited, wanted to preserve and enhance fisheries around Leavenworth and elsewhere.

To meet its goal, Trout Unlimited secured funding from five groups for a new well and water supply system for Thousand Trails. Now that the well is online, Clear Creek flows have increased, which help maintain habitat for fish and other aquatic species during dry summer months. In addition, Thousand Trails now has a more reliable water supply that requires far less maintenance and comes from a more protected source.

Next year, Trout Unlimited and Thousand Trails plan to remove the diversion dam from the old surface water supply system. This dam poses a partial barrier to fish migration, particularly for steelhead listed under the Endangered Species Act. Removing the dam expands access to several miles of quality spawning and rearing habitat. ♦