

Greetings Extremophilers!

We come with news of another world... a world contained within your water heater! Researchers recently made the call for participatory scientists to explore the tiny worlds contained inside our very own homes, in our water heaters. The results? Fascinating organisms!, Wilpiseski et. al recovered over 100 samples from across the world that revealed a complex mix of organisms, including the extremophile *Thermus scotoductus*. This research provided powerful insight into the microbial conditions inside our homes and the potential distribution of microbes across the world!

If you are willing and able to drain your hot water heater and collect samples for The Extremophile Campaign: In Your Home, please contact sarah.newman@colostate.edu. We'll talk you through the process and send you a sampling kit to get started. Once you have received your kit, you're ready to sample.

Instructions

Draining your hot water heater may sound intimidating, but it's actually fairly easy to do. It can be helpful to have two people for the sampling. One person can be available to hold the hose in one bucket, while the other person empties the full buckets of water.

Supplies we will provide: 2 test tubes, gloves, a metal scoop/scrapper, a disposable pipette, a shipping envelope with prepaid return shipping label, double-nested ziploc bags with paper towels to absorb any leaks

Supplies you need to provide: At least two clean 5 gallon buckets for water collection; A clean hose (a clear hose is great for viewing gunk that may come out of the heater, but any hose will do).

To collect a sample for the Two Frontiers project you can follow this procedure:

1. **Read your water heater owner's manual:** If you have access to the manual for your hot water heater, it most likely includes step by step instructions for how to drain it. Most of the instructions should be similar to our instructions below. Our instructions also include how to collect samples to send to The Extremophile Campaign: In Your Home.
2. **Turn off your water heater.** If you have a gas water heater your model will most likely have a dial you can move to the off setting. If you have an electric water heater you will need to shut off the power to your water heater first.

3. **Turn off your cold water supply.** There should be a valve near the top of your water heater that you switch off to prevent the flow of water into your tank while you collect your sample.
4. **Allow the water to cool.** Wait about 5-10 minutes to allow the water in the water heater to cool to at least below 120 F before you begin the draining process or attempt to collect a sample. This will reduce the risk of scalding yourself and is an extremely important step.
5. **Locate and open the valve.** At the bottom of your water heater, there should be a valve to allow for the release of water. Place a large container such as a bucket beneath this valve and attach a clean hose to the valve. The bucket will catch any water that may leak out when you first open the valve.
6. **Set up your buckets.** Place the open end of the hose into one of the buckets. Place the second bucket nearby.
7. **Start draining the water from the heater.** When you open the valve, the water should start flowing into the bucket. When the first bucket is about $\frac{1}{2}$ to $\frac{2}{3}$ full, move your hose over to the second bucket. If there is sediment or flocculent (floaty stuff) in the first bucket, you may wish to take a sample (See Step 9, Collect your Sample). If you don't notice anything, keep draining. *Note: The water heater is draining from the bottom to the top. You may see sediment or flocculent right away, at the end of the draining process, or maybe not at all! Buckets of water that do not appear to have any sediment or flocculent can be dumped out.*
8. **Drain the sediment.** Sediment from your water system may have collected at the bottom of your water heater. Once you open the valve, allow this sediment to drain until the water runs clear or mostly clear. Shut off flow again.
9. **Collect your sample.** When the water is cool enough to touch, dip your test tube into the bucket of water with sediment/flocculent and collect as much sediment/flocculent into the tube as possible. You may wish to use the metal scraper or pipette from your sampling kit to get as much of the sediment as possible into the tube.
10. **Reset your equipment .** After making sure that the valve of your water heater is firmly tightened, you can turn the valve near the top of your water heater to return the cold water supply, and then restart your water heater. Follow the instructions in your water heater owners manual for this step.

Remember, your safety is of the utmost importance, so be sure to consult an owners manual before collecting any samples, and always exercise caution around hot water.

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Centers for Disease Control and Prevention Sampling Procedure and Potential Sampling Sites. (n.d.). <https://www.cdc.gov/investigate-legionella/media/pdfs/cdc-sampling-procedure.pdf>

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Wilpiseski, R. L., Zhang, Z., & House, C. H. (2019). Biogeography of thermophiles and predominance of *Thermus scotoductus* in domestic water heaters. *Extremophiles : Life under Extreme Conditions*, 23(1), 119–132. <https://doi.org/10.1007/s00792-018-1066-z>