Effects of Drainage and Stagnation on Microbial Communities in Biofilm and Bulk Drinking Water

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**Intermittent Water Supply (IWS)**

- **Causes of IWS**
  - Water Scarcity
  - Microbial Regrowth
  - Recontamination and Regrowth during Household Storage
  - Inadequate Infrastructure
- **Risks of IWS**
  - Microbial Regrowth (possibly pathogens!)
  - Recontamination and Regrowth during Household Storage

**Key Features of IWS are**

- Stagnation
- Drainage

Where water ceases to flow and remains in the pipe.

- e.g., Premise plumbing - one may not turn on a specific faucet in a building

Where water ceases to flow and none remains in the pipe.

- e.g., water scarcity - there is simply not enough water to distribute

How do drainage and stagnation affect the microbial communities in biofilm and bulk drinking water?

**Our experiment aimed to answer this question, but first we needed to simulate pipe flow in the lab using small reactors where water ceases to flow and remains in the pipe.**

These reactors were used because sampling real pipes is not accessible.

They're everywhere! This is normal, but too many can be problematic. Water treatment plants add disinfectants (like chlorine) to keep them under control.

Microbial communities in our drinking water distribution systems (DWDS) can be found:

- In the bulk water (free-floating)
- But mostly in biofilms attached to pipe walls

Fed from the tap

We chose an intermittency period of 3 days, but it can vary greatly from city to city. It can range from a few hours up to a week.

**Sample before intermittency begins**

**Sample after intermittency ends**

During this intermittency, one reactor gets drained and stays empty for the weekend, and another sits with stagnant water.

Total chlorine disinfected were measured, and intact cell counts were enumerated (an intact cell strongly suggests viability).

1. This is tap water, which we used to feed our reactors and compare our results from the reactors to

2. The stagnant reactor had a much greater number of intact cells than the tap after stagnation, and little chlorine residuals. Chlorine in the existing tap water was likely consumed and allowed for microbial growth.

3. The drained reactor had higher chlorine residuals because to sample it after drainage, we refilled with tap and operated for a few minutes before sampling. The 100X difference appears to be microbes knocked off from biofilm.

3.

**References:**


