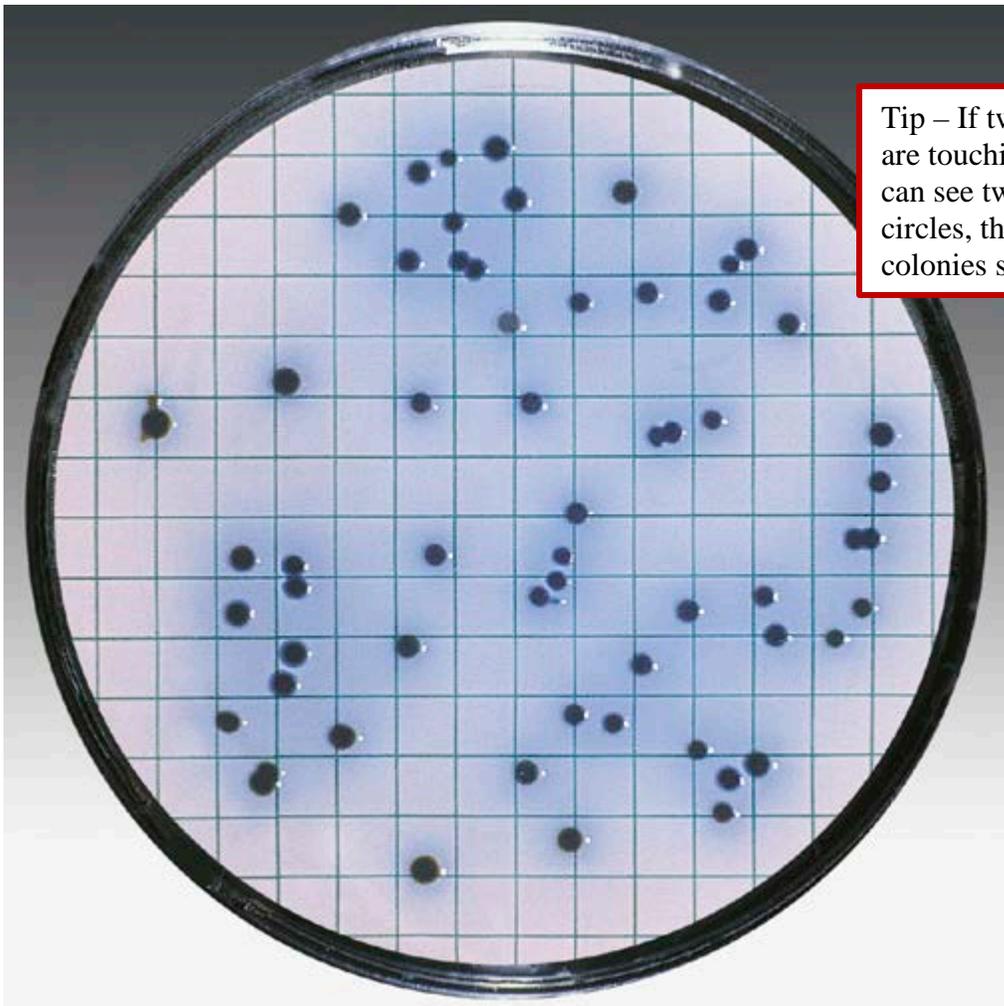


## Public Health-Related Water Microbiology: Is it safe to swim?!

A local beach, where water quality has traditionally been classified as good, has had unusually high concentrations of enterococci (greater than 10,000 colony forming units (cfu) /100 ml) during the last four months. According to a recent sanitary survey (defines possible sources of wastewater pollution), the only possible source of wastewater pollution is an effluent pipe from the Most Fun Amusement Park's wastewater treatment plant. However, this wastewater treatment plant is one of the most sophisticated in Florida and its treated effluent has an average enterococci concentration of less than 1 cfu/100 ml.

The U.S. Environmental Protection Agency's Beaches Environmental Assessment Closure and Health (BEACH) program recommends weekly assessments of recreational waters in order to minimize public health risks related to recreating in polluted surface waters. As a state public health official in charge of implementing the BEACH program, yesterday you collected seawater from this beach. Upon returning to the laboratory, you filtered 0.1 ml of seawater onto a membrane filter and placed the filter on top of mEI agar (a particular type of agar specific to enterococci bacteria). The sample was incubated for 24 h at 41°C. The picture below is of your sample. Each spot is a colony of enterococci bacteria, originally created by one bacterium.



### References:

U.S. Environmental Protection Agency, Method 1600: Enterococci in water by membrane filtration using membrane-enterococcus indoxyl- $\beta$ -D-glucoside agar (mEI), in, Publication No.EPA-821/R-09/016, Office of Water, Washington, DC., 2009.

Florida Healthy Beaches Program [www.floridahealth.gov/environmental-health/beach-water-quality/](http://www.floridahealth.gov/environmental-health/beach-water-quality/)

U.S. Environmental Protection Agency, 2012. Recreational Water Quality Criteria, U.S. EPA

## Data Analysis per U.S. EPA method 1600

1. Count the number of colonies (reported as colony forming units, cfu) present on the membrane (see picture on page 1).

Record here: 58 cfu

2. Calculate X, the number of enterococci per 100 ml following the formula:

$$X \text{ cfu}/100\text{ml} = \frac{\# \text{ Enterococci colonies counted (cfu)}}{\text{Volume of sample filtered (ml)}} \times 100$$

$$58 \text{ cfu}/0.1 \text{ ml} \times 100 = 58,000 \text{ cfu}/100 \text{ ml}$$

3. The Florida Healthy Beaches Program, per U.S. EPA recommendations, identifies enterococci concentrations greater than 130 cfu/100 ml as poor (statistical threshold value). Those beaches classified as poor will be issued an “advisory” and the beach will be closed to swimming until enterococci concentrations decrease to safe levels. In the US, this concentration is called the beach action value. Similar regulations exist in many other countries.

A) Is it safe to swim at the beach? Why or why not?

**NO! There are high concentrations of enterococci in the waters. High numbers of enterococci means the water is likely contaminated with fecal matter and that pathogens are likely present.**

B) If you are uncertain, what could be done to clarify your decision?

**You could analyze another aliquot of sample from the original water collected. You could also take a new sample from the beach and analyze it.**

C) How would your response to A and B change if the local beach had no known point or non-point sources of fecal pollution?

**The waters would still be classified as unsafe for swimming. A sanitary survey of the area would need to be executed in case there are new sources of fecal pollution within the watershed. Additionally, more tests would need to be conducted to find the cause of the high ENT concentrations.**

D) If the Amusement Park’s effluent pipe waters were not the source, could you brainstorm other sources of contamination?

**Agriculture, burst sewer pipe nearby, animal feces, etc. Be creative!**

### References:

U.S. Environmental Protection Agency, Method 1600: Enterococci in water by membrane filtration using membrane-enterococcus indoxyl-β-D-glucoside agar (mEI), in, Publication No.EPA-821/R-09/016, Office of Water, Washington, DC., 2009.

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