Name _____ Date _____

## Microbes All Around Us

**Microbes:** What microbes are in our environment?

What are some microbes that are good for us?

What are some microbes that are bad for us?

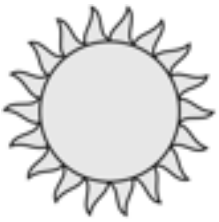
## Clean and Dirty Water

One sixth of the world live without access to clean water
= 1,100,000,000 people

Boiling water will kill microbes but it costs energy. What if you don't have power or wood?

Let's try using solar power

What is in solar radiation?



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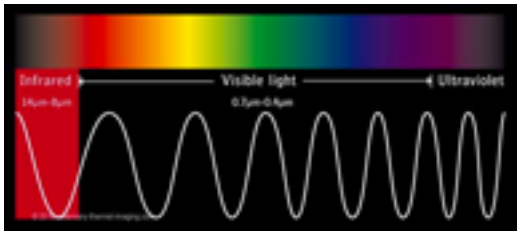


_____ waves can damage DNA

Microbes are sensitive to heat from _____ waves

Most 'bad' microbes normally live in animal's guts so they like a warm (not hot), dark area.

River Water = H2O plus (POSSIBLY)

algae
copepods
amoeba
bacteria

**Saris filtration removes** _____ _____

but what about the rest?

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**SODIS technique =**

**SOlar water DISinfection**

UV + IR = dead cells

can work in 6 hours in full sun,
2 or more days in cloudy weather

**What should we test?**
Variables

A.

B.

C.

D.

**Scientific Method**

Question, Hypothesis, Method, Results, Conclusions

Question: _____

_____

What do you think will happen (hypothesis)?

_____

_____

**Method:**

Write two three observations about your water sample (where is it from? what color is the water? etc.)

Label your bottles/baggies with your name and sample number

Control - saris filtered water from _____ river that will not be in the sun

Variable 1 (V1) =

Variable 2 (V2) =

Fold a piece of fabric twice and attach it to the bottle with a rubber band

Pour water through filter into bottles/baggies

one that will be the control and placed in a box next to the SODIS table (not in the sun)

2 bottles/baggies to test your variable

Place samples on the SODIS table/black tarp/aluminum foil/etc.

Record temperature at the same time each day - IR gun or sticker
air temperature and bottle/baggie temperature

**Temperature Data (IR radiation)**

| | Control | V1 | V2 | air temperature |
|---|---|---|---|---|
| Day 2 | | | | |
| Day 3 | | | | |
| Day 4 | | | | |

Day 5 - collect your samples




**Method for plating for water samples to detect bacteria/E. coli**

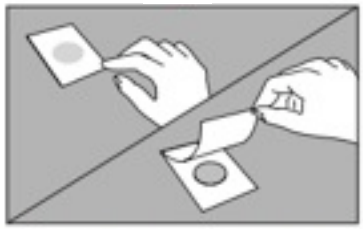
Take three Petrifilm sheets and place them with the shiny side up on the table.
The red/pink disk should be on the bottom
The top sheet contains agar - a jello-like substance with food for the bacteria

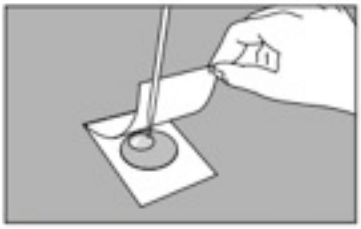
Label the top sheet near the top with your name and the three samples codes.

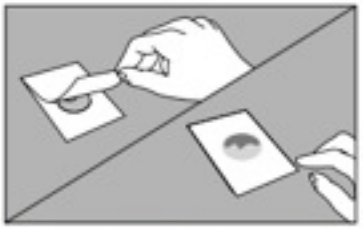
Practice using your pipette to pick up 1.0 ml of water

When ready, lift top film and add 1.0ml of your control in the middle of the red/pink disc
only use your fingers near the bottom of the film (remember - bacteria are everywhere!)

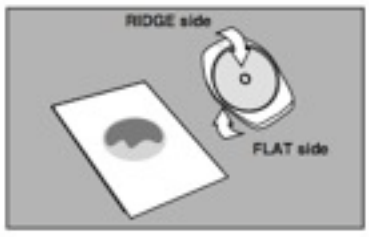
ROLL the film down - this allows the sample to spread on the disc and prevents air bubbles from being trapped


Place Petrifilm plate on **level** surface. Lift top film.

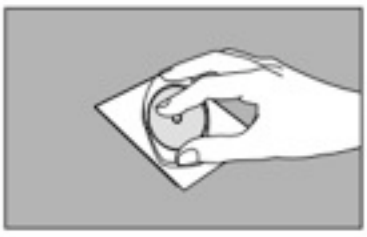

With pipette **perpendicular** to Petrifilm plate, place 1 mL of sample onto center of bottom film.

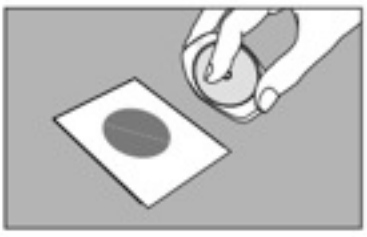

Carefully **ROLL** top film down to avoid entrapping air bubbles. Do **NOT** let top film drop.

Keep the plate flat and place the flat side of the spreader over the center of your disc.
don't push too hard or the agar will be too flat to allow bacteria to grow
DO NOT REUSE THE PIPETTE for the next sample! Take a new pipette for each sample.



With **FLAT** side down, place spreader on top film over inoculum.


**GENTLY** apply pressure on spreader to distribute inoculum over circular area before gel is formed. Do not twist or slide the spreader.


Lift spreader. Wait a minimum of one minute for gel to solidify.

The plates will be stored for 48 hours at room temperature - 25'C

## Results

The agar on these plates has a dye that will turn the bacteria blue

It also contains lactose which will cause the E. coli bacteria to release a gas bubble
- a ‘burp’ from the bad bacteria

What do you observe on the bacterial plates?

Are there any blue dots? Are there any bubbles next to blue dots?

Please count the dots and bubbles.

| | blue dots | bubbles |
|---|---|---|
| control | | |
| V1 | | |
| V2 | | |

Blue dot = a colony of bacteria
Blue dot with a bubble = E. coli

## Conclusions

What did you do?  What did you find?

Was your hypothesis true or false?

If you could test this method again, what would you do differently?

Notes for your class presentation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