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Evaluating the Effectiveness of Different Hand Soaps

I) Problem: Which one of the 5 hand soaps is most cleansing?

The purpose of this activity is to compare the effectiveness of different antibacterial agents in hand soaps in inhibiting the growth of common skin bacteria.

II) Background Information: Bacteria can be found in mouths, shoes, more or less anywhere. Even in the oxygen we breathe. Bacteria can be found in your hair and even in your lungs and in the smallest of all places

Today, most of us accept that handwashing is a critical act of personal hygiene that may protect us from infections by microorganisms. But this has not always been so. Until the mid 1800's, few doctors washed their hands. They believed that diseases were caused by some change in the atmosphere produced by poor sanitation, and no one felt responsible for these atmospheric influences or capable of coping with them.

In 1839, a New England physician, Oliver Wendell Holmes, stated that childbed or (puerperal) fever was spread by doctors from cadavers to healthy expectant mothers. He proposed that physicians change their clothing after autopsies and wash their hands before examining patients. Doctors met this idea with great opposition.

By 1848, Ignaz Semmelweiz, an Austrian Obstetrician, started washing his hands as an antiseptic measure. Semmelweiz noted the same relationship that Holmes had between cadavers and women about to deliver. He believed that doctors were carrying some kind of poison from the autopsy directly to these women. He forced medical students and physicians in his hospital to wash their hands between each patient and after autopsies. Deaths from childbed fever fell dramatically. His ideas also were met with protest. Semmelweiz died without the medical community accepting his ideas, but he made an important contribution to obstetrics and surgery by practicing antisepsis years before Joseph Lister and before Louis Pasteur proposed him germ theory of disease.

Handwashing is a method of controlling microbial levels on the skin. Scrubbing by it mechanically removes many microbes while soap acts on them chemically. Soap is both a wetting and solubilizing agent. A wetting agent breaks the surface tension of water so that it can better wash off particles. A solubilizing agent emulsifies large particles into smaller ones. Soaps are made from fats and an alkali such as lye (sodium hydroxide, or Draino). The skin has a lipid layer within which microbes are enmeshed along with oily secretions, dirt, sweat, and dead skin. Soaps emulsify this lipid layer into tiny droplets. The water and soap together lift the emulsified oil, dirt particles, and resident microbes and all of it vanishes down the drain!

Soaps are a type of antiseptic, a chemical that can be used on living tissue to kill or inhibit microbes. Because of its alkali and sodium contents, soaps are germicidal for some pathogens, specifically, those that cause syphilis, gonorrhea, some meningitides and pneumonias, and the influenza virus. Yet they are too mildly antiseptic to remove most bacteria effectively.

About 50% of all cosmetic soaps now contain antibacterial chemicals. These chemicals retard cross contamination, reduce body odor, and prevent superficial cuts from becoming infected. Some of these

compounds are: metabromsalan, triclocarban, tribromsalan, triclosan, and chloroxylenol.

How much cleanliness is necessary? Certainly we don't want to go back to the medical practices of the early 1800s, but we need not suffer from microphobia either. Healthy people can usually be infected by pathogens (organisms capable of causing diseases), but extremely young or old people and those sick or with depressed immune systems can be infected by non-pathogenic microbes. Extra precautions should routinely be taken around these people in homes, hospitals, and rest homes. Those microbes on television advertisements are the normal flora of our bodies and are unlikely to cause us any problems. However we do need to take precautions because we don't know when we will come into contact with a pathogen such as *Salmonella* or *Shigella*. Sloppy hygiene standards will then exact their penalty!

III) Hypothesis: If soft-soap kills the most bacteria then, it will have less bacteria near it.

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IV) Experiment Plan:

Materials

Nutrient agar plates
Nutrient broth
Paper disks
Applicator sticks
Forceps
Soaps
Water

Procedure

Part 1: Collecting and Culturing Hand Bacteria

1) Select one member of your lab group to be the "collector" and the others to be the "donors." Have the collector was his/her hands. The donors should NOT wash their hands.
2) The collector should swab the donors' hands and under their fingernails with the applicator stick trying to collect as much hand bacteria as possible,
3) Remove the cap from a nutrient broth tube and place the applicator stick into the broth. Seal the top tightly.
4) Wash all hands.
5) Incubate the tubes at room temperature for several days.

Part 2: Testing the Effectiveness of Soaps

1) Locate the tube of nutrient broth. The broth should be cloudy indicating the growth of hand bacteria. Thump the tube to suspend any bacteria that may have settled to the bottom of the tube.
2) Remove the applicator stick and inoculate the agar dish, covering the entire surface of the agar. Be sure that you don't break the surface of the agar.
3) Return the applicator stick to the broth. Turn the dish 1/4 turn and again inoculate the dish so that the second application streaks are perpendicular to the first.
4) Clean a pair of forceps with an alcohol pad.
5) Pick up one colored disk with the forceps and immerse it in one of the soaps being tested. Allow the disk to absorb the liquid. Remove excess liquid by gently tapping the disk against the side of the soap dish. Record the color of the disk that is used with each soap.

6) Remove the lid off of the Petri dish and lay the disk onto the agar surface about 2cm from the edge of the dish. Replace the lid on the dish as soon as each disk is added,

7) Repeat steps 4-6 with the other soaps and the dish of sterile water.

8) Incubate the dishes for several days.

9) Measure the zone of inhibition in millimeters for each disk to determine the effectiveness of the different soaps.

Experimental Components

Manipulated (Independent) Variable: Handsoaps
Responding (Dependent) Variable: The zone of inhibition.
Controlled (Constants) Variables: *Same bacteria, The size of the dots, The amount of soap on each of the dots, And Same temperature.*
Control: Dot with only water.

V) Data Collection:

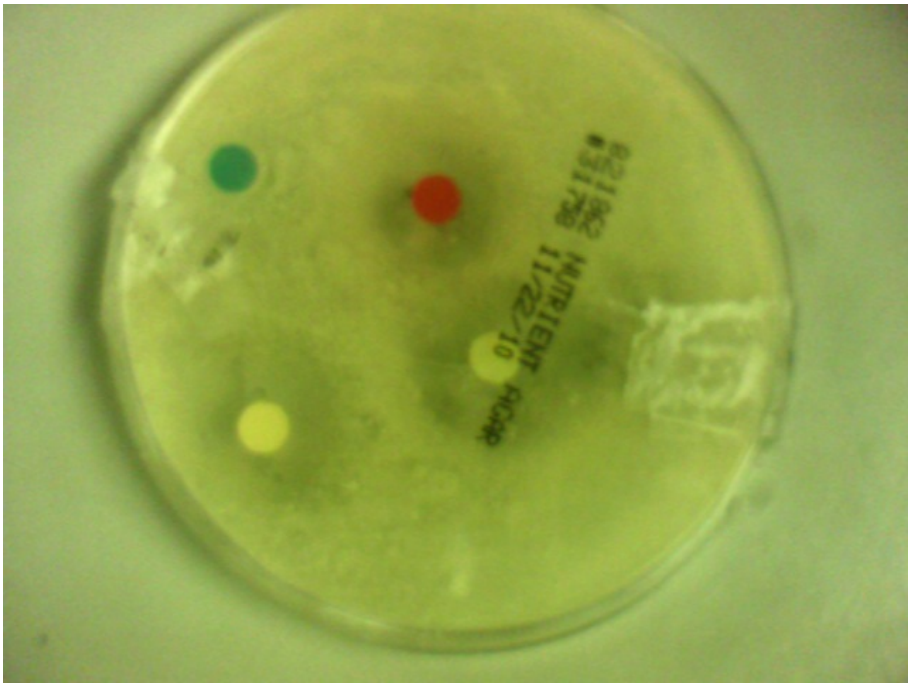
(Data should be recorded in both a qualitative and quantitative format. Qualitative data would be recorded as general observations. Quantitative data involves the recording of numbers, usually through measurements of some type.)

Observations:
It is moldy foggy and smells weird yellow and orange

Data Table:

Type of soap	Color of disk	Zone of inhibition (mm)	Antibacterial agents
Hand sanitizer	**Blue**	**0mm**	
Soft-soap	**Yellow**	**30mm**	
Ajax	**Red**	**8mm**	
Method	**Orange**	**25mm**	
Water (control)	**white**		**None**

Photographs:
Insert digital photos here



VI) Conclusion

In the data that we found it turns out the most original hands soap called hand soap worked the best out of dish soap, hand sanitizer, and another type of soap.

My hypothesis was correct because I guessed that the original hand soap would be the most bacteria free area and it was.

In the experiment we tested which hand soap worked that best by swabbing our hands and put the bacteria on a plate and cover a small area with hand soap and saw whether the area covered in the hand soap had bacteria in it and if it didn't the soap works.

Some of the problems with the lab procedure might have been what the people touched before the experiment. Or how much bacteria was already on the plate before the experiment.

If I were to redo this experiment I would wash the plates the second before I put the bacteria on the plate and also I would put the same amount of soap in each place by measuring.

Overall that was how my group preformed the hand soap lab.