Effectiveness of Common Household Antimicrobial Cleaning Agents

Theory:

There are many choices available in the lab and at home when it comes to cleaning surfaces of all kinds. This lab will give you the chance to test two cleaners versus one of the normal flora sources you cultured in the last lab. Not every antimicrobial solution has the same mechanism of action and their effective use might be dependent on other factors such as concentration.

The type of organism being targeted by a cleaning agent usually does not impact its overall effectiveness nearly as much as the concentration does. It is likely that there will be no significant difference between effectively concentrated cleaning solutions (such as those used in the last lab), but rather the difference will be seen in how concentrated each solution was and the total number of bacteria to be targeted. This brings up some a need to introduce two basic definitions:

Bacteriostatic: growth of microorganism is still possible but at a much lower rate. Some microbes live.
Bactericidal: growth of microorganisms does NOT occur. Microbes are killed.

It is very possible for a drug, chemical or cleaning solution to be bacteriostatic at lower concentrations, and once it reaches a certain concentration strength — that same drug, chemical or cleaning solution becomes bactericidal. The same is true for the concentration needed to achieve bacteriostatic conditions — which means at really low concentration, a drug, chemical or cleaning solution might have no effect on microbial growth at all.

At the next lab you will look at your tubes and if they are **cloudy**, then growth occurred (or was slowed) and the solution is either **Bacteriostatic** or **not effective**. It will technically not be possible to quantify this based on the amount of cloudiness based on the way the lab was performed. If the tube's solution is **clear**, then there was no growth and the cleaning agent was **bactericidal at the concentration used and the time exposed to the agent**. A tube of sterile media is provided as a comparison as the color of the media can make interpretation difficult.

Materials:

Amount per Student	Material
at your table (they spill easy so move them as little as possible)	3 Petri dishes with various contents (see labels)
5	Sterile Glass Beads
1	Pair of Forceps
1 (share with your neighbor)	Beaker of 100% Ethanol (for forceps sterilization)
5	Tubes of Sterile Nutrient Broth
1	bacteria solution (species to be announced)

Procedure:

1. Label your 5 test tubes filled with sterile nutrient broth as follows (also include your name):
   - negative control
   - positive control
   - ____ % of _____ (*for example*, 100% bleach)
   - ____ % of _____ (*for example*, 50% bleach)
   - ____ % of _____ (*for example*, 10% bleach)

2. Using sterile forceps, transfer 1 glass bead to the negative control tube.

3. Dump the bacteria tube's contents into the Petri dish containing the other 4 glass beads and gently roll them around in the petri dish (with the lid on) to coat them with the bacteria. Let them **soak for 15 minutes** to ensure bacteria have stuck to the glass bead.

4. Using sterile forceps, transfer 1 "dirty" glass bead soaked in bacteria to the tube labeled "positive control".

5. Using sterile forceps and sterile technique, transfer 1 glass bead to each of the 3 Petri Dishes provided, the contents of which should match what you wrote on the 5 test tubes.:
   Petri Dish 1: Cleaning Solution _____ at _____% concentration.
   Petri Dish 2: Cleaning Solution _____ at _____% concentration.
   Petri Dish 3: Cleaning Solution _____ at _____% concentration.

6. Soak in Petri dish for ***2 minutes (or longer… you may be asked to soak a different time)*** each, then perform a sterile transfer of the glass bead to a sterile tube of nutrient broth with the forceps. **To avoid cross-contamination and potential accidents in the procedure, go slow and transfer each bead slowly.** If you drop the bead let me know so I can figure out a good fix for based on when the bead was dropped.

7. Put your 5 tubes in the designated test tube rack for storage till the next lab. Any test tube that "stays clear" is bacteria free, whereas a "cloudy tube" has bacteria growth…. just like the photo in question 5 on the next page.

Lab 9 Questions (Due at the end of lab)

Name: _____ **Grade:** _____ **of 10 points**

This lab is one method by which antibacterial products are tested against their claims. It also is a way to look at what minimum concentration of the product is needed to accomplish those claims. In many cases, some products perform well even when diluted down. A solution is considered **statistically** "**effective**" if it prevents the growth of the microbes it targets at least 95% of the time. Too strong a concentration can lead to side effects for the user and other unintended consequences such as harmful fumes and rashes. You will test one bacteria of your choice versus the product at your table—which is represented in 3 different concentrations (full strength, 10% strength, and 1% strength). A negative and positive control will also be prepared and used for comparison purposes at the next lab.

1. (1 point) Name of bacteria: _____

2. (1 point) Name of cleaning product: _____

3. (3 points) Besides the concentration of the cleaning agent, other factors besides concentration can be tested to determine the impact they have on antimicrobial activity. To keep the testing results comparable between cleaning agents, name three factors should be kept the same?

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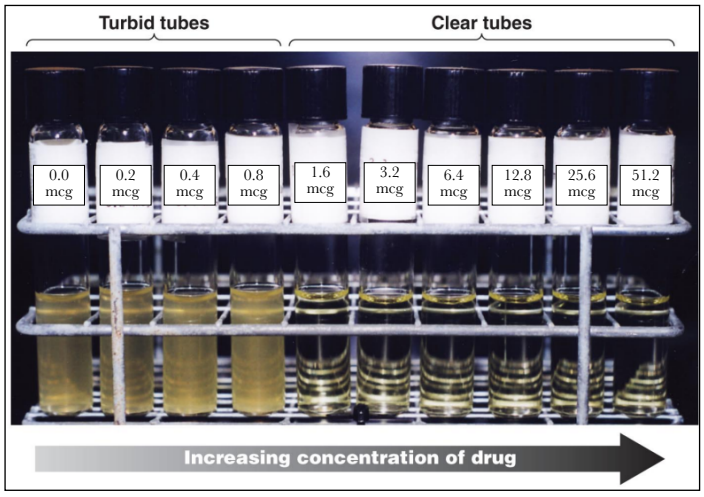
4. (2 points) If a certain concentration of a cleaning product is only "partially effective", what might that tube of nutrient broth look like at the next lab? Is this "partially effective" concentration bacteriostatic or bactericidal?

5. (3 points) In the photo below, **label** tube's drug concentration is the **Minimum Inhibitory Concentration** (MIC) and which is the **positive control**. If the concentrations 12.8 mcg and higher are known to cause skin rashes, then what concentration(s) of product are considered "safe" and "effective"?



a. MIC dosage: _____mcg.

b. Positive Control dosage: _____mcg.

c. "Safe and Effective dosage in mcg.:

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