Lab Exercise 15: Evaluation of Alcohol Antisepsis

Objectives

1. To evaluate alcohol as an antiseptic.
2. Compare antiseptic effectiveness of alcohol wipes, soap and liquid hand sanitizers.
3. Quantify the effectiveness of an antiseptic and compare to other antiseptic methods.

Introduction

The body parts of healthy humans and animals are hosts to a variety of microbes known as resident microbes. But through contact with other objects, the body also picks up other microbes known as transient microbes. For example, a typical person's hand can carry 10,000 to 10 million bacteria, some resident and some transient. When humans or animals are sick or infected with specific microbes the number of microbes may increase.

Antiseptics are chemicals that are used to remove bacteria and potential pathogens from the skin. This is common in medical procedures, such as before an injection or surgery. Alcohol is a very common antiseptic. It is used in wipes ubiquitously before injections. Hand sanitizers are typically alcohol based. Many believe they are more effective than soap and water, while others do not believe this is so. The majority of alcohol-based sanitizers in the United States contain ethanol or isopropanol or a combination of these two products. Most brands also contain a moisturizer to minimize irritation to the skin. Alcohol works immediately and effectively to kill bacteria and most viruses. The antimicrobial activity of alcohol is its ability to change proteins in microorganisms. Proteins and fats on soiled hands will decrease the effectiveness of alcohol as a sanitizer. Alcohol solutions containing 60-95% alcohol are the most effective. Higher concentrations are less potent, because proteins are not denatured easily without water.

Alcohol gels work by stripping away the outer layer of oil on the skin, thereby destroying any "transient" microorganisms present on the surface of the hands. After use, re-growth of bacteria on the skin tends to occur slowly, thereby effectively keeping "residual" micro-flora that reside in deeper layers of skin from coming to the surface. To be most effective, a dime-size dollop of alcohol gel should be rubbed into the hands for 30 seconds.

Chemically speaking, “soaps” are surfactants. In the cleaning process, soaps or detergents help reduce surface tension. They make water mix better with dirt and soil on surfaces and skin. Through their ability to loosen and remove soil from a surface or from skin, they contribute to good personal hygiene by reducing the presence of germs that cause infectious diseases. Plain soap is used primarily in the mechanical removal of transient microorganisms whereas antimicrobial products are used for the mechanical removal and killing or inhibition of both resident and transient microbes. Antimicrobial soaps contain an antiseptic agent to help lower the number of microbes, in addition to mechanical removal. Triclosan is the most commonly used chemical ingredient in antimicrobial soaps.

In this lab we will evaluate the effectiveness of alcohol wipes, alcohol gel sanitizers and soap and water.
Lab Exercises

Supplies per group of 3
3 trypticase soy agar (TSA) plates
2 sterile cotton swabs
1 broth of TSB

Protocol
Day 1
1. Prepare lab bench by removing extraneous items and cleaning surface with table disinfectant.
2. Label one plate. Divide your plate in half, one side labeled pre-treatment, the other half, post-treatment.
3. Dip one swab into the TSB broth. Press the swab against the inside of the tube to remove excess broth; you just need it moist, not dripping.
4. Rub sterile cotton swab over your palm and between your fingers of your left hand.
5. Roll the swab over the half of plate labeled pre-treatment.
6. Select an antiseptic treatment (each group will have one wiper, one washer and one hand sanitizer). Treat your hands and let dry for 3 minutes.
7. Use the second swab, as above, dip, squeeze and then swab your right hand as you did with your left hand before.
8. Roll the swab over the half of the plate labeled post-treatment.
9. Incubate all media at 37° C for 2 days or 25° C for 5 days.

Day 2
1. Obtain your plate.
2. Count all the colonies on the half labeled pre-treatment. Record in the table below.
3. Count all the colonies on the half labeled post-treatment. Record in the table below.
4. Calculate the percent reduction from pre to post treatment. You can determine this by taking the difference in colony numbers and dividing by the number in the pre-treatment sample. Then multiply by 100 to get the percent reduction.
   Example if you had 10 colonies pre-treatment, and 6 colonies post-treatment, then you would have the difference of 4 colonies. Take 4 divide by 10. Multiply by 100. This would be 40% reduction.
5. Compare with the other treatments in your group.

Data and observations for your Group

<table>
<thead>
<tr>
<th>Treatment</th>
<th>Pre-treatment</th>
<th>Post-Treatment</th>
<th>Difference Pre to Post</th>
<th>Percent Reduction</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wiping with alcohol wipe</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Washing with soap and water</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Use of a hand sanitizer</td>
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</tbody>
</table>
**Discussion**

1. What was your treatment?

2. Which treatment was most effective?

3. Which treatment was least effective?

4. What problems do you see in the accuracy of the lab? How would you improve it?

Optional follow up lab:
Wash hands with soap and water and have half the students dry with paper towels, have the other half dry with blow dryers. Compare drying methods.