BIO FAX!

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Assessment of Over-the-Counter Antibacterial Products

Introduction

Use the following bacterial culture test to observe the effectiveness of antibacterial household products in preventing microbial growth.

Biological Concepts

- Antibacterial agents
- Bacterial inoculation
- Zones of inhibition

Materials

Bleach solution, 10% (for disposal)*
Household products (i.e., mouthwash, cleaners, antibacterial soaps, etc.)
Isopropyl alcohol, $(CH_3)_2CHOH$ (for sterilization)
Autoclave (recommended)
Bacterial stock cultures (optional)
Forceps
Incubator (optional)
Marking pens
Sterile paper disks, 4 per dish, or hole-punch to make paper disks, ≈ 7 mm
Petri dishes filled with nutrient agar
Cotton swabs
Ruler
Tape, transparent

**Dilute household bleach by a factor of 10.*

Safety Precautions

After use, agar plates will contain viable microbes. Do not open the plates unnecessarily. Use sterile techniques at all times while handling bacterial cultures. Before disposal, plates should be soaked in a 10% bleach solution or autoclaved. The plates should then be disposed of directly into the garbage. Set a good example of sterile technique for students when handling culture plates. Be sure to sterilize work areas before and after handling microbes and have students wash their hands with soap before leaving the laboratory area. Bleach solution is a corrosive liquid, and may cause skin burns. Avoid contact with heat, acids, and organic materials. Isopropyl alcohol is a flammable liquid and is slightly toxic by ingestion and inhalation. Please consult current Material Safety Data Sheets for additional safety, handling, and disposal information.

Procedure

1. Draw quadrants on the bottom of the nutrient agar–filled Petri dish using a marking pen.
2. Using a moistened cotton swab, take a bacteria sample from a classroom area (e.g., doorknob, bathroom sink, drinking fountain, etc.), or from a stock culture.
3. Streak the entire agar plate and wait a few minutes for the plate to dry.
4. Soak different paper disks in four different household products and use forceps to transfer the disks to the Petri dish.
5. Gently blot the disks on a paper towel to remove excess product before placing the disks on the agar plate.
6. Using forceps, place one paper disk in a quadrant. Press down lightly with forceps to set the disk in place.
7. Sterilize the forceps using isopropyl alcohol between samples.
8. Label the bottom of the plate along the plate edge. Do not write under the disk—this area needs to remain clear in order to measure the zone of inhibition.

9. Repeat steps 5–8 using the three remaining disks.
10. Have students write their initials and the date on the bottom of the plate, and tape the lid shut.
11. Stack the Petri dishes in a cabinet, on a countertop, or in an incubator set at 37 °C for a few days until bacteria growth is heavy enough that zones of inhibition can be easily seen around the paper disks. (This may take only a day if an incubator is used.)
12. Measure the zone of inhibition around each disk from the bottom of the plate. Which products had the largest zone of inhibition? The smallest?

Disposal

Please consult your current *Flinn Scientific Catalog/Reference Manual* for general guidelines and specific procedures governing the disposal of laboratory waste. The agar plates may be disposed of according to Flinn Suggested Biological Disposal Method Type I.

Tips

- Isopropyl alcohol and bleach solution are used as disinfectants. Try them as test chemicals to observe their effectiveness!
- Have students bring in their own household products. Try some products that may not claim to be antibacterial but would be interesting to test (i.e., acidic beverages or fruit juices, regular soaps, spicy sauces, bug repellant, salt water, oils, etc.).
- Once the agar plates have been taped shut, do not reopen except for sterilization before disposal.
- Purchase stock cultures from Flinn Scientific to test how different bacterial strains react to antibacterial products.

Discussion

Triclosan, a chlorophenol, is commonly found in over-the-counter products which claim antibacterial properties. This chemical has the ability to kill both gram-positive and gram-negative bacteria and to inhibit bacterial growth. Zones of inhibition are areas where bacteria cannot grow due to the presence of an inhibiting substance such as triclosan. Many people are not aware that bacteria need to be exposed to an antibacterial agent for at least two minutes in order for the chemical to effectively kill bacteria. Recently scientists have been concerned with bacterial resistance leading to the development of resistant strains. Antibacterial products kill not only pathogenetic bacteria (capable of causing disease), but also bacteria that make up our natural flora as well. Bacteria normally found on our bodies help inhibit growth of parasitic strains by occupying space and resources that pathogens require in order to flourish. A common misconception is that antibacterial products may prevent or reduce the severity of viral infections—antibacterial agents are not effective against viruses.

Connecting to the National Standards

This laboratory activity relates to the following National Science Education Standards (1996):

Unifying Concepts and Processes: Grades K–12

Evidence, models, and explanation
Evolution and equilibrium

Content Standards: Grades 9–12

Content Standard A: Science as Inquiry
Content Standard C: Life Science, the cell, biological evolution, matter, energy, and organization in living systems
Content Standard F: Science in Personal and Social Perspectives, personal and community health

Reference

Scheppler, Judith A.; Sethakorn, Nan; Styer, Susan. *The Science Teacher.* November 2003, 56–61.

Materials for *Assessment of Over-the-Counter Antibacterial Products* are available from Flinn Scientific, Inc.

Catalog No.	Description
FB0526	Nutrient Agar, 10 plates
LM1006	*Escherichia coli*
AP1227	Applicator Swabs
FB1148	Blank Sterile Disks

Consult your *Flinn Scientific Catalog/Reference Manual* for current prices.