THE USE OF SPICES IN THE PRESERVATION OF FOOD

Bacterial action on food depends upon the chemical composition of the food itself, as well as the types of microorganisms that the food comes into contact with. Freezing, boiling and secure packaging help prevent contamination.

Improper handling, such as employees returning to the food processing area from the bathroom without washing their hands can cause serious contamination. Improper beef processing has apparently caused recent outbreaks of a lethal form of E. coli. Animal feces (containing E. coli) were included in beef processing along with the beef body tissues.

The microbial spoilage of food is not a new problem - it has been a matter of concern throughout the history of human culture. In the days before refrigeration and other modern methods of keeping food fresh, such as vacuum sealing or freeze-drying food, preservation of food was accomplished by salting, dehydrating, smoking and using spices to limit bacterial growth.

There are many spices, and not all can help preserve the freshness of food. Some just lend flavor to food. Others, such as vinegar, salt, or garlic provide some degree of anti-microbial activity that allows food to remain edible for a longer period of time. Additionally, they enhance the flavor of food.

Vinegar, for example, is acetic acid and water. In nature, certain bacteria (Acetobacter) produce it when they use enzymes to break down sugars into alcohol. Once the alcohol reacts with oxygen from the air, acetic acid is formed. Vinegar (soured wine) has been used for thousands of years for pickling and preserving foods.

Garlic has been used since the time of the ancient Egyptians to control the spreading of viruses and bacteria - even before people knew such things existed!

They did not know why food spoiled, but they learned by trial and error how to use spices such as garlic, vinegar, salt, cinnamon, cloves and others to control or prevent food loss.

These spices help preserve the freshness of food because they limit (inhibit) the growth of bacteria on/in the food. Like antibiotics, these spice chemicals create an area (zone of inhibition) that is toxic to bacteria and therefore prevents their growth.

Today we will compare the anti-microbial activity of various spices.

PART I: Observation of prepared Petri plates with spice soaked paper discs:

Notice that the outer bottom cover of the Petri dish must be marked with (use tape or grease pencil) your name because Petri dishes must be stored upside down in the incubator to prevent moisture from washing away the organisms that are growing on the surface of the agar.

Notice that there are small markings in five locations on the outer, upper edge of the Petri dish. These identify the spice content of the discs located on the agar surface.

Observe the arrangement of the discs and how far apart they are from one another. Your plate must be arranged in this manner.
**PART II:** Preparation of a Petri dish for growth of a bacterial culture:

Each team needs to obtain:

1. Two clean, closed Petri dishes that contain agar,
2. one tube of bacterial culture,
3. one alcohol spreader in a beaker of alcohol and
4. access to a Bunsen burner and striker.

Each team member should prepare one Petri dish in this manner:

- Turn the Petri dish right side up.
- Open the bacterial culture and **flame** the opening.
- Open the lid of the Petri dish only part way – just enough so that you can pour a dime-sized puddle of bacterial culture on the agar surface.
- Close the Petri dish.
- Flame the opening of the bacterial culture tube and close the tube.
- Take the glass elbow (called an **alcohol spreader**) from its container of alcohol, tapping as much alcohol as possible off its surface against the inside wall of its container.
- Carefully flame the alcohol spreader and hold it until it cools slightly.
- Open the Petri dish just enough to admit the alcohol spreader.
- Use the alcohol spreader to disperse the culture evenly over the surface of the Petri dish.
- Close the Petri dish.
- Re-flame the alcohol spreader and return it to the alcohol solution.

**PART III:** Application of the spice-soaked paper discs to the agar surface:

Each team will need:

1. One forceps, Bunsen burner, striker and an alcohol dish.
2. Access to ten different spice-soaked paper discs: five for each team member. Each disc is soaked in a different spice solution and each team member will use five discs on their plate. Do not select the same discs as your lab partner - your team should use all ten!

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<tr>
<td>A</td>
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<td>B</td>
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<td>Fine Pepper</td>
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<td>Cloves</td>
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Each member of the team should prepare his or her spice disc Petri dish in this manner:

- Dip forceps in the alcohol and flame them.
- Mark the alphabet letter that designates each disc you are using on the upper Petri dish lid.
- Organize the marks in a circle around the edge of the lid: like birthday candles forming a ring on a cake.
- Select one of the five spice discs with the forceps.
- Open the Petri dish just enough to fit the forceps in and place the disc (at the location of the mark for that spice) on the agar.
- Gently press the disc onto the agar without pushing in under the surface or breaking the surface.
- Close the Petri dish and re-sterilize the forceps.
- Select another disc and repeat the procedure until all five discs have been placed on the Petri dish near their initials that you previously placed on the upper Petri dish lid with wax pencil.
- Secure the Petri dish with several pieces of tape.
- Place upside-down Petri dish in incubator.

Next session you will look at the growth of colonies on the Petri dish and observe if any zones of inhibition of growth are present around the spice-soaked discs.

You will use a metric ruler to measure the zone of inhibition around each disc and compare them. Use the chart below for next week's data.

<table>
<thead>
<tr>
<th>NAME OF SPICE</th>
<th>MEASURE OF THE ZONE OF INHIBITION (IN MM)</th>
<th>GENERAL OBSERVATIONS</th>
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<tbody>
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<td>VINEGAR</td>
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