FOOD SCIENCE

Environmental monitoring for food safety

Focus questions	How might we test the food production environment for potential contamination? What are the best cleaners to use for food safety in our lab?
Vocabulary	Petrifilm®, cleaning, sanitizing

There are essential steps one can take for food handling, cooking, and storage. These steps help to prevent foodborne illness. The harmful bacteria that may cause illness are not detectable visibly or by smell or taste. The United States Department of Agriculture (USDA) has set four guidelines to keep food safe:

- **Clean:** Wash hands and surfaces often.
- **Separate:** Don't cross-contaminate.
- **Cook:** Cook to proper temperatures, checking with a food thermometer.
- **Chill:** Refrigerate promptly.

This activity shows a procedure that can be used to test surfaces in a laboratory or kitchen for bacterial contamination.

Materials

- Distilled water
- Soy-based cleaners (i.e. Seventh Generation, BioKleen, Meyer)
- Whirl Pak® bags
- Graduated cylinder
- 2 Aerobic Count Petrifilm per lab group
- Film spreader
- Sterile swabs
- Micropipette (P-1000) and tips (or disposable pipettes)
- 10% bleach
- Sharpie markers®

Procedure

Day 1

1. Label each Whirl Pak bag with location, date, and initials with a Sharpie.
2. Add 10mL of distilled water into a sterile Whirl Pak bag.
3. Repeat steps 1–2 for each location assigned to be tested.
4. Using a sterile swab, dip cotton swab tip into the Whirl Pak bag of distilled water, then swab a 5cm^2 lab surface area and place the swab tip into the appropriately labeled bag. (Make sure to wear gloves so as to not contaminate.) Repeat this step for each assigned area in the lab.
5. Seal and homogenize the bag for 30 seconds.
6. Label each Petrifilm plate with swabbed location, date, and initials.
7. Using a P-1000 micropipetter, extract 1mL of the solution from the corresponding swabbed location. Lift the plastic cover on the Petrifilms, pipette the 1mL solution onto the middle of the film, and slowly lower the plastic cover over the liquid. Make sure to not touch the underside of the Petrifilm.
8. Allow the Petrifilm to sit for 1 minute after plating. Then use a plate spreader to apply slight pressure on top of the plastic cover to remove all air bubbles captured under the film.
9. Clean, using one of the cleaners provided by your instructor, then sanitize the workstation with a 10% bleach solution.
10. Repeat steps 1–9 to test the effectiveness of your cleaning.
11. Stack no more than 20 petrifilm plates together and place in an incubator at 35° C for 24–48 hours.

Day 2

1. Compare the results of before cleaning and sanitizing to after cleaning to see if you adequately cleaned and sanitized your lab surface. Compare different cleaners to see if there is a difference.
2. Note: A red indicator dye in the gelling agent produces red colonies that provide better contrast for easier colony counting.
3. Count all colonies regardless of size or color intensity and record each in a data table.
4. To calculate results:
   # of red/violet colonies on plate x volume of solution in Whirl Pak bag = Total CFUs per area sampled.
5. Disinfect each plate by pipetting 1 mL of a 10% bleach solution onto the plate before disposing in the trash can.

Reflection

1. What is the total CFUs per area that you found?
   Reminder: *# of red/violet colonies on plate × volume of solution in Whirl Pak bag (10mL) = total CFUs per area sampled (5cm^2).*

2. Was cleaning and sanitizing effective in reducing the number of colonies?

3. Was one cleaner better than another?

4. Might there have been a difference in the colony count if you would have swabbed after cleaning, but before sanitizing? Why?

Rubric for self-assessment

Skill	**Yes**	**No**	**Unsure**
I was able to properly clean a lab surface for food preparation.			
I determined which cleaner was most effective for providing a food-safe environment.			
I described a solution for preparing a surface for food preparation.			