

Environmental monitoring for quality assurance

What is the importance of monitoring for pathogens and cleanliness in lab spaces?

In the world of biotechnology and food safety, monitoring for microorganisms is a routine procedure. 3M Petrifilms make this an easier option for workplaces, removing the need to pour agar plates and reducing the storage space needed for incubation. These films are ready-to-use culture medium systems designed for microbial testing, consisting of a thin, flat plastic film coated with nutrients and gelling agents. They are used to detect and quantify various microorganisms like bacteria, yeasts, and molds in different environments, including food processing facilities, hospitals, and water treatment plants. They provide results through color change in response to the presence of a specific organism. In the classroom, students may substitute mixing, boiling and pouring agar plates into sterile petri dishes with the use of these films for less mess and quicker turnaround to check for specific organisms.

Ohio Standards

Grade 6

- 6.LS.1: Cells are the fundamental unit of life.
- 6.LS.4: Living systems at all levels of organization demonstrate the complementary nature of structure and function.

Biology

- B.DI.3: Loss of diversity – Anthropocene effects
- B.E.2: Speciation – Natural selection
- B.H.5: Modern genetics

Human Anatomy and Physiology

- AP.LO.3: Homeostasis
- AP.T.3: Lymphatic and immune system
- AP.AE.1: Digestive system

Student prior knowledge

Students need to be able to follow a standard operating procedure or protocol for monitoring surfaces and air.

Suggested timeline

Preparation of the films requires a 90 minute wait after set up. The collection of samples can be completed within one class period. Results will be available the next day.

Materials

- P1000 micropipette
- Pipet pump (green)
- Stopwatch / timer (phone)
- Incubator
- Film spreader
- Personal protective equipment (PPE): lab coat and gloves
- 3M Petrifilms – AB, EB, and YM
- P1000 micropipette tips
- Serological pipet, 10 mL
- Permanent marker
- Whirl-Pak
- Chip clip
- Double-sided tape
- Cotton swab
- 10% bleach solution
- 70% ethanol

Teacher preparation

1. Read through the student SOP.
2. Organize materials for each lab group.
3. Choose whether to have students set up the films during class time and complete the collection the following day, or prepare the films for collection 90 minutes before use for the students.
4. Determine which areas each group is responsible for testing.
5. Distribute Environmental monitoring using Petrifilms SOP.

Procedure

1. Follow the procedure in the SOP.
2. Have students complete the guided research assessment before collecting samples or during class time after collection. Have them predict results of sampling before viewing results the following day.
3. Incubate the exposed films overnight.
4. View results the following day.
5. Students may report on the results from their various areas tested.

Suggested wrap-up

The environments of labs and food production facilities have specific guidelines to meet for quality assurance. The importance of these regulations and guidelines relate to medical and food safety. The failure to follow these guidelines have resulted in massive recalls for companies.

Differentiation

Students should be grouped cooperatively, with roles assigned to collect each type of microbe from various surfaces.

Extensions

Students may use various types of Petrifilms to select for specific organisms.

Support information

- 3M Petrifilm products [3m.com/3M/en_LB/p/c/lab-supplies-testing/film-dehydrated-media/b/petrifilm/i/manufacturing/](https://www.3m.com/3M/en_LB/p/c/lab-supplies-testing/film-dehydrated-media/b/petrifilm/i/manufacturing/)
- History of Petrifilm development [youtube.com/watch?v=liLyNESb44w](https://www.youtube.com/watch?v=liLyNESb44w)

Career connections

- **Quality assurance manager:** QA primarily focuses on the processes and procedures that improve quality, including training, documentation, monitoring, and audits.
- **Quality control manager:** QC focuses on the product to find defects that remain after development.
- **Lab technicians** set up, maintain, and clean laboratory instruments and equipment, such as microscopes, scales, pipettes, and test tubes.
- **Food processing operator:** Responsible for implementing and maintaining the effectiveness of the quality and safety system; accountable for meeting compliance standards including FDA, OSHA, and company policies.