Altamonte Springs
SCIENCE
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Name: _____
Date: _____

Testing Water for Bacteria Using Membrane Filtration

High School Physical Science | Fall Module 1 | Environmental Laboratory

NGSSS Big Idea:

Coliform is a type of bacteria common in soils, plants and animals. The presence of fecal coliform in drinking water or at swimming sites is evidence that human or animal waste has been or is present. This may be cause for concern because many diseases can be spread through fecal transmission. Also, coliform are principle indicators of water quality, pollution and effectiveness of the treatment processes.

Benchmark Code & Description:

SC.912.L.18.12—Discuss the special properties of water that contribute to Earth's suitability as an environment for life.

SC.912.L.18.In.7—Identify that special properties of water, such as the ability to moderate temperature and dissolve substances, help to sustain living things on Earth.

SC.912.L.18.Su.6—Identify the important role of water in sustaining life of plants and animals.

SC.912.L.18.Pa.5—Recognize that plants and animals use water to live.

SC.912.L.17.16—Discuss the large-scale environmental impacts resulting from human activity, including waste spills, oil spills, runoff, greenhouse gases, ozone depletion, and surface and groundwater pollution.

LEARNING GOAL/OBJECTIVE

Students will learn how water is analyzed for bacteria using a membrane filtration method. They will be taught how to identify and count Total and Fecal Coliform colonies. The presence/absence of coliform are principle indicators of water quality, pollution and effectiveness of the treatment processes.

PREREQUISITES

Review:

- Laboratory Safety (see Support Materials)
- Vocabulary List

VOCABULARY

See vocabulary list.

HANDS-ON ACTIVITIES

Task(s):

- Use laboratory equipment to measure sample volumes.
- Use laboratory equipment to filter samples.
- Manipulate filter paper and petri dishes.

Provided Materials:

- Clipboard/Pencil
- Bacteria Testing Worksheet
- Lab Coat
- Safety Goggles
- Gloves

Career Options: Chemist (BS Degree), Scientist (BS Degree), Microbiologist (BS Degree)

Lesson Steps:

1. Students are provided lab coats and safety glasses to wear.
2. As students are suiting up, we will present safety instructions and an overview of the module.
3. Students are provided a clipboard with handouts covering the procedures they will learn.
4. Students are guided to the laboratory.
5. Measure 100mL of water into a filtration funnel.
6. Turn on the vacuum by opening the valve.
7. Observe as a vacuum pulls the sample through a membrane filter.
8. Turn off the vacuum by closing the valve.
9. Use tweezers to remove filter and place filter in a Petri dish containing media broth.
10. Identify coliform colonies in a real Petri dish.
11. Count the colonies and record the number of colonies

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Environmental Laboratory—Microbiology Vocabulary

Bacteria—one celled organism occurring in many forms and having a wide range of biochemical properties and are mostly pathogenic.

Biological—related to life processes of living organisms.

Colony—the microorganism grown or cultured in a medium

Culture—a colony of bacteria or the growing of organism in a particular medium

Fecal Coliform—a form of coliform bacteria primarily present in the gut of humans and other warm blooded animals.

Filtration—a process that allows liquids to pass through a porous material for separation or removal of particles

Incubate—the act of placing organisms or bacteria into an environment that has the proper temperature to allow growth.

Media Broth—a substance containing the necessary nutrients needed to grow organisms/ bacteria

Microbiology—The study of microorganic life or microorganisms.

Microorganism—an animal or plant that has microscopic size.

Organism—Animal or plant life.

Petri Dish—a covered container that is used as a vessel for growing organisms/bacteria.

Suction/Filter Apparatus—device for filtering using a vacuum source.

Suction/Filter Flask—a flask that connects to vacuum source and suction apparatus.

Total Coliform—a group of bacteria used as indicator organisms in monitoring water quality.

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Introduction: Coliform is a type of bacteria common in soils, plants and animals. The presence of fecal coliform in drinking water or at swimming sites is evidence that human or animal waste has been or is present. This may be cause for concern because many diseases can be spread through fecal transmission. Also, coliform are principle indicators of water quality, pollution and effectiveness of the treatment processes.

Procedure A: Use membrane filtration for coliform determination.

1. Measure 50ml of water into a filtration funnel.
2. Observe as a vacuum pulls the sample through a membrane filter.
3. Use tweezers to remove filter and place filter in a Petri dish containing media broth.

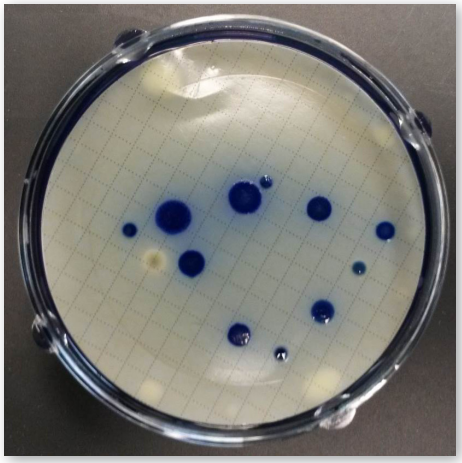
Procedure B: Identify and count Coliform colonies in Petri dish.

4. Identify coliform colonies in a real Petri dish.
5. Determine which type of colonies exist (fecal or total) and circle it below.
6. Count the colonies and record the number of colonies below.

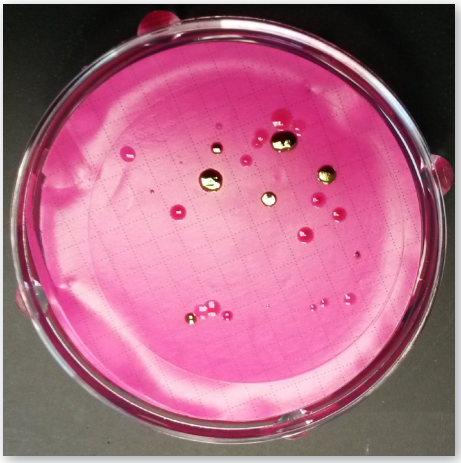
Type of Colonies		Number of Coliform Colonies Counted
Fecal	Total	

What Do Fecal and Total Coliform Colonies Look Like?

Fecal Coliform colonies are blue in color, and Total Coliform colonies have a gold sheen. Each colony or dot is counted.



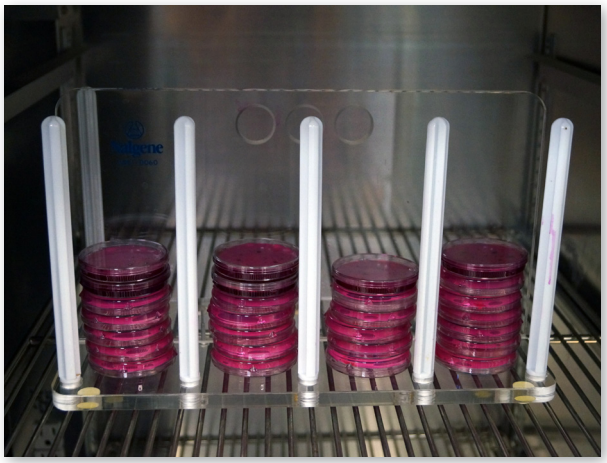
Fecal Coliform



Total Coliform

Samples are incubated for 24 hours in a dry incubator or water bath to allow the Coliform colonies to grow.

It is made up of several groups, one of which is fecal coliform, which is found in the intestinal tracts of warm-blooded animals including humans.



Dry Incubator

Water Bath