

Details



Completion Time: About 1 period

Permission: Download and Share

Do Microorganisms Live In Antarctica?

Overview

We know that we have lots of microorganisms growing where we live, but can microorganisms like bacteria also live in the harsh, cold, dry climate of Antarctica? Part of our research project in Antarctica is looking at the microorganisms that live in the Taylor Glacier. We are taking dirty ice (ice with lots of dirt/sediment in it) and clean ice (ice without sediment) samples and analyzing them to see if they contain microorganisms and if the microorganisms are alive. In this activity, we will be sampling different types of ice and other common places to see if we can find some microorganisms living in Antarctica!

Objectives

1. All students should be able to identify the conditions necessary for microorganisms to grow and reproduce.
2. All students should be able to identify the tools and procedures necessary to culture microorganisms.
3. All students should be able to describe the adaptations necessary for organisms to grow and reproduce in the Antarctic environment.

Lesson Preparation

This lesson is pretty easy to do. Students use the PolarTREC journal to watch the set-up of the experiment in the field and then analyze the results by viewing pictures and completing the data sheet. Very little preparation is needed except for setting up internet access or signing up for the computer lab. Students should have an idea of what microorganisms are, how they reproduce, and what they need from their environment to survive before completing the assignment.

Procedure

This assignment can be done together as a class, individually or in small groups using a computer lab, or as a homework assignment if students have internet access

Materials

- Student Worksheets (handout and data sheet)
- Video of Experimental Design and Procedure (see Resources section)
- Daily Pictures of Bacteria Growth from PolarTREC Journal (see Resources section)
- Access to individual computers (complete assignment individually) or projector (complete assignment as a class)



at home.

- Answer pre-lab questions
- Watch video of the set-up of the experiment
- Make hypotheses
- Use the pictures of daily microorganism growth to complete the data table
- Analyze the results and answer the follow up questions

Extension

A follow-up activity would be to use the same procedures to have the students culture their own microorganisms. Students could swab similar places that we did (hands, shoes, dirt, etc.) to see how fast they get growth in their climate or they could set up their own temperature-growth experiment.

Resources

Lindsay Knippenberg's PolarTREC journal:

<http://www.polartrec.com/expeditions/microorganisms-in-antarctic-glacier-ice/journals/october-27-2009-do-microorganisms-live->

Microbiology of Permanently Cold and Frozen Environments:

<http://brent.xner.net/> (current news and pictures of the microorganisms found in Antarctica)

Assessment

Follow-up questions (see student handout).

Credits

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National Science Education Standards (NSES):

Content Standards, Grades 5-8

Content Standard A: Science As Inquiry

- a. Abilities necessary to do scientific inquiry
- b. Understandings about scientific inquiry

Content Standard C: Life Science

- e. Diversity and adaptations of organisms

Content Standards, Grades 9-12

Content Standard A: Science As Inquiry

- a. Abilities necessary to do scientific inquiry
- b. Understandings about scientific inquiry

Content Standard C: Life Science

- c. Biological evolution

Data Table #1: Week One - For each day record if the liquid in the tube is cloudy or not cloudy.									
Tube #	Type	Temperature	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7
1	Control	cold							
2	Dirty Taylor Ice	cold							
3	Clean Taylor Ice	cold							
4	Sediment	cold							
5	Fingers	cold							
6	Boots	cold							
7	Dinner Table	cold							
8	Air	cold							
9	Lake Bonney Ice	cold							
10	Control	warm							
11	Dirty Taylor Ice	warm							
12	Clean Taylor Ice	warm							
13	Sediment	warm							
14	Fingers	warm							
15	Boots	warm							
16	Dinner Table	warm							
17	Air	warm							
18	Lake Bonney Ice	warm							

Data Table #2: Week Two - For each day record if the liquid in the tube is cloudy or not cloudy.									
Tube #	Type	Temperature	Day 8	Day 9	Day 10	Day 11	Day 12	Day 13	Day 14
1	Control	cold							
2	Dirty Taylor Ice	cold							
3	Clean Taylor Ice	cold							
4	Sediment	cold							
5	Fingers	cold							
6	Boots	cold							
7	Dinner Table	cold							
8	Air	cold							
9	Lake Bonney Ice	cold							
10	Control	warm							
11	Dirty Taylor Ice	warm							
12	Clean Taylor Ice	warm							
13	Sediment	warm							
14	Fingers	warm							
15	Boots	warm							
16	Dinner Table	warm							
17	Air	warm							
18	Lake Bonney Ice	warm							

Name: _____

Hour: _____

Do Microorganisms Live in Antarctica Too?

We know that we have lots of microorganisms growing where we live, but can microorganisms like bacteria also live in the harsh, cold, dry climate of Antarctica? Part of our research project while we are down here in Antarctica is looking at the microorganisms that live in the Taylor Glacier. We are taking dirty ice (ice with lots of dirt/sediment in it) and clean ice (ice without sediment) samples and analyzing them to see if they contain microorganisms and if the microorganisms are alive. In this activity, we will be sampling different types of ice and other common places to see if we can find some microorganisms living in Antarctica!

Pre-Lab Questions:

1. What do you think microorganisms need in order to grow and reproduce?

2. What is the average temperature and humidity in Antarctica? What is the average temperature and humidity where you live?

Problems: **#1.** Do microorganisms in Antarctica prefer to live in clean or dirty ice?
 #2. Do the bacteria that we find in Antarctica grow and reproduce more in warm or cold temperatures?

Hypothesis #1: Do you think we will find more microorganisms in the clean or the dirty ice? Why?

3. Did microorganism growth occur faster in the warm or cold temperature environment? Why do you think this occurred?
4. Did microorganism growth occur faster in the clean or in the dirty ice? Why do you think this occurred?
5. How did the microorganism growth in Lake Bonney ice compare to the microorganism growth in the clean and dirty ice from the Taylor Glacier?
6. Based upon our results, is it possible for microorganisms to exist in Antarctica? Explain.

7. Think about the harsh conditions in the Antarctic environment (extreme cold, 24 hours of darkness or light, extreme dryness, high winds, etc...). What type of adaptations do you think the microorganisms might have to make them able to live and grow here?
8. Based on the experiment that we just did, how might we be able to tell if more bacteria grew in one tube than in another? Would there be a way to measure this?
9. If you could go to Antarctica, what other types of places would you like to test to see if microorganisms are living there?
10. Besides Antarctica, what other harsh environments in the world do you think microorganisms have evolved to live in?