

# Unit 4

## Microbial Diversity

### Description

Microbes are adapted to live in strange and varied habits, where they use inorganic as well as organic materials for energy. Phylogenetic comparisons of DNA sequences of genes that produce ribosomes indicate that the single large group of prokaryotes comprises two very different groups: the Bacteria and the Archaea. Understanding how microbes communicate with each other and interact with their environment (as in the production of biofilms), can help us to control disease, limit microbial damage, and harness the skills of microorganisms to rehabilitate damaged ecosystems.

### Menu of Unit Activities

**Note:** All activities, handouts, solutions, and tips can be found in the Appendix of this guide.

#### **Activity 1: Indescribable** (30 minutes)

Confronting the issues involved in collecting and cultivating microorganisms from extreme environments, using the bacteria that will be featured in the video as examples.

#### **Activity 2: PCR Demonstration** (60 minutes)

A hands-on demonstration of how polymerase chain reaction amplifies a specifically targeted section of DNA, with discussion questions and a reading about how this is used to investigate microbial diversity.

#### **Activity 3: Biofilm Stars** (15 minutes)

A discussion on the impact of microbial biofilms on everyday life and on medical treatments.

#### **Activity 4: The Fall of Biosphere 2** (15 minutes)

Readings and discussion on how miscalculations about microbial metabolism affected the Biosphere experiment.

# Before the Session

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**Facilitator:** Copy and assemble the following activity materials. (See the Activities section in the Appendix of this guide for master copies of transparencies and handouts, plus Tips and Suggested Answers.)

**Activity 1: Indescribable** requires:

- One copy of the List of Organisms and Instructions per person (master copy provided)
- One transparency of the Table of Terms from the Microbial Diversity online text chapter (master copy provided)
- Tips and Suggested Answers

**Activity 2: PCR Demonstration** requires:

- One set of PCR materials per four people. Each set contains:
  - two cardboard strips, 12 inches long and 2 inches wide, with a light-colored surface that can be written on
  - 10 cardboard strips, 2 inches long and 2 inches wide, with a light-colored surface
  - eight cardboard strips, 10 inches long and 2 inches wide, with a light-colored surface
  - 40 rubber bands that can fit around the cardboard strips
  - one roll of tape
- One black marker per person
- One copy of the Instructions per person (master copy provided)
- One copy of the Discussion Questions and Microbial Diversity Chapter Excerpt per person (master copy provided)

**Activity 3: Biofilm Stars** requires:

- One copy of the Microbial Diversity online text chapter per three people (available online at <http://www.learner.org/channel/courses/biology>)
- One copy of the Discussion Questions per person (master copy provided)
- Tips and Suggested Answers

**Activity 4: The Fall of Biosphere 2** requires:

- One copy of the Discussion Questions per person
- One transparency of the Table of Terms from the Microbial Diversity online text chapter (master copy provided; see Activity 1)

**Facilitator:** Make sure that the room has these supplies:

- pens or pencils and paper
- VCR and TV
- overhead projector and markers
- black/white board with chalk or markers

# Session Activities and Video

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## Activity 1: Indescribable (30 minutes)

- Read the Setup and arrange in pairs.
- Have each person take a copy of the List of Organisms and Instructions.
- Put the Table of Terms transparency on the overhead.
- Spend five minutes working in pairs on Exercise 1, using the terms in the table to describe the organisms described in the list.
- As a group, go through the list quickly, and compare answers to those found in Tips and Suggested Answers.
- Spend 10–15 minutes working in pairs on Exercise 2.

## Video (30 minutes)

- Watch the Microbial Diversity video.

## Activity 2: PCR Demonstration (60 minutes)

- Read the Setup and arrange into teams of four.
- Have each team take a set of PCR materials.
- Have each person take a copy of the Instructions and a copy of the Discussion Questions and Microbial Diversity Chapter Excerpt.
- Spend a few minutes in teams reading and reviewing PCR from the instructions.
- Working in teams, make the target and primer sequences, and go through the PCR demonstration according to the instructions.
- In teams, answer the Discussion Questions and read the Chapter Excerpt.

**Facilitator:** After all teams have finished, remind everyone that they can view the PCR animation at <http://www.learner.org/channel/courses/biology>.

## Activity 3: Biofilm Stars (15 minutes)

- Read the Setup and arrange into teams of three.
- Have each person take a copy of the Discussion Questions. Have each team take a copy of the Microbial Diversity chapter.
- Spend 10–15 minutes working in teams of three on the questions.
- As a group, quickly compare lists and answers with each other, and with the answers in Tips and Suggested Answers.

# Session Activities and Video, cont'd.

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## Activity 4: The Fall of Biosphere 2 (15 minutes)

- Put the Table of Terms transparency on the overhead.
- Read the Setup and have each person take a copy of the Discussion Questions.
- Discuss the questions as a group.

## Summary (5 minutes)

- If time permits, as a group or in pairs, define the major ideas or “take home” lessons of this unit and its applications.