



Medicines from Nature: Exploring Biodiversity and Human Health

Subject: biological diversity, species extinction, drug discovery

Grade Level: 9-12

Class Time: 50-60 minutes

Overview

In this lesson, students watch the PBS Newshour video, *Exploring Links of Climate Change-Biodiversity*, featuring Dr. Eric Chivian. Here they learn about the medical implications, from the cellular to the organismal level, of species extinction due to climate change. Examples include unlocking possible treatments for ovarian cancer, diabetes, kidney disease and osteoporosis.

Students then divide into three groups and act as major players in the nature based medicine debate, researching and presenting each perspective, in the activity, Shaman Pharmaceuticals Strategic Planning Session.

Objectives

Students Will:

- Review medicines made from nature
- Explain the unique threats to biodiversity posed by global climate change, habitat destruction, and chemical pollution
- Give examples of the many interactions between species



Standards

National Science Education Standards (NSES):

Life Science Content Standards, Grades 9-12

- Interdependence of organisms

Science in Personal and Social Perspectives, Grades 9-12

- Natural Resources

About the Lecturer

Eric Chivian M.D. is the Director of Center for Health and the Global Environment, Harvard Medical School.

Lesson Video

Exploring Links of Climate Change-Biodiversity. PBS Newshour

Video Length

10:26 minutes

Biodiversity and Human Health

Summary

Biodiversity is the total complement of different living organisms in an environment. Global climate change, stratospheric ozone depletion, chemical pollution, acid rain, the introduction of alien species, and the over hunting of species all threaten biodiversity. The greatest threat, however, is the degradation, reduction, and fragmentation of habitats, especially of species-rich areas, such as tropical rain forests and coral reefs. This lesson reviews some of the ways that plant, animal, and microbial species support human health, and by their interactions with each other and with their inorganic environment provide various ecosystem services making all life, including human life, possible on Earth.

Activity: Shaman Pharmaceuticals Strategic Planning Session

Medicines from nature are of enormous interest to pharmaceutical companies. Companies like the now-defunct Shaman Pharmaceuticals sought to find some of the best medicines from the rainforest, so that they could develop them for commercial use. The complex relationship between industry, the population living in the area, and nature is one that can benefit all involved, but is also one that could have detrimental effects.

Divide the class into three groups: the pharmaceutical company, the community, and environmental advocates. Each group should prepare a paper detailing their goals from this connection, and the potential positive and negative aspects about this relationship. As each group presents, look for the ways in which each group may have their needs met.

Discussion Questions

1. Name some threatened species important to medical research, and detail the importance of these species.
2. How does climate change contribute to species loss?
3. How do recent rates of extinction differ from background extinction rates?

Key Vocabulary

1. Anthroponotic
2. Conotoxins
3. Endemics
4. Genetic Library
5. Biodiversity
6. Invasive Species
7. Taxol
8. Extinction rates

Biodiversity and Human Health

Comprehension Exercise

Approximately 70% of the medicines developed between 1970 and 2006 are based on natural compounds, including aspirin and penicillin. Ask students to look through their own medicine cabinets and research which over-the-counter medications are based on natural sources. Each student may choose a medical product to research, preparing a brief report on its discovery, production, and utility. Be sure to examine applicable compensation for these resources, and to think about the value of ecosystem services.

Background Reading

1. eds. Chivian, Eric and Aaron Bernstein. *Sustaining Life: How Human Health Depends on Biodiversity*. New York: Oxford University Press, 2008.
2. Chivian, Eric and Aaron Bernstein. (2010) *Killing the Cures*. Project Syndicate

All videos and materials associated with this lesson can be found free-of-charge on the Center for Health and the Global Environment's website at:
chge.med.harvard.edu/education