

Microbiology: An Historical Continuum

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Abstract

Microorganisms have been critically involved in the history of life on earth. In this activity, the contributions of bacteria, viruses, and other microbes will be examined in an historical context, through the development of a "time line" of important events in which microbes have played either a positive or negative role.

Activity

Invitation for User Feedback. If you have used the activity and would like to provide feedback, please send an e-mail to MicrobeLibrary@asmusa.org. Feedback can include ideas which complement the activity and new approaches for implementing the activity. Your comments will be added to the activity under a separate section labeled "Feedback." Comments may be edited.

Editor's Note (2008): This Curriculum Resource was published prior to establishment of current criteria of submission, and as such, does not contain all criteria required of current publications. However, the Editorial Committee felt that the activity itself remained worthwhile and relevant, and encourages potential users to contact the authors for clarification as needed. If you do update this activity for use with your students, and are interested in updating the resource for distribution in the library, please contact ASM at MicrobeLibrary@asmusa.org.

INTRODUCTION

Core Themes Addressed

Depending on the "headlines" chosen, this activity may address concepts in all five of the core themes. More specifically, the core themes concepts addressed in this activity are: 1. Microbial cell biology - cellular structure and function; 2. Microbial genetics - causes, consequences, and uses of mutations; 3. Microorganisms and humans - disease transmission, antibiotics and chemotherapy, genetic engineering, biotechnology; 4. Microorganisms in the environment - adaptation and natural selection, symbiosis, microbes transforming environments; 5. Integrating themes - microbial evolution, microbial diversity.

Learning Objectives.

At the conclusion of this activity, students will have an understanding that the continuum of human history parallels, intersects, and is often dependent upon the history of the microbial inhabitants of the planet. This exercise will also illustrate that microbes have made many positive contributions to the quality of life we currently enjoy.

PROCEDURE

Materials.

The following materials may be needed to complete this activity.

1. Poster board.
2. Colored pens or markers.
3. 3 x 5 (or larger) index cards printed with "headlines".
4. Tape, tacks, or a stapler to affix posters to a wall, corkboard, or blackboard.
5. Access to computers with presentation-type software.
6. Access to publishing equipment (photocopying machine, desktop publishing software, etc.)
7. Other supplies that students may wish to provide to enhance their presentations.

Instructor Version.

1. As a class, discuss how students perceive the contributions of microorganisms in their daily lives. This may begin as a word association with students freely associating with terms such as bacteria, virus, fungus, and microbe. Negative responses (such as germs, disease, sickness, etc.) and positive responses should be listed, and the lengths of the two lists compared.
2. Students are then divided into teams of 3 or 4 (a maximum of 6) students. Each group is given an index card upon which a "headline" has been written. The headline should represent a significant microbe-related historical event, occurring within either a narrow or broad time period. Depending on the focus of the course, the headlines could span dates within the following time periods:

- From life's earliest beginnings to the present, focusing on biogeological and biochemical events.
- The Golden Age of Microbiology, focusing on infectious diseases.
- The lifetime of the students in the class, focusing on developments in basic research.

A list of sample headlines is provided (see **Appendix 1**). Alternatively, the instructor may assign a time period (a decade during the Golden Age, for example) and allow the students to come up with appropriate headlines.

3. The event depicted in the headline will be investigated by the team, to identify:

- The date (or approximate time period) when the event occurred.
- Details about the specific event (such as: what microorganism was involved, the sequence of occurrences during the event, human participants (if any), etc.).
- How the event impacted, or will impact, history; as well as present day outcomes (did the event have any positive or negative impact on how we live our lives today).

4. After researching the event, each team will develop a presentation which must address the three focus areas: date or time period, details of the event, impact(s) of the event. The overall design of the presentation is left up to the students on each team, but it is suggested that each team be required to use the same overall format. For example, the teams could each create a display on poster board, write a summary, give an oral presentation, or create a computer-based display such as a Web page or a PowerPoint presentation.

5. Each team will present their interpretation of the event to the rest of the class. Three ideas concerning the overall scope of the activity are given below:

- Activity assigned and completed in one class period: In one period, the cards bearing headlines are handed out; poster board or paper is distributed; team members are given a short time to assemble the available information (using their text and other resources available in class as primary references); and the outcome is presented in chronological order, from the earliest event to the most recent. If poster boards are used, they can be lined up for a visual display resembling a "time line". If this alternative is chosen, it is important that the headlines be appropriate for the amount of information available in the text.
- Activity assigned in one class period and completed in another: In the first period, headline cards are distributed and time is provided for the teams to organize and discuss the activity. The presentations are completed in a second class period; with the time between (the next class; a two week period) determined by the instructor.
- Longer term activity: Students could be allowed several weeks or even an entire semester to work on this activity. An example of a long term activity would be to have the students develop a Web page or other computer presentation. Another example would be to allow students time to play the role of reporters, to "uncover" the story behind the headline. The written stories can be collected, collated, and published in newspaper form (such as, "The Microbe Times"); either one newspaper per class, or one newspaper published by each team. The published "newspaper(s)" is then distributed to all of the class members. Each newspaper article can serve as a topic of discussion in subsequent classes.

SUPPLEMENTARY MATERIALS

Possible Modifications.

Two variations of this activity have been successfully used in both large and small microbiology classes.

1. Creating a time line of events displayed on individual poster boards, which are then affixed to a wall (such as along the walls in a hallway) in chronological order, has been used as an introductory activity to acquaint students with microbiology while providing them with a background on the many positive contributions microbes make to our world.
2. Writing and publishing a newspaper based on microbiological events, with each team working on headlines from a specific time period (such as headlines from the same decade, century, or epoch), is a longer term activity which is very popular with students. This approach provides both an introductory and summary activity for the class.

Appendices.

List of sample headlines that might be used in this activity.

[Appendix I. List of Sample Headlines](#)

User Feedback

"A great way to get students thinking about the importance of microbes in their daily lives. I think it went very well and the directions and notes were wonderful."

- Beverly J. Brown, Nazareth College of Rochester, Biology Department, Rochester, NY

List of Sample Headlines

1. **Researchers Use Electron Microscope to View a Virus**

Scientists note that virus particles look nothing like bacteria.

2. **Boy in Plastic Bubble, 12, Dies**

Succumbs to infection after leaving his womb of protective plastic.

3. **Cary Mullis Wins Nobel Prize**

Inventor of PCR harnessed the power of a bacterial enzyme to amplify DNA.

4. **Earth's Atmosphere Gains Oxygen**

Multicellular life forms will soon follow.

5. **White Cliffs of Dover a Natural Wonder to Behold**

But what makes them white?

6. **Cure for Scourge of Syphilis Found!**

Paul Ehrlich discovers Salversan and invokes the wrath of church leaders who believe the arsenic-based compound circumvents the will of God.

7. **Environmental Activists Destroy the Test Site for "Ice Minus" Bacteria**

Are the genetically-engineered organisms really man-made monsters?

8. **Life on Mars?**

NASA scientists observe "bacterial fossils" in a meteorite from Mars.

9. **Life Too Small to See Exists, According to Lens-Maker Antoni van Leeuwenhoek**

"Wee Animacules" thrill the Queen and her court.

10. **Magic Bullet Found!**

New drug, penicillin, prevents infection in people burned in the tragic Coconut Grove fire.

11. **The Western Front: 200,000 Allied Troops Killed or Injured at Verdun**

Meanwhile, millions of people are sickened and die from the "Spanish flu".

12. **Some Like It (Really) Hot**

Chemosynthetic bacteria support novel ecosystems in ocean thermal vents.

13. Physician Declared Insane!

Dr. Ignaz Semmelweiss is declared insane when he continues to insist that doctors should wash their hands.

14. Nucleated Cells Emerge from a Sea of Procaryotes

Complex cells with intracellular compartments found.

15. Woese Proclaims Three Domains

Carl Woese determines that some microbes are as distinct from each other as they are from eucaryotes.

16. A Patent on Life?

Pharmaceutical giant Hoffman LaRoche patents the bacterium that produces the thermostabile polymerase behind the PCR process.

17. Millions in Ireland Starve as Blight Destroys Potato Crop

Starving Irish leave country in droves after third year with no potatoes.

18. Pasteur Saves Boy Bitten by Rabid Dog!

Pasteur's injection protects a neighbor boy from the ravages of rabies.

19. New Disease Linked to an Increase in *Pneumocystis carinii* Pneumonia Cases

Drug technician Sandra Ford notes that an increase in prescriptions for pentamidine to treat PCP corresponds to an outbreak of a new and alarming immunodeficiency disease.

20. Bacterial Enzyme Cuts DNA

Hamilton Smith discovers bacterial enzymes with the ability to "snip" DNA into smaller pieces.

21. Smallpox Virus Declared Extinct

The world's last known smallpox victim is released from a hospital in Somalia.

22. Killer Bacteria Invincible

A deadly strain of *Staphylococcus aureus* proves to be resistant to all known antibiotics.

23. Outbreak of New Disease Strikes Italy

Called syphilis, some trace its origins to Spain while others blame "New World" explorer Christopher Columbus.

24. Milk Producers File Suit

Claim new law requiring pasteurization of milk will ruin their product.

25. Natural Resistance to HIV Identified

Researchers claim that 2% of Caucasians are homozygous for a gene that protects against HIV infection.

26. New Uses for Agar

Polysaccharide used in Asian cooking found to solidify microbiological media.

27. Humpty Dumpty Revisited on a Submicroscopic Scale

Frankle-Conrat disassembles and reassembles Tobacco Mosaic Virus in a test tube.

28. Flesh-Eating Bacterium Strikes in England

A particular virulent strain of *Streptococcus* eats the face off a man in Great Britain.

29. Three Hundred Russians Die of Anthrax

Was it bad sausage or the intentional release of a biological weapon that killed scores of people in Sverdlovsk?

30. CDC Investigates Bloody Deaths in Kitwit, Zaire

The rural hospital which is the site of the latest outbreak of Ebola Hemorrhagic Fever is empty; most of the personnel have died or run away.

31. Bacterial Behemoth Found in the Gut of a Fish

The discovery of a bacterium visible to the naked eye leaves scientists rethinking the classic postulate that procaryotes have to be small.

32. Human Drug Produced by Yeast

Fungal cells engineered with human genes produce vast quantities of human insulin.

33. Brain-Eaters Sickened

Guiducek deduces that an encephalitis-like disease emerging among brain-eating cannibals is caused by a prion, a new type of infectious agent.

34. Cells Acquire Energy-Producing Structures

A merger between procaryotes and eucaryotes creates a more energy-efficient way of life.

35. American Legion Felled in Philadelphia

Hundreds of Legionnaires fall ill with a mysterious pneumonia at convention.

36. Responsible or Not? Koch Reports New Way to Know for Sure

Robert Koch presents his protocol to determine the microbial agent responsible for a particular disease.

37. **Bacteria Do the Dirty Work**

Billions of bacteria remove hydrocarbons left on Alaska=s rocks and beaches after the Exxon *Valdez* spills her oil.

38. **Algae, or Bacteria?**

In a development sure to startle taxonomists, blue green algae are reclassified as cyanobacteria.

39. **Killer Revealed**

A staining technique developed by Christian Gram reveals pneumonia-causing microbe in the lungs of victims.

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