



Lesson #1

What is Microbiology?

Objectives:

- The learner will demonstrate knowledge of important advances in microbiology by creating a timeline of microbiological milestones.
- The learner will demonstrate application of the many milestones in microbiology by researching and reporting on the current work being done by microbiologists.

National Science Education Standards:

SAI 1, LS 1, ST 2, SPSP 5, HNS 1, HNS 2, HNS 3

Benchmarks:

1C, 1D, 2B, 3A, 3C, 7G, 10I, 12D

Materials:

Internet access
Student research sheets
Books (optional)
Colored pencils
Timeline poster sheet

Background:

Many students are unaware of the varied areas of science. Because there is so much diversity within scientific fields, it is important for scientists to know about fields other than their own so that they can more easily communicate with other scientists. This is also important for students, as they can not only explore new areas of science, but also have an awareness of the struggles and accomplishments which have made our world what it is today.

The first part of this activity allows students to look into the roots of microbiology and see how the discipline has grown. Using a timeline format will help students to see the order in which scientific discoveries occurred, allowing them to make connections from one discovery to the next and see how these discoveries build upon each other.

In the second part of this activity, students will have the opportunity to look into the science of today. Students will be asked to focus on a specific area of microbiology. They will then be asked to find scientists who are currently doing research in their chosen area. This is important for students to see that many discoveries are being made in colleges, universities and institutes all around the world, with some near them. It is important to appreciate the achievements of all researchers who are helping to make a difference in our world, whether they are “famous” or not.

Preparation:

The preparation for this activity depends on how you will be organizing your timeline. If you have more than one class that will be working on the project, you may want to have one large timeline for all of your classes. This activity will work well no matter how long you decide



to make your timeline. You can use the list of microbiologists as a guide. If you will be working with just one class, please consider your choice of microbiologists so that the timeline will span the history of microbiology. There is a suggested list of microbiologists for use with single classes.

Along with the list of microbiologists, there is also a list of six of the main areas of microbiology. Review this list with students when they are choosing the branch of microbiology that they will be researching.

Warm-Up:

Ask your students “What is microbiology? What do microbiologists do?” Discuss different kinds of microorganisms and how they affect our lives.

Procedures:

1. Students will each be assigned a microbiologist to research. They will use their findings to create a piece of the class microbiology timeline.
2. After creating the timeline pieces, students will assemble the timeline and discuss the major milestones which they researched.
3. Students will then be asked to pick one of six different areas in microbiology. They will use a website to gather information on that branch of microbiology and research a scientist currently working in that area.

Variations and Follow-Up Activities:

As described in the background section, there are many options for putting the timeline together. This may be a project using the work of students from many different classes or from just one class. The location of this timeline will vary by teacher, but these may be displayed in the classroom, cafeteria, hallway, or in a school display case.

Because each student will be creating his/her own piece of the timeline it is very easy to assemble all of their pieces to make the timeline. A piece of string may be used as a “line” and students posters may be hung on that string, or attached to the wall below the line. Alternatively, the posters can be attached to a large piece of roll paper and displayed. The method used will depend on the needs of the students and the locations available to you.

The activities that follow in this module will serve as a follow-up to this lesson as students can refer back to the timeline while they are learning about specific microbial processes.

Assessments:

While constructing the timeline, students’ interpersonal skills may be observed as they may work together in placing each of the posters chronologically on the timeline. This will depend on the way that you structure the activity.

Students’ research skills and writing skills can be assessed through the individual timeline pieces that the students create as well as through the “Microbiology Today” research that they conduct and report on.

Two separate grades can be given on this assignment, one for the timeline poster and the other for the “Microbiology Today” research sheet.

**Observations:**

I found that it was very helpful to have some books on hand for the research portion of this lesson. While many of my students were able to use the internet as a research tool with very little difficulty, some students found the information on the internet to be too much to look at all at once. The use of books provided a more concise format for students with perceptual difficulties as well as for my Limited English Proficiency students. It is not necessary to go out and buy special books for these students to use. Encyclopedias, comprehensive dictionaries, and printed copies of simple web pages can be a great help.

It is **STRONGLY** recommended that you check all websites you are planning to use with students before beginning work. The internet is ever changing and what is there one year may not be there the next. Taking a few minutes to check the sites the day before an activity can save a lot of class time if those sites are not up and running.

Consider using some examples in your classroom. I have found that my students produce a higher quality of work when an example is shown. This will give students some expectations to consider when working. I found that a sample was helpful for both the microbiologist poster and the timeline. When my students know I expect quality work from them, they don't let me down.

You may want to consider doing some research of your own and look for microbiologists in your area. While you may not have a microbiologist next door, students can feel a sense of pride in researching a microbiologist who works in their state or region. Look to local colleges and universities for information about any microbiologists who may be of interest to your students.

The following page gives examples of some of the work which my students produced.

David Baltimore

BIRTH: March 7, 1938
New York, NY
DEATH: —

Notable Accomplishments
1975 Nobel Prize in Medicine for work in virology; 1999 National Medal of Science at White House.

Schooling/Training
• Swarthmore College
• Massachusetts Institute of Technology
• Summer at Cold Spring Harbor Laboratories

Interesting Fact
He researched how cancer-causing RNA viruses manage to infect a healthy cell.

Description
David Baltimore was interested in Biology when he was in high school and since he spent a summer at Jackson Memorial Laboratory.

ILYA IZITCH METCHINKOFF

Awarded the Nobel Prize in medicine or physiology in 1908 because he demonstrated that certain body cells move to damaged areas of the body where they consume bacteria. The process is called phagocytosis. Proposed a theory of cellular immunity.

SCHOOLING
Went to school at Warhoff and was passionately interested in natural history. Also completed college in 2 years (University of Kharkoff)

INTERESTING FACT:
Was going through a tough time, and decided to try to kill himself by taking a large dose of OPISM. Luckily he survived!

DESCRIPTION
Had long hair and an unkempt beard. Wore overcoats, and carried an umbrella. His pockets were overfilled with scientific papers and he always wore the same hat.

Craig Venter

Born October 14, 1946 in Salt Lake City, Utah

In 1995, he elucidated the first complete genome sequence of a microorganism: *Haemophilus influenzae*.

In 2000, he deciphered all of the 3.1 billion "letters" that make up human DNA.

Craig Venter got his PhD in Physiology and Pharmacology from the University of California.

Venter worked for a decade to decipher all of the 3.1 billion "letters" in DNA!



Venter was very determined. He said he'd finish a project two years before he was supposed to and he did. He was also a teacher while he worked, which showed he cared about other things besides his work and it also showed that he likes to share his results.

Edward Tatum
December 14, 1909 Boulder, Colorado
November 5 1975 New York, New York

Most Notable Accomplishments

-He shared the 1958 Nobel Prize in Physiology or medicine with G. W. Beadle and Joshua Lederberg.

- In 1958 helped discover that genes act by regulating definite chemical events.

-Earned his Doctorate from the University of Wisconsin in 1934.

School or special training

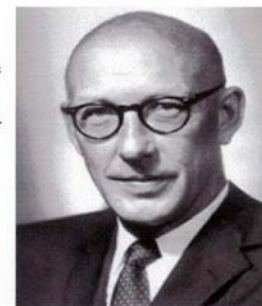
University of Chicago, Stanford University, Yale University, University of Wisconsin and Rockefeller Institute for Medical Research.

Description of Microbiologist

Edward Tatum is married and has two kids. He is a professor and educator at Rockefeller University.

Interesting Fact

Edward Tatum received the Remsen Award of the American Chemical Society in 1953.





List of Famous Microbiologists

Oswald Avery	David Baltimore
George Beadle	Emil von Behring
Martinus Beijerinck	Herbert Boyer
Sydney Brenner	Thomas Brock
Elizabeth Bugie Gregory	Annie Chang
Martha Chase	Stanley Cohen
Ferdinand J. Cohn	Rebecca Craighill Lancefield
Francis Crick	Max Delbruck
Gerhard J. Domagk	Hendrick Jean Louis Donker
Paul Ehrlich	John Franklin Enders
Alice Catherine Evans	Alexander Fleming
Giralamo Fracostoro	Claire Fraser
Robert Gallo	Walter Gilbert
Hans Christian J. Gram	Fredrick Griffith
Robert Helling	Alfred Hershey
Dmitri Ivanowski	Louis Jablot
Francois Jacob	Holger Jannasch
Edward Jenner	F.L. Kilbourne
Shibasaburo Kitasato	Albert Jan Kluyver
Robert Koch	Georg Kohler
Joshua Lederberg	Antonie van Leeuwenhoek



Joseph Lister

Colin MacLeod

J.H. Matthaei

Matthew Meselson

Cesar Milstein

Jacques Monod

Kary Mullis

Louis Pasteur

Julius Richard Petri

Stanley Prusiner

Francis Reyton Rous

Carmen Sanchez

Albert Schatz

Kiyoshi Shiga

Theobald Smith

Wendell Stanley

John Tyndall

Craig Venter

James Watson

Maurice Wilkins

Carl Woese

Norton Zinder

Salvador Luria

Luc Montagnier

Maclyn McCarty

Ilya Ilich Metchinkoff

Peter Mitchell

Ruth Ella Moore

Marshall Nirenberg

David Perrin

Margret Pittman

Walter Reed

Howard Ricketts

Fredrick Sanger

Ignaz Semmelweis

Hamilton Smith

John Snow

Edward Tatum

C.B. van Neil

Selman Waksman

Thomas H. Weller

Sergei Winogradsky

Charles Yanofsky



List of Famous Microbiologists
(for one class, add from the main list as necessary)

Robert Koch	Joseph Lister
Louis Pasteur	Martinus Beijerinck
Sergei Winogradsky	Alexander Fleming
Selman Waksman	Hans Christian J. Gram
Julius Richard Petri	Thomas Brock
Edward Jenner	Antonie Van Leeuwenhoek
Howard Ricketts	Robert Gallo
Ronald Ross	Walter Reed
Elizabeth Bugie Gregory	C.B. van Neil
Ilya Ilich Metchnikoff	Albert Schatz



Branches of Microbiology

Bacteriology

Virology

Mycology

Protozoology

Epidemiology

Immunology



Name _____

Date _____

What is Microbiology?

In this activity you will be researching a microbiologist who has made an important contribution to the study of microbiology. You will then compile your findings into a data page which will be used to create a timeline of the major milestones in microbiology. Next you can choose an area of microbiology to research and find out about the scientists who are carrying on that type of research today.

Use this sheet to help you in your research before putting together your piece of the timeline. You may use books and internet sites, but you must record these sources. Here are some sites to try:

<http://www.historique.net/microbes/history.html>

<http://www-micro.msb.le.ac.uk/109/History.html>

http://www.microbes.info/resources/General_Microbiology/History/

http://www.microbeworld.org/hm/aboutmicro/timeline/tmln_0.htm

When researching your chosen area of microbiology, it is suggested that you start at <http://www.microbeworld.org>

Microbiologist _____

Birth/Death/location _____

Most notable accomplishments (including years)

Schooling or special training _____

Interesting Fact _____

Description of person _____



Use this format for organizing your microbiologist's information

Name of Microbiologist

Birth & Location

Death & Location

Most Notable Accomplishments
(be sure to include years)

Use this space to draw a picture of your microbiologist or a drawing of his/her work.

Schooling / Special Training

Description of Microbiologist

Interesting Fact



Name _____

Date _____

What is Microbiology

Microbiology Today Research Form

Use this form to record your findings on the microbiologists of today.

Branch of Microbiology _____

Brief description of this branch _____

How this branch is important in today's world? _____

Name of current researcher in this field _____

Born/location _____

Education/Special Training _____

Most notable accomplishments _____

Interesting Facts _____

List all of your sources on the back of this page!