

# MICROBIOLOGY

## INTRODUCTION

### What is Microbiology?

Microbiology is the study of living creatures too small to see with the naked eye. This division of biology includes the study of bacteria, fungi, protozoa, algae, viruses and other important invisible creatures.

### Why Study Microbiology?

No living creature can separate itself from interactions with microbes. We use them to help create pharmaceuticals, clean up hazardous waste, and make food products. They can also wreak havoc on all creatures by invading them and causing disturbance and infection. Understanding the way they function is vital to life on earth.

## HISTORY OF MICROBIOLOGY

**1820** Deodorants used to reduce putrefaction. Sodium hypochlorite used in Parisian morgues to reduce decay.

**1840** Ignaz Semmelweis, a Viennese physician, was supervising medical students in the maternity wards when he noticed a correlation between putrefaction in autopsy and puerperal fever in pregnant women. He also noticed that some physicians found higher rates of puerperal fever in their patients. He, along with Oliver Wendell Holmes in the US, suggested that all of the physicians wash their hands between patients. Few complied and many more women died in childbirth.

**1850** Louis Pasteur, a very bright brewer trying to make the best beer in France, noticed that it was microorganisms that fermented sugar to alcohol. When incorrect microbes were in the mixture, undesirable products resulted. He proceeded to culture bacillus anthracis and proved it to be a causative agent of the disease anthrax.

**1860** Joseph Lister, an English surgeon, using data gathered in operating rooms and from old bandages he picked up in the dumpsters outside hospitals, proposed that infections were due to "germs." Found around patients. He began to use carbolic acid (phenol) to wrap wounds and to spray the air around the patient, which killed what he called "septic germs." His work went unappreciated for years.

**1890** Robert Koch, a German physician, continued on Louis Pasteur's work. He established that anthrax bacteria was always present in infected blood, that the infected blood could transmit anthrax, and the bacteria was isolatable outside the animal.

**1940** Alexander Fleming discovered penicillin and used it to cure various diseases. Along with Ernst Chain and Howard Florey, he developed a production process.

**1950** Joshua Lederberg, Edward Tatum, and George Beadle discovered and worked on genetic recombination in bacteria.

**1960** Francois Jacob and Jacques Monod discovered and elucidated control of enzyme synthesis. They are credited with the Lac Operon model of genetic control of enzyme synthesis.

**1980** Michael Bishop and Harold Varmus discovered that virus-encoded oncogenes originate in eukaryotic cells.

**1985** Kary Mullis invents PCR, polymerase chain reaction, a technique to amplify any DNA sequence.

**1997** Stanley Prusiner is awarded Nobel Prize for work on prions, "infectious proteins."

## THE FIVE KINGDOMS

### Monera

Includes bacteria and cyanobacteria

### Protista

Includes dinoflagellates, amoeba, ciliates, heliophytes, diatoms

### Fungi

Includes basidiomycetes, ascomycetes, yeast, slime molds, and other members

### Plantae

Includes green algae, mosses, liverworts, ferns, angiosperms, gymnosperms

### Animalia

Includes mollusks, arthropods, worms, vertebrates, insects

## TYPES OF INFECTIVE AGENTS

Bacteria	Mycoplasmas	L. Forms
Fungi	Rickettsias	Viruses
Viruses	Spirochetes	Prions
Protozoa	Chlamydiae	DNA/RNA

## HOW PROKARYOTES AND EUKARYOTES DIFFER

### PROKARYOTES

No nucleus  
Simple membrane  
One chromosome  
Bacteria - Bluegreen algae  
Small diameter / 1-5um  
No organelles  
Ribosomes are 70S  
Simple flagella  
Conjugation, transduction, transformation  
peptidoglycan in cell wall



### EUKARYOTES

True nucleus  
Complex, invaginated membrane  
Multiple chromosomes  
Algae/fungi/protozoa  
Large diameter / 10-100um  
Organelles  
Ribosomes are 80S and 60S  
9 x 2 microtubular flagella conjugation  
No peptidoglycan



## THE CELL THEORY

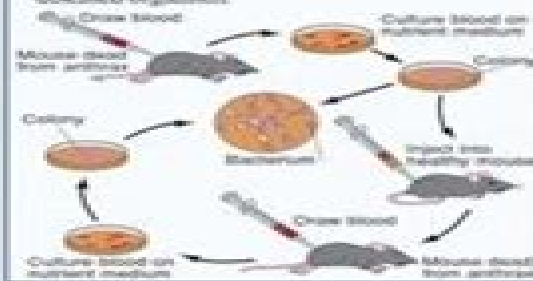
The cell theory, first put forth in the 1800's, has three main premises and states:

- All living things are made up of one or more cells.
- The cell is the basic unit of life.
- All cells come from pre-existing cells. A microbe can be one cell or a cluster or colony of cells that work together. Some pathogens are just infective pieces of RNA or DNA.

## KOCH'S POSTULATES

To Prove A Microorganism Causes Disease:

- Identical microbe must be present in all individuals with the same disease.
- Microbe must be cultured outside the body.
- Microbe must induce disease when given to same species.
- Identical microbe must be isolated from newly diseased organism.



## FOOD BORNE PATHOGENS

### VIRUSES

Norwalk  
Polio  
Coxsackie  
Echovirus  
Hepatitis A

### FUNGI

Aspergillus

### PROTOZOA

Entamoeba  
Giardia  
Toxoplasma  
Cryptosporidium  
Balantidium

### HELMINTHS

Trichina  
Taenia  
Tricostema  
Nematodes

### BACTERIA

Gram Positive Genera	Gram Negative Genera
Bacillus	Escherichia
Clostridia	Salmonella
Listeria	Klebsiella
	Proteus
	Shigella
	Enterobacter
	Pseudomonas
	Campylobacter
	Serratia
	Bacteroides
	Brucella

### GRAM NEGATIVE VS GRAM POSITIVE

Food Borne Bacterial Symptoms  
**Gram Positive (Usually Produce Toxins)**  
Headache, dizziness, uncoordinated movements, numbness and muscle incoherence  
**Gram Negative (Usually Result in Infection)**  
Abdominal cramps, nausea, vomiting, diarrhea, hemorrhagic stool, vomiting and nausea

# Microbiology Study Guide On

**Melanie Harris**



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**Microbiology Study Guide** Lansing M. Prescott,John P. Harley,Donald A. Klein,2004-02 This is an introduction to the major areas of microbiology and is designed for students of medicine dentistry nursing and allied health Knowledge of biology and chemistry are prerequisites There is updated coverage in this edition of clinical microbiology with corresponding photographs **Microbiology** Speedy Publishing,2014-09-04 A Microbiology study guide is a learning resource that is recommended to be used in a microbiology course The study guide is used in correspondence with the course textbook the material matching what is found in the textbook and in the course Microbiology study guide includes important definitions flash cards study games and diagrams to help learn the material in your course The study guide can contribute to your success in microbiology by focusing on the important material you need to know to learn the material and to pass the exams The study guide can help to boost your grade to the next level *Student Study Guide to accompany Microbiology: Principles and Explorations, 6th Edition*

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**Fund of Microbiology** Jeffrey C. Pommerville, 2007-01-01 *A Study Guide in Microbiology for Non-Majors* Melanie Harris, 2018-05-22 **Study Guide to Accompany Microbiology, Fourth Edition** George A. Wistreich, 1984 Alcamo's Fundamentals of Microbiology Jeffrey C. Pommerville, 2004 Pommerville biology and microbiology Glendale Community College provides new infectious disease coverage with material on mad cow disease SARS and West Nile fever plus a new chapter on genetic engineering and bacterial genomics for this seventh edition of a text for introductory microbiology courses that emphasize the biology of human disease MICROBIOLOGY National Learning Corporation, 2019

**Microbiology - Biology 221** Robert Hairston, 2019-10-28 *Basic Microbiology* R. Wilson Gorham, Wesley A. Volk, 1992-01-01 **Microbiology Essentials** Lauren Gross, Tammy McCormick, 2013-01-01 REA's Essentials provide quick and easy access to critical information in a variety of different fields ranging from the most basic to the most advanced As its name implies these concise comprehensive study guides summarize the essentials of the field covered Essentials are helpful when preparing for exams doing homework and will remain a lasting reference source for students teachers and professionals Microbiology includes the history of microbiology equipment and techniques diversity of microorganisms genetics metabolism transport of molecules role of microbes in disease microbes in the environment and microbes in industry

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