Why are microbes so fascinating?

Lecture

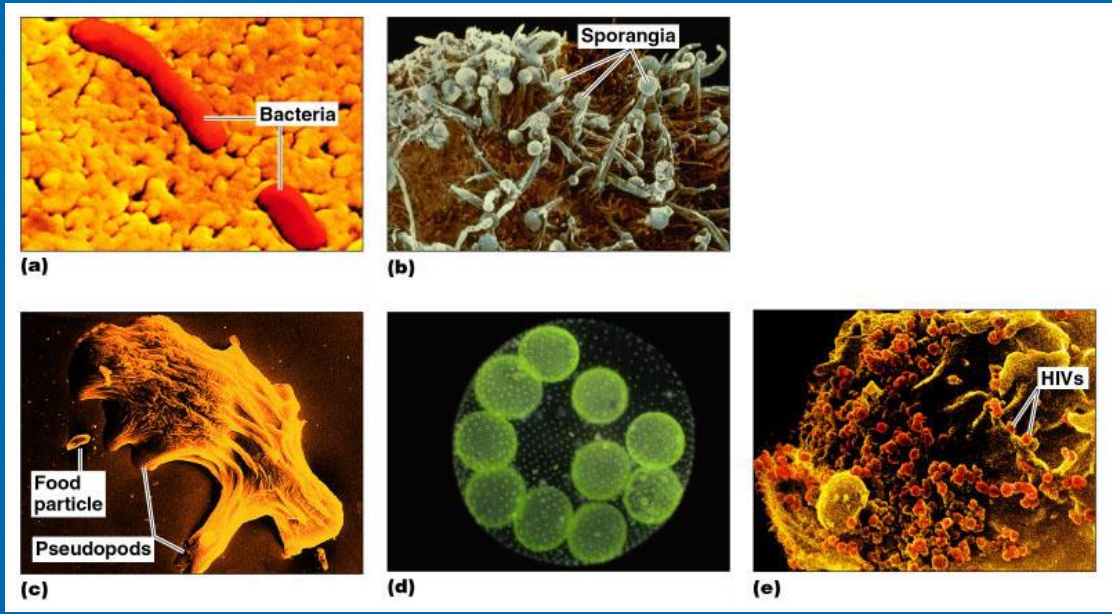
Why study microbes?
Naming and categorization

Lab

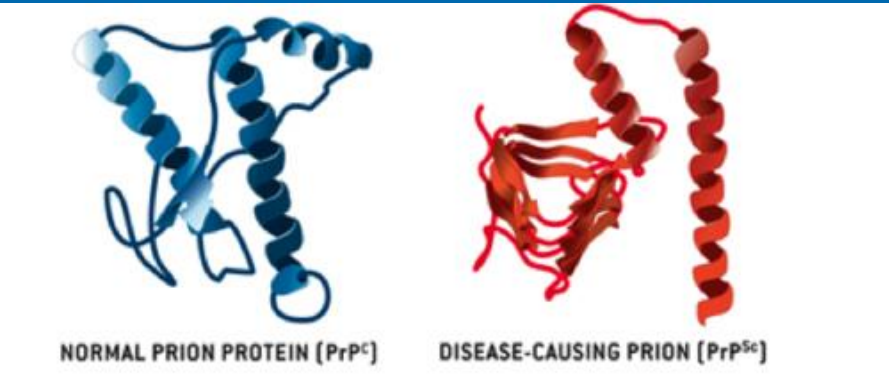
Introduction
Microscopes and measurements

Pre-lab

Aseptic technique
Microbes in the environment



What is a “microbe”?

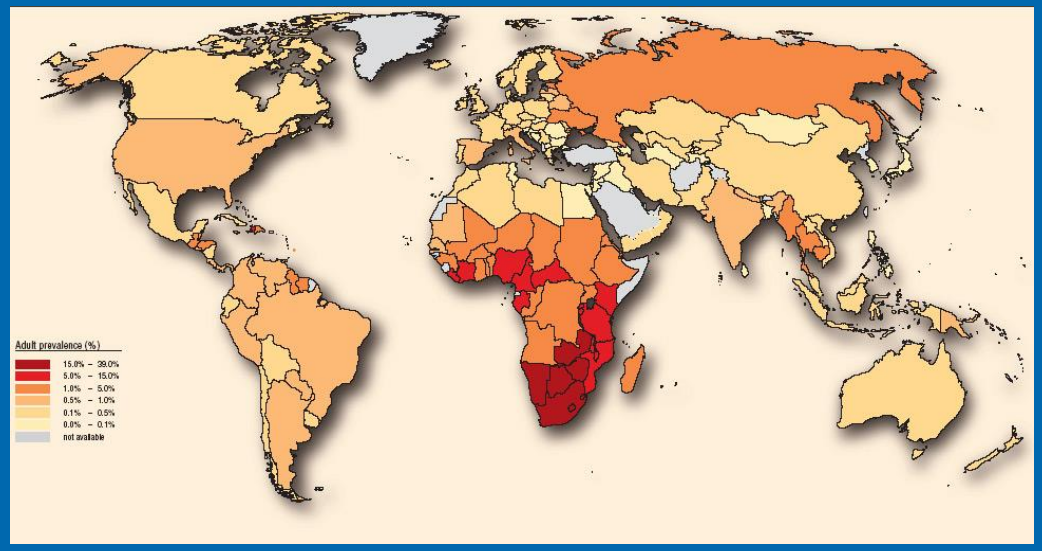


Why study them?

Why study them?

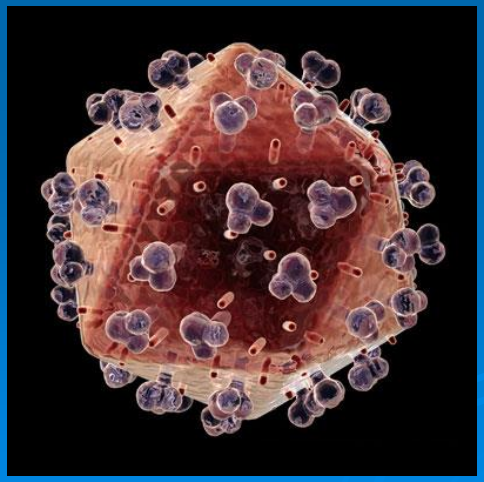
#1 INFECTIOUS DISEASE

Disease Case #1: > 36 million infections since 1959



Worldwide distribution

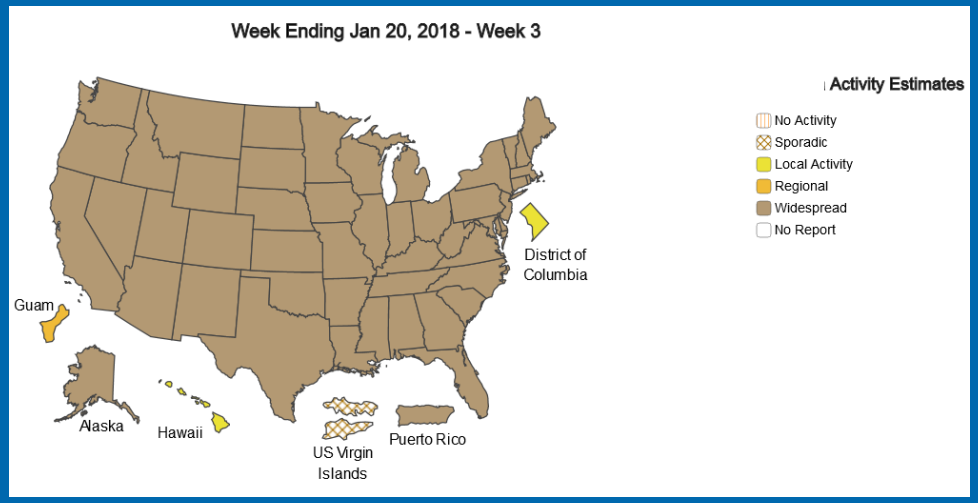
Symptoms



The Microbe

Animal reservoir/ host

Disease Case #2: epidemic and pandemic status



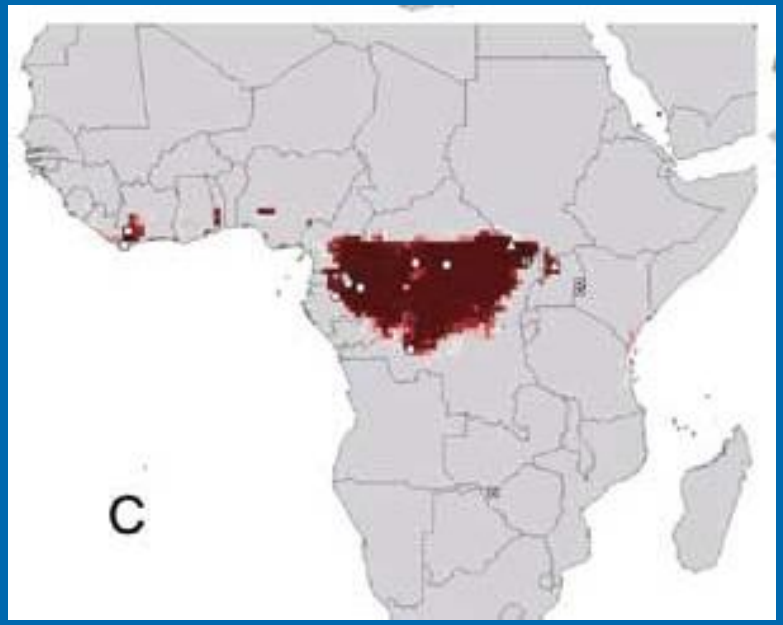
US distribution

Symptoms

The Microbe

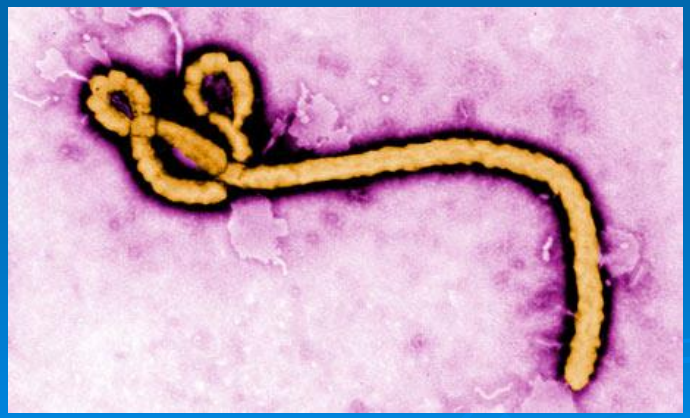
Animal reservoirs

Disease Case #3: 29 outbreaks since 1976



Primary distribution prior to 2014

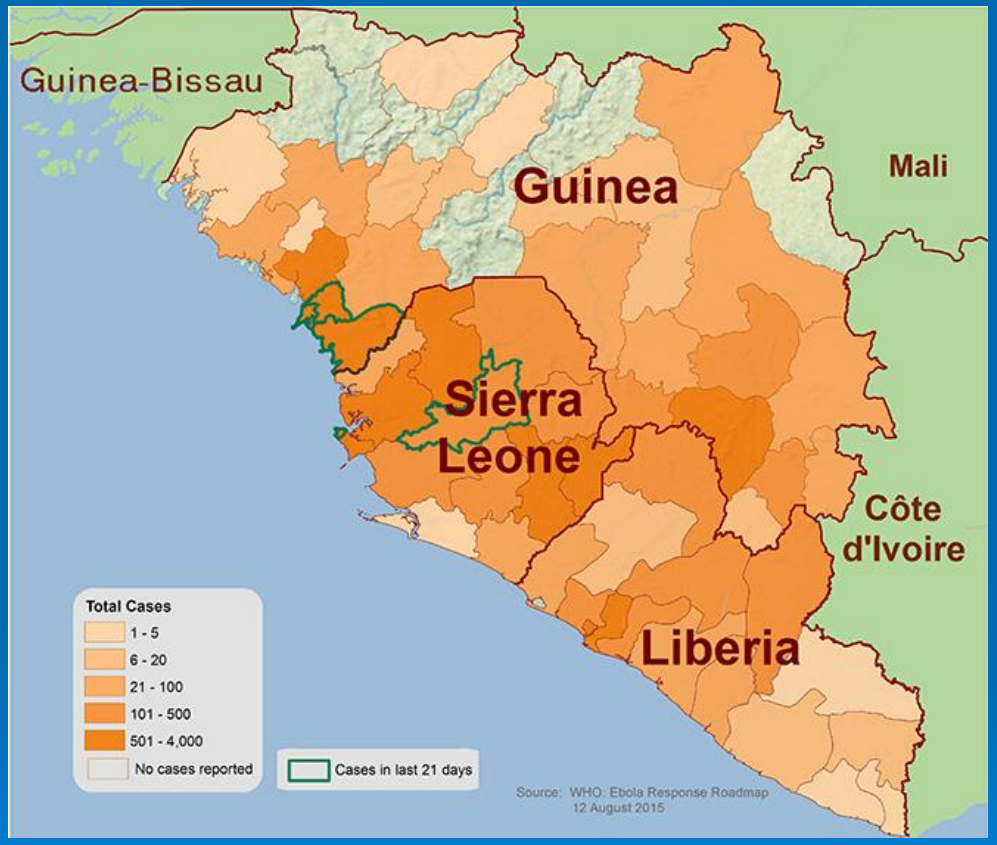
Symptoms



The Microbe

Animal reservoirs/ hosts?

2014/15 Ebola Outbreak in West Africa



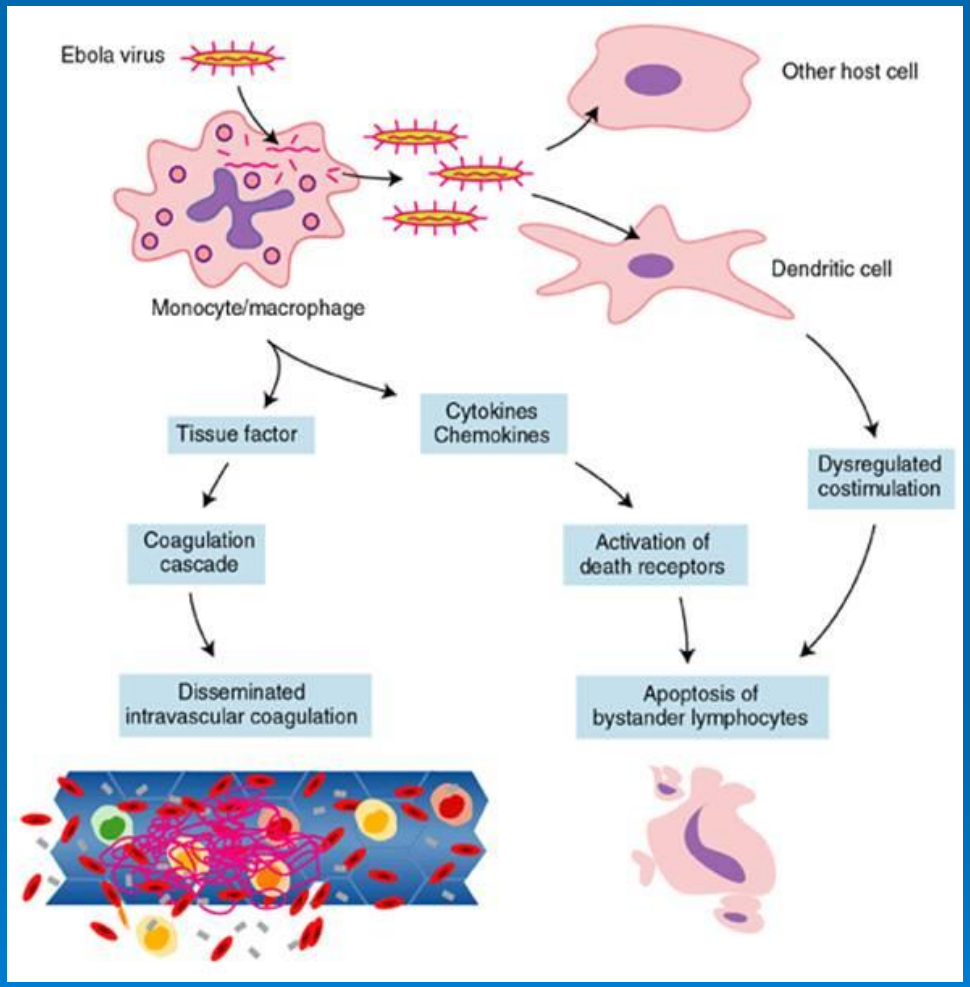
2014/15 Outbreak

Status as of 8/12/15:

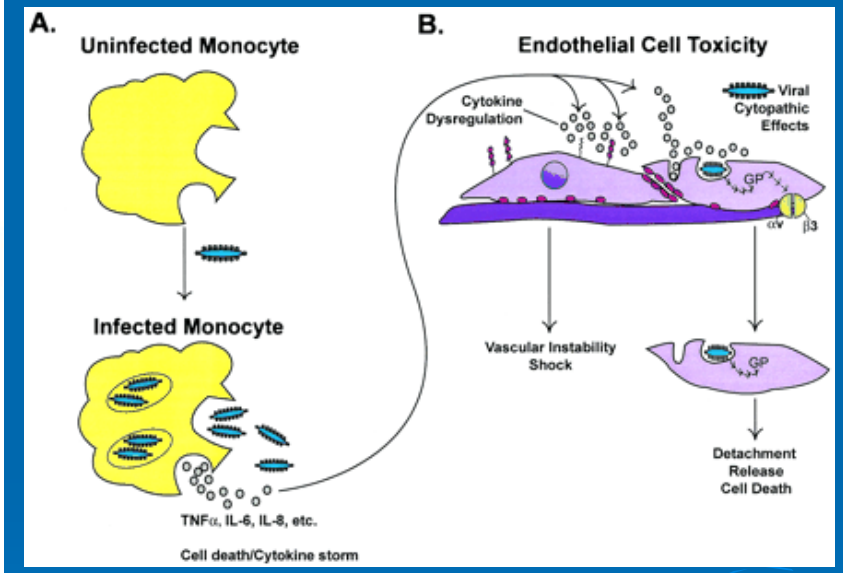
Suspected/confirmed cases
30,952

Suspected case deaths
11,284

Ebola HV: the paradoxical virus



Death from catastrophic thrombosis



Death from massive hemorrhage

Similarities?

- All are viruses

- All are **zoonoses**: diseases transmitted through an animal reservoir

- All have occurred with alarming frequency in the past 50 years and represent…

Emerging infectious diseases (EIDs)

-**Definition:** **New or changing diseases that are increasing in incidence or have potential to increase in the near future**:

For example:

- Avian influenza A (H5N1) and swine flu (H1N1)
- Invasive Group A *Streptococcus*- "flesh eating" bacteria
- Methicillin-resistant *Staphylococcus aureus* (MRSA)
- Hypervirulent drug-resistant *Clostridium difficile*

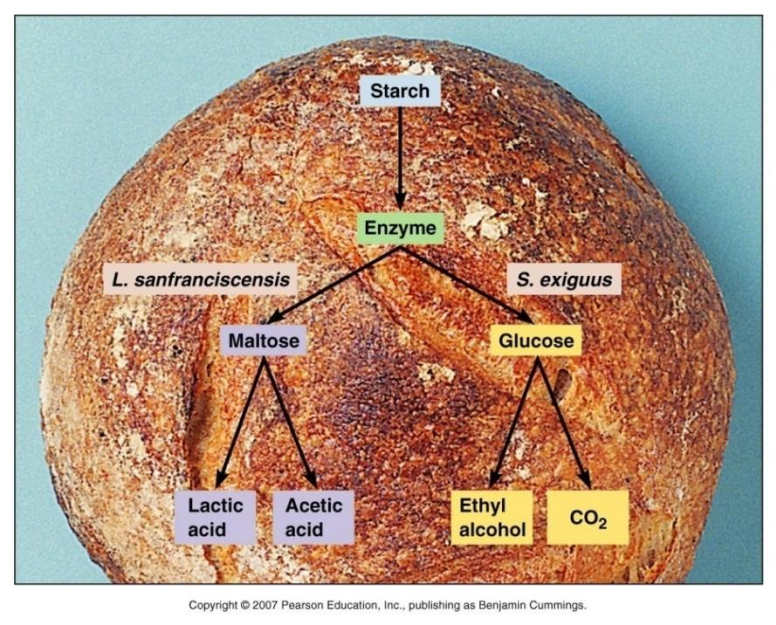
Why are we seeing so many EIDs in the past half century? (APO-1)

How do we study and keep track of all these diseases?

-Epidemiology: the branch of science that deals with the incidence, distribution, and possible control of diseases and other factors relating to health (CDC, MMWR, ISID, etc.)

#2 Biotechnology

Example: Chemical and food production



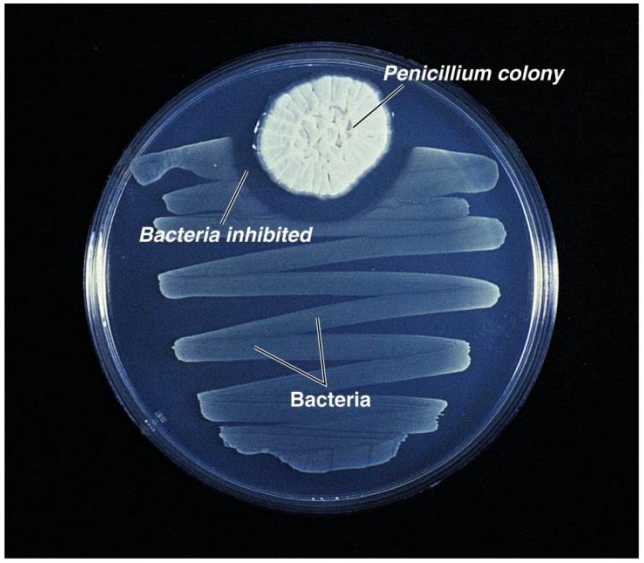
#2 Biotechnology

Example:

Chemotherapy: treatment of disease with a chemical

1. **Synthetic drugs-** man-made chemicals
2. **Antibiotics-** microbe-made chemicals

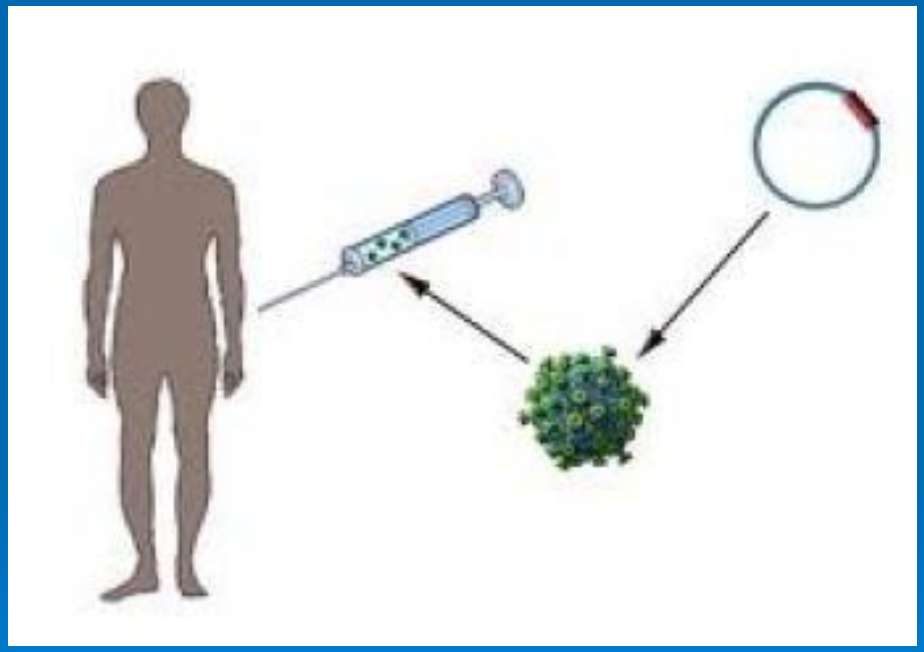
   Ex. Alexander Fleming's penicillin from *Penicillium notatum*

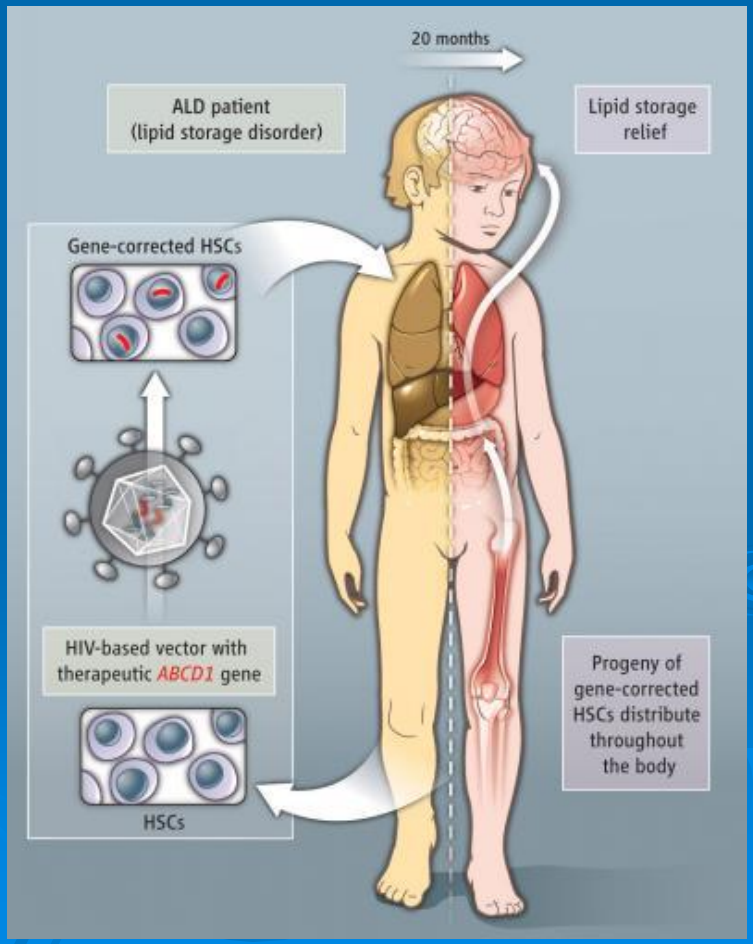


#2 Biotechnology

Example:

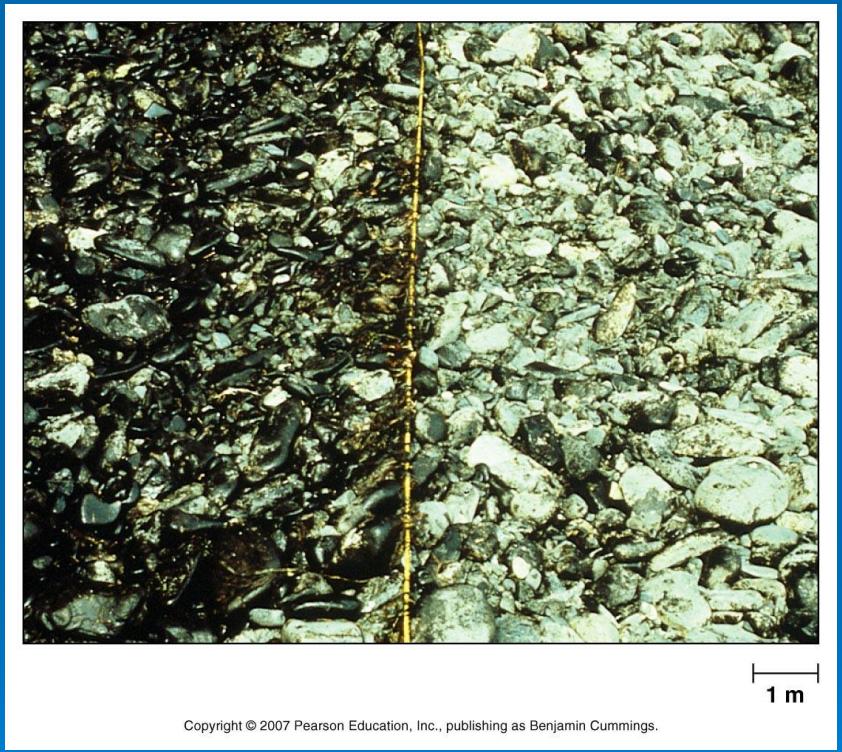
Genetic manipulation: using genes from/in microbes (for example in gene therapy and genetic engineering)





#3 Environmental role

Bioremediation- use of microbes or their enzymes to degrade, detoxify, or otherwise decontaminate environmental hazards



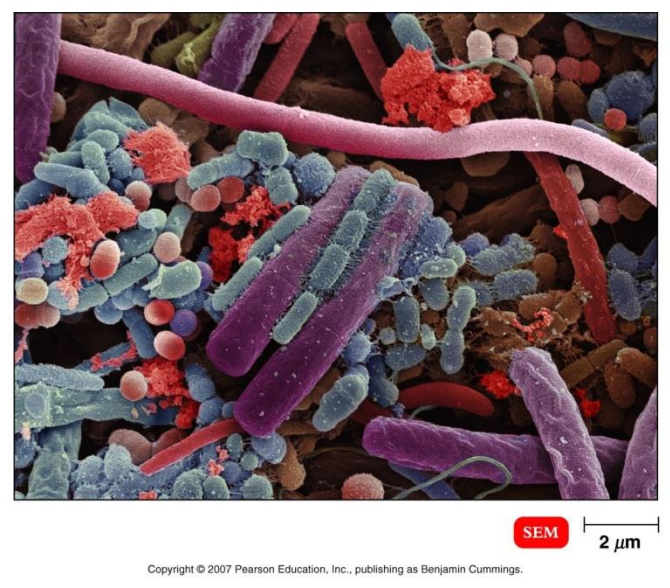
Pseudomonas spp. metabolize oil spill on Alaskan shore

#4 Human health

Microbiota= the microbes that live in and on our bodies

Maintain health: intestinal and vaginal tracts, skin

Cause disease: oral microbiota, overuse of antibiotics, opportunistic pathogens



Naming- Binomial nomenclature

1730s Carolus Linnaeus

ALWAYS *italicize (when word processing/ printing)* or underline (when handwriting) genus and species names

Genus species or G. species
Escherichia coli or E. coli
Staphylococcus aureus or S. aureus
Rickettsia rickettsii or R. rickettsii

Categorization

Domains of Life	Kingdoms of Life
Archaea	Archaea
Bacteria	Bacteria
Eukarya	Protista (or Protoctista)
	Fungi
	Plantae
	Animalia

Independent Learning

1. Complete "APO-1: Microbiology- past and present" and turn in on Monday 2/4. This is the first Additional Point Opportunity (APO) and is an individual assignment. You can access APO-1 on my website:
https://www.sdmiramar.edu/faculty/lmurphy

2. Review Chapters 2 and 4 for the basic chemistry and biology principles you would have learned in your pre-requisite courses. Pre-requisite quiz is on Wednesday 1/30.