

## SECTION 18.5 - Prokaryotes perform important functions for organisms and ecosystems.

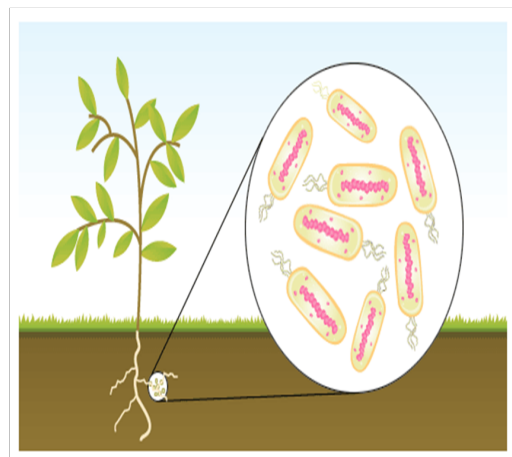
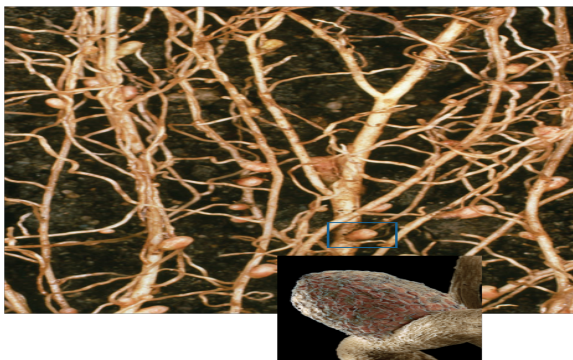
- Bacteria help to *provide nutrients* to humans and other animals, to *fertilize* fields, to *recycle* nutrients on Earth, and to produce *foods* and *medicines*.

### A. Prokaryotes live in digestive systems of animals

1. Make *vitamins* like Vitamin K and some B
2. *Break down food*, i.e. cellulose in some animals

### B. Nitrogen Fixation

1. All organisms need *nitrogen* because the element is a component of their **proteins, DNA, RNA, and ATP**. Yet, few organisms can directly use nitrogen from the *atmosphere*.
2. Several species of bacteria have **enzymes** that convert  $N_2$  into **ammonia** in a process known as **nitrogen fixation**.
3. Some nitrogen-fixing bacteria live *symbiotically* within the roots of some *plants*.



### C. Recycling of nutrients

• *Life* could not exist if *decomposing* bacteria did not break down the organic materials in *dead* organisms and wastes, returning *nutrients* to the environment. Autotrophic organisms use the nutrients in the **food** they make.

### D. Food and Medicines

1. Some foods that you eat would not exist without bacteria.  
EX: **Cheese, pickles, yogurt**
2. During *respiration*, different bacteria produce diverse *products*, many of which have distinctive *flavors* and aromas.
3. Some bacteria produce important *antibiotics*.



### E. Prokaryotes play important roles in ecosystems.

**Bioremediation** uses prokaryotes to break down pollutants.

-*oil spills*

-*biodegradable materials*



## SECTION 18.6 Understanding bacteria is necessary to prevent and treat disease.

### I. Bacteria cause disease

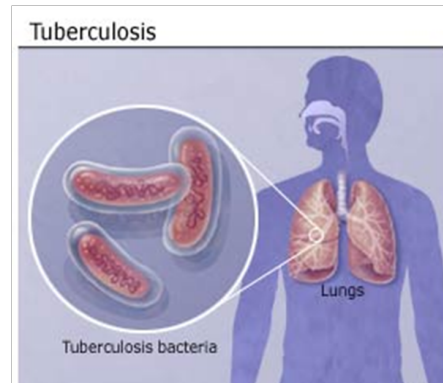
1. Bacteria cause diseases in *plants* and *animals*, causing crops and livestock losses that impact *humans* indirectly.
  2. Bacteria cause many *human* diseases.
  3. Disease-causing bacteria can enter human bodies through *openings*; they are carried in *air, food*, and *water*.
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4. Bacteria can harm *people* in two ways:
    - a. The growths of the bacteria can *interfere* with the normal *function* of body *tissue*.
    - b. It can release a *toxin* that directly attacks the body.



## II. Bacterial Infection Details

### 1. Tuberculosis

- Mycobacterium tuberculosis* bacteria multiply in the lungs **kill white blood cells**.
- Host responds to the infection by releasing enzymes that cause **swelling**
- Damages** the host's lungs.



### 2. Staph Poisoning

- Staphylococcus aureus* can be transferred to food when food handlers **don't wash their hands**
- Can cause serious **food poisoning** called Staph Poisoning

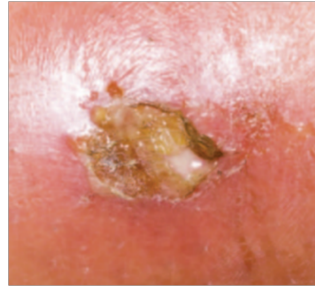
### 3. Botulism

-illness caused by the eating of **improperly canned foods** that were contaminated with **endospores** of *Clostridium botulinum* before being sealed



#### 4. Flesh Eating Infection

-caused by *Streptococci* bacteria that **colonize tissues** they do not usually encounter through a cut, scrape, or surgical incision.



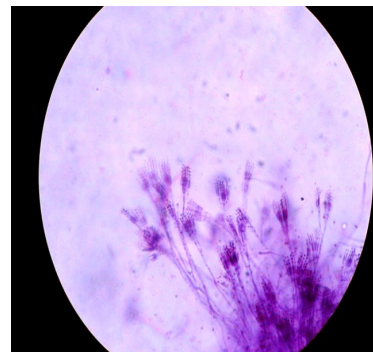
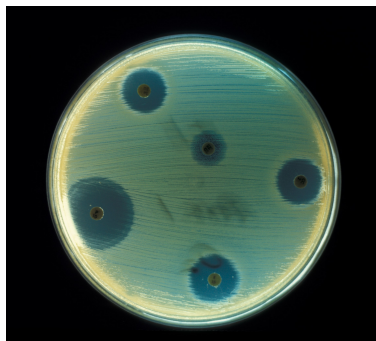
- Look at chart on pg. 548.

INFECTION	BACTERIUM	SYMPTOMS	CAUSES
Acne	<i>Propionibacterium</i>	chronic cysts, blackheads	increased oil production in skin
Anthrax	<i>Bacillus anthracis</i>	fever, trouble breathing	inhaling endospores
Lyme disease	<i>Borrelia burgdorferi</i>	rash, aching, fever, swelling of joints	bite from infected tick
Tetanus	<i>Clostridium tetani</i>	severe muscle spasms, fever, lockjaw	wound contaminated with soil
Tooth decay	<i>Streptococcus mutans</i>	tooth cavities	large populations of bacteria in mouth

### III. Antibiotics are used to fight bacterial disease.

-In 1928, Sir **Alexander Fleming** accidentally discovered penicillin, the first **antibiotic**.

- He accidentally discovered that the **mold** *Penicillium notatum* secreted a substance that **killed** the bacteria.
- Penicillin can **interfere** with the ability of some bacteria to make cell **walls**, water then enters the cell and bacteria cell **ruptures** and dies.
- Antibiotics **do not work on viruses**.



## IV. Bacteria can evolve resistance to antibiotics.

### -Antibiotic Resistance

#### a. Overuse

Using **antibiotics** when bacteria *are not causing an illness*  
 May create an environment that may make some bacteria **resistant to antibiotics** through exposure

#### b. Underuse

Failure to take the *entire course* of antibiotics may just **kill the weak** bacteria  
 Allows the *stronger* bacteria to survive

#### c. Misuse

When antibiotics are **added to the food** of healthy animals, bacteria within the food—including *pathogens*—can **become resistant** to multiple antibiotics

