Chapter 20 Notes - Viruses and Prokaryotes Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Period \_\_\_\_\_\_\_

**20-1 VIRUSES**

**\_\_\_\_\_\_\_\_\_\_**= A nonliving (?) particle made of proteins, nucleic acids, and sometimes lipids (fats)

* Viruses only reproduce by \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
* Most viruses can only be seen with an electron microscope
* The first virus isolated was the tobacco mosaic virus in 1935

Structure of Viruses

- **\_\_\_\_\_\_\_\_\_\_\_\_\_** – protein coat surrounding the virus

- Genetic information – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

- Viruses have specific proteins that bind to the host cell. Because of this they infect

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** = Viruses that infect \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Viral Infections

* Inside living cells, viruses use their genetic information to make multiple copies of themselves. Some viruses replicate immediately (lytic infection), while others are inactive in the host (lysogenic infection).

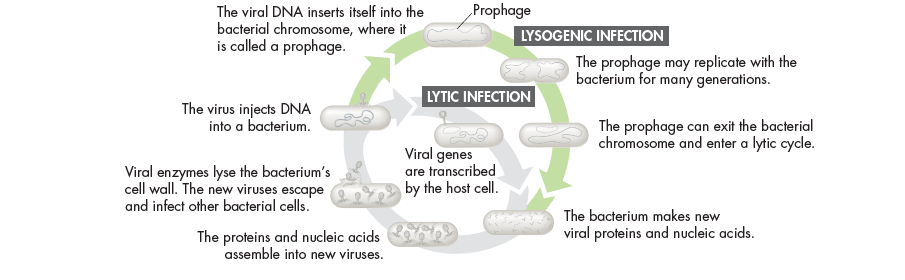
**\_\_\_\_\_\_ Infection** (ex. T4 bacteriophage) - the virus enters a cell, makes copies of itself and bursts the cell (lyse)

* + The virus injects its \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + The cell then begins to make \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (nucleic acid).
  + The viral nucleic acid and proteins are then assembled into \_\_\_\_\_\_\_\_\_\_\_\_ virus particles
  + Viral proteins lyse (\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_) the cell
  + New viruses can infect other cells

**Lysogenic Infection** - \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

* + In each cell division the new cell is infected with the virus
  + When bacteriophage DNA is imbedded in the host’s DNA it is called a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_
  + A trigger (heat, chemicals, radiation, etc) causes the prophage to remove itself from the host DNA and become a lytic infection.



RNA Viruses

* 70% of viruses have \_\_\_\_\_\_\_\_\_\_\_\_ instead of DNA
* RNA viruses cause colds, AIDS, cancer and others

The common cold

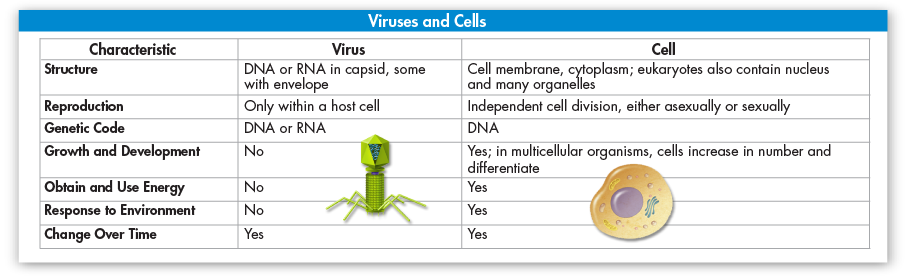
* The virus is brought in the host cell (nose, etc.)
* The host cell makes viral protein and RNA
* Within 8 hours the hose cell bursts and releases hundreds of new viruses

HIV

* HIV is a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_– the genetic information is copied from the RNA to DNA
* The viral DNA remains inactive for many cell divisions
* When activated, the viruses damage the host’s immune system.

VIRUSES vs. CELLS

* Viruses have many characteristics of cells
* Viruses depend on living things and therefore were not likely to be the first living organisms.



**PROKAYROTES**

**Prokaryote** –\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (DNA is found in the cytoplasm)

2 Domains of prokaryotes

1) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-Live almost everywhere (fresh and salt water, land, other organisms

-Have a cell wall made of peptidoglycan (sugar and amino acids)

-some have flagella and second cell membrane

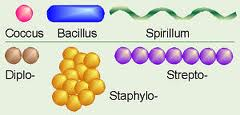
2) \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-DNA is more similar to eukaryotes

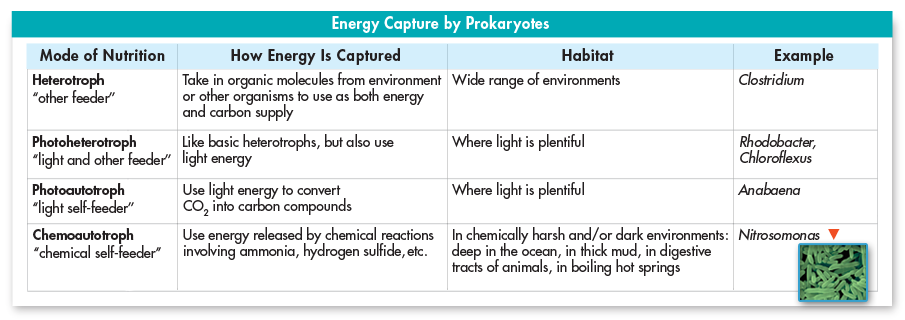
-many live in \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_environments (digestive tract, hot spring)

Structure and Function

* Prokaryotes vary in their size and shape, the way they move and the way the use energy
* Shapes –



* Movement
  + Some don’t move
  + Flagella
  + Move in slime they make
* Obtaining Energy



Growth and Reproduction

* **Binary fission** – a prokaryote replicates its DNA and divides in half, producing two identical cells
  + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ reproduction
  + Can occur every \_\_\_\_\_\_\_\_ minutes

- **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – a structure produced in unfavorable conditions

- A thick internal wall encloses the DNA and cytoplasm

How do prokaryotes evolve?

- **Mutation** – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-passed on to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-one of the main way prokaryotes evolve

- **Conjugation** – \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-increases genetic diversity

-many times a gene that enables the bacteria to live in a new environment is transferred in form of a \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ (circular piece of DNA)

The Importance of Prokaryotes

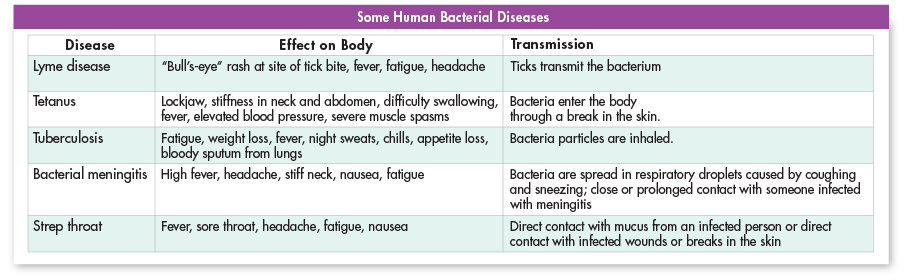
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – assist in breaking down dead organisms
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – food chains are dependent on bacteria for producing food
  + 1 cyanobacterium (*Prochlorococcus*) is the most abundant photosynthetic organism – makes over ½ of food in the open ocean
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Fixers – converts nitrogen into a form plants use (N2 to NH3)
  + 90% of the nitrogen organisms use comes from fixation
* Human Uses of Prokaryotes
  + Production of Food – yogurt, cheese, vinegar
  + Clean oil spills
  + Remove human waste and poison from water
  + Medicine – synthesize drugs – insulin, human growth hormone
  + Digestion
  1. **Disease**

Bacterial Diseases

* **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** = a virus or bacteria that causes disease
* Bacteria cause disease by

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ directly of cause tissue damage when they provoke an immune response from the host
   * + Tuberculosis (TB) is inhaled into the lungs and the immune response destroys tissue
2. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ that upset the normal activities of the host
   * + Botulism – food poisoning
     + tetanus – causes lockjaw, muscle spasms

Bacterial Diseases



Controlling Bacteria

* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – hand washing removes bacteria
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ - chemicals that kill bacteria
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – refrigeration/freezing slows the growth
* \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – boiling, frying, steaming kills bacteria
* Sterilization \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – kills bacteria

- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ – a preparation of weakened or killed pathogen or inactivated toxin

-The vaccine stimulates the body to produce immunity to a specific disease

- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_– block the growth and reproduction of bacteria

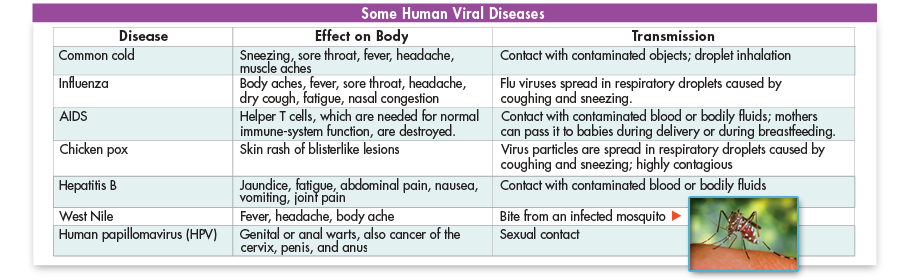
* + Disrupt proteins or cell processes specific to bacterial cells
  + Do not harm host’s cells

Viral Diseases

Viruses also cause disease by

1. \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cells directly

2) interrupting cellular processes



Prevention and Treatment for viral diseases

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

- \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

-wash hands

-avoid sick people

-cough into a tissue or sleeve

* + \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_DO NOT WORK for viral infections

- There are a handful of antiviral drugs - they speed recovery from flu/may reduce spread of HIV

Emerging Diseases

* + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** = an unknown disease that appears in a population for the first time or a well-known disease that has become harder to control
  + Pathogens that cause emerging diseases are threatening because humans have little or no resistance for them and control methods have not been developed
  + Human populations once isolated are now connected –quick spread of disease

Superbugs

* + Use of antibiotics has lead to bacteria that are resistant to antibiotics
  + Penicillin killed many infections in the 1940s when it was introduced. Now is has lost effectiveness
  + Bacteria that are resistant to penicillin reproduce and pass resistance on through conjugation
  + MRSA – skin infection spread by close contact

New Viruses

* + Genetic makeup of viruses changes quickly and allows a virus to jump form one species to another.
    - AIDS may have jumped from nonhuman primates
    - “Bird flu” is a concern because it may jump to humans and is similar to some of the most deadly human versions of the flu

Prions

* + **\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_** – protein particle that causes disease
    - misfolded proteins in the brain that cause a chain reaction of misfolding in other normal proteins they contact, clogging the brain tissue and causing disease.

Sheep – scrapies

Cow – mad cow