CHAPTER 18

VIRUSES AND BACTERIA

I. Viruses

A. Introduction

1. **Viruses are not alive** because they are not made of cells. Viruses don't have all the characteristics of living organisms.
2. Viruses replicate using host cells.
3. The names of viruses are often the tissue they infect or the disease they cause.

B. Virus Structure and Characteristics

1. **Inner Core** contains the hereditary material, either RNA or DNA. The instructions for making new viruses. Viruses have very few genes, some have as few as four genes.
2. **Outer Coat (capsid)** is made of protein and protects the viruses. Some larger viruses have an additional **envelope** on the outside of the capsid.

3. **Virus Diagram**

C. Viruses Replication (Reproduction)

1. **Attachment to the Cell**: first the virus as to attach to a receptor on the cell. Many viruses imitate materials the cells need. Viruses usually infect only one or a few species, they are very host specific.
2. **Lytic Cycle**: Once inside the virus's genes are expressed and virus takes over the cell immediately instructing the cell to make new viruses until the cell bursts. These new viruses infect other near by host cells.

3. **Lysosgenic Cycle**: After entering the host cell the virus inserts its DNA or RNA into the chromosome of the cell. The virus remains in active in the cell has the cell continues to divide normally. The virus can remain dormant for many years and later enter a lytic cycle causing the disease symptoms. EX: Shingles a painful infection of the nerve cells caused by the chicken pox virus.

D. Specialized Viruses
   1. **Retroviruses**: Nucleic acids made of RNA Once inside the virus makes DNA from its own RNA to insert into the host DNA. It uses an enzyme called reverse transcriptase to produce DNA from RNA. HIV is a retrovirus example.
   2. Retroviruses are one type of virus that cause cancer.

3. About 400 viruses infect plants causing 1000 plant diseases. Ex: Rembrandt tulips are caused by a non-harmful virus.
4. Viruses are not an early life form although they are simple. They need host cells to replicate, therefore they could have existed before the host.

II. **Archaebacteria and Eubacteria**

A. **Archaebacteria**

1. All live in extreme environments without oxygen.
2. **Methanogen** live in marshes, lake sediments, and the digestive systems of cows (most hoofed mammals). They breakdown materials to produce CH (methane) and extract energy. These bacteria are used to break down human sewage.
3. **Halophiles** live in very high salt environments such as the Great Salt Lake or Dead Sea. “halo” is latin for salt and “phil” is latin for loves.

B. **Eubacteria**

1. **Heterotroph** are bacteria that obtain nutrients from other organisms. Parasites if the organisms is alive and Saprophytes if the organisms is dead. most bacteria.
2. **Cyanobacteria** are photosynthetic bacteria that gather energy from sun light through photosynthesis.
3. **Chemosynthetic autotrophs** gather energy from inorganic molecules on the ocean floor without sun light. Non-photosynthetic producer.

C. **Bacteria Structure**

D. Bacteria reproduce by binary fission (asexual). They just divide making two identical cells that separate (mitosis like). Bacteria can reproduce very quickly (every 20 min.) , but without variation. Some bacteria can create variation through conjugation where they exchange part of their DNA with another bacteria.

E. Important Bacteria
    1. **Nitrogen fixing**: Some bacteria can convert N into NH . NH can be used by other living organisms and N cannot be.
    2. Bacteria are the main decomposers that break down dead organisms.
    3. **Food and Medicine**: Many foods use bacteria in the processing to create them such as cheeses, ice cream, yogurt, and pickles. Insulin and Human growth hormone are both made using bacteria to create the proteins.

4. Bacterial Diseases used to kill many people before the discovery of **antibiotics** in 1929. The average life expectancy has increased in the U.S. from 47 years to the current 75 years. Recently antibiotic resistant bacteria infections are on the rise.