Lecture 2

FUNCTIONAL ANATOMY OF THE PROCARYOTIC AND EUCARYOTIC CELL

COMPARISON OF PROCARYOTIC AND EUCARYOTIC CELLS

PROCARYOTIC

A. Chief distinguishing characteristic of prokaryotic cells

1. Lack membrane-bounded organelles including a nucleus.
2. Peptidoglycan is found in prokaryotic cell walls but not in eukaryotic cell walls.
3. Bacteria are unicellular and most multiply by binary fission.
4. Species are differentiated by morphology, chemical composition, nutritional requirements, biochemical activities, source of energy, and DNA/RNA sequences

Size

Most bacteria are from 0.20 to 2.0 μm in diameter and from 2-8 μm in length.

Shape

1. **Coccus** - spherical - May be oval, elongated or flattened on one side.
a. **Diplococci** - pairs after dividing
b. **Streptococci** - chains
c. **Tetrads** - groups of four

d. Sarcinae – cube-like groups of eight

e. Divide in multiple planes and form **grapelike clusters** or broad sheets.

2. Bacillus - rod-shaped
a. Single - Most
b. Diplobacilli - Pairs
c. Streptobacilli - Chains
d. Scattered - Chinese letters
e. Coccobacilli - Look like cocci
3. Spiral - one or more twists
a. Vibrios - curved rods
b. Spirilla - helical shape - corkscrew & rigid

c. Spirochetes - helical and flexible

STRUCTURES EXTERNAL TO THE CELL WALL

A. Glycocalyx – Capsule

B. Flagella

C. Axial Filaments

D. Fimbriae and Pili

THE CELL WALL

Consists of peptidoglycan, a polymer consisting of NAG and NAM and short chains of amino acids.

Gram positive - many layers + teichoic acid

Gram negative -few layers and outer membrane - Composed of lipoprotein, lipopolysaccharides, and phospholipids

STRUCTURE INTERNAL TO THE CELL WALL

1. These structures include **plasma membrane**, which encloses the cytoplasm (fluid component) the nuclear area, inclusions and endospores.The plasma membrane allows for materials to enter the cell into the cytoplasm where metabolic reaction necessary for life are carried out.
2. The nuclear area is composed of DNA where genetic information is contained. Also have small circular DNA molecules called **plasmids**
3. Ribosomes are sites of protein synthesis.
4. Inclusions include reserve deposits such as inorganic phosphate (metachromatic granules) or glycogen or starch (polysaccharide granules).
5. Endospores - Specialized "resting cells" formed in response to adverse conditions. Ex: Clostridium sp. and Bacillus sp.a.(Diameter can vary and can be terminally, subterminally, or centrally located).

THE EUCARYOTIC CELL

Chief Distinguishing Characteristics of Eucaryotes

1. Nucleus bounded by a membrane
2. DNA of chromosomes consistently associated with proteins called histones and non histones.
3. Possess mitotic apparatus, mitochondria, endoplasmic reticulum, and sometimes chloroplasts.

Structures External to Cell

Flagella and Cilia- Both used for motility.Flagella are few and long in relation to cell size; cilia are numerous and short.

The Cell Wall and Glycocalyx

1. The cell walls of most algae and some fungi consist of cellulose.

2. The main material of fungal cell walls is chitin.
3. Yeast cell walls consist of glucan and mannan
4. Protozoa have a flexible outer covering called a pellicle.
5. Animal cells have a sticky carbohydrate covering called a glycocalyx.

Q: Compare between Procaryotic and Eucaryotic Cells