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**Program**  BS (MLT) 6TH

**Subject**  clinical bacteriology

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**Date**  20-08-2020

Q1: Differentiate features of prokaryotic and eukaryotic cells.

Answer**; FEATURES OF PROKARYOTIC CELLS**

1. 1.DNA is:
   1. **Not** enclosed within a **nuclear** **membrane**.
   2. A **single** **circular** chromosome.
   3. **Not** associated with **histones** proteins.
2. **Lack** membrane-enclosed organelles like mitochondria, chloroplasts, Golgi, etc.
3. Cell walls usually contain **peptidoglycan**, a complex polysaccharide.
4. Divide by **binary fission**.

**FEATURES OF EUKARYOTIC CELLS**

1. DNA is:
   1. Enclosed within a **nuclear** **membrane**.
   2. **Several linear** chromosomes.
   3. Associated with **histones** and other proteins.
2. **Have** membrane-enclosed organelles like mitochondria, chloroplasts, Golgi, endoplasmic reticulum, etc.
3. Divide by mitosis.

Q2: Briefly discuss different shapes of bacteria

Answer; **Shape of bacteria**

* **Coccus** (plural: cocci): Spherical.
  + May have the following arrangements:
  + **Diplococci**: A pair of attached cocci.
  + **Streptococci**: Chainlike arrangement.
  + **Tetrads**: Groups of four. Divide in two planes.
  + **Sarcinae**: Groups of eight. Divide in three planes.
  + **Staphylococci**: Grapelike clusters. Divide in multiple planes.
  + **Bacillus** (plural: bacilli): Rod-shaped. Most bacilli appear as single rods but may see:
  + **Diplobacilli**: A pair of attached bacilli.
  + **Streptobacilli**: Chainlike arrangement.
  + **Coccobacillus**: Intermediate shape between coccus and bacillus. Oval rods.
  + **Spiral Bacteria**: Have one or more twists:
  + **Vibrio**: A comma shaped cell. Look like curved rods.
  + **Spirilla**: Helical, corkscrew shaped bacteria

Use whip like **external flagella** to move.

* **Spirochetes**: Helical bacteria with **flexible** bodies.

Use **axial filaments** (internal flagella) to move.

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* **Other less common shapes:**
* Star
* Flat and square
* Triangular
* **Pleomorphic bacteria**: Have several possible shapes. Found in a few groups:
* *Corynebacterium*
* *Rhizobium*
* Most bacteria are **monomorphic**: Maintain a single shape. However environmental factors may affect cell shape.

Q3: Differentiate gram negative and gram positive bacterial cell wall.

Answer;

**GRAM POSITIVE CELL WALL**

* Consist of **several** **layers** of **peptidoglycan**, which form a **thick**, **rigid** structure (20-80 nm).
* Also contain **teichoic acids**, which are made up of an alcohol and a phosphate group. Two types:
  + - **Lipoteichoic** **acids**: Span cell wall, linked to cell membrane.
    - **Wall** **teichoic** **acids**: Linked to peptidoglycan layer
* **Teichoic acids** are negatively charged and:
  + - Bind to and regulate movement of cations into cell.
    - Regulate cell growth and prevent cell lysis.
    - Can be used to identify bacteria.

**GRAM NEGATIVE CELL WALL**

* Cell wall is thinner, more complex and more susceptible to mechanical breakage than that of Gram-positive bacteria.
* Consist of one or a few peptidoglycan layers and an outer membrane.
* Peptidoglycan is bonded to lipoproteins in:
* Outer membrane
* Periplasmic space: Region between outer membrane and plasma membrane.
* Periplasmic space contains degradative enzymes and transport proteins.

**Outer membrane Consists of:**

* **Phospholipid bilayer**
* **Lipopolysaccharides** (LPS) with two components:
* **polysaccharides**: Antigens, used to identify bacteria.
* **Lipid A**: Endotoxin causes fever and shock.
* **Porins**: Membrane proteins that allow the passage of nucleotides, disaccharides, peptides, amino acids, vitamins, and iron.
* **Lipoproteins**

**Thank you!**