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Subject: Medical Microbiology

Midterm exam

Q#1:Illustrate what are the difference between prokaryotes and Eukaryotes?

Ans:Difference between Prokaryotic and Eukaryotic Cells:

Though these two classes of cells are quite different, they do possess some common characteristics. For instance, both possess cell membrane and ribosomes, but the similarities end there. The complete list of differences between prokaryotic and eukaryotic cells are summarized as follows:.

Prokaryotes

Type of Cell :	Always unicellular
Cell size:	Ranges in size from 0.2 μm – 2.0 μm in diameter
Cell wall:	Usually present; chemically complex in nature
Nucleus:	Absent. Instead, they have a nucleoid region in the cell
Ribosomes:	Present. Smaller in size and spherical in shape
DNA arrangement:	Circular
Mitochondria:	Absent
Cytoplasm:	Present, but cell organelles absent.
Endoplasmic reticulum:	Absent
Plasmids:	Present
Ribosome:	Small ribosomes
Lysosome:	Lysosomes and centrosomes are absent.
Cell division:	Through binary fission

Flagella:	The flagella are smaller in size
Reproduction:	Asexual
Example:	Bacteria and Archaea

Eukaryotes

Type of Cell:	Unicellular and multi-cellular
Cell size:.	Size ranges from 10 μm – 100 μm in diameter
Cell wall:.	When present, chemically simple in nature
Nucleus:	Present
Ribosomes:	Present. Comparatively larger in size
DNA arrangement:	Linear
Mitochondria:	Present
Cytoplasm:	Present, cell organelles present
Endoplasmic reticulum:	Endoplasmic reticulum
Plasmids:	Very rarely found
Ribosome:.	Large ribosomes
Lysosome:	Lysosomes and centrosomes are present
Cell division:	Through mitosis
Flagella:	The flagella are larger in size
Reproduction:	Both asexual and sexual
Example:	Plant and Animal cell

Q#2:What do you know about the Normal Flora? Write down the Advantages and disadvantages?

Ans:Normal Flora:

The normal flora influences the anatomy, physiology, susceptibility to pathogens, and morbidity of the host.

Skin Flora:

The varied environment of the skin results in locally dense or sparse populations, with Gram-positive organisms (e.g., staphylococci, micrococci, diphtheroids) usually predominating.

Oral and Upper Respiratory Tract Flora:

A varied microbial flora is found in the oral cavity, and streptococcal anaerobes inhabit the gingival crevice. The pharynx can be a point of entry and initial colonization for *Neisseria*, *Bordetella*, *Corynebacterium*, and *Streptococcus* spp.

Gastrointestinal Tract Flora:

Organisms in the stomach are usually transient, and their populations are kept low (10^3 to 10^6 /g of contents) by acidity. *Helicobacter pylori* is a potential stomach pathogen that apparently plays a role in the formation of certain ulcer types. In normal hosts the duodenal flora is sparse (0 to 10^3 /g of contents). The ileum contains a moderately mixed flora (10^6 to 10^8 /g of contents). The flora of the large bowel is dense (10^9 to 10^{11} /g of contents) and is composed predominantly of anaerobes. These organisms participate in bile acid conversion and in vitamin K and ammonia production in the large bowel. They can also cause intestinal abscesses and peritonitis.

Urogenital Flora:

The vaginal flora changes with the age of the individual, the vaginal pH, and hormone levels. Transient organisms (e.g., *Candida* spp.) frequently cause vaginitis. The distal urethra contains a sparse mixed flora; these organisms are present in urine specimens (10^4 /ml) unless a clean-catch, midstream specimen is obtained.

Conjunctival Flora:

The conjunctiva harbors few or no organisms. *Haemophilus* and *Staphylococcus* are among the genera most often detected.

Host Infection:

Many elements of the normal flora may act as opportunistic pathogens, especially in hosts rendered susceptible by rheumatic heart disease, immunosuppression, radiation therapy, chemotherapy, perforated mucous membranes, etc. The flora of the gingival crevice causes dental caries in about 80 percent of the population.

Advantages of Flora:

These normal flora provide us with many benefits, which include:

- They prevent colonization by pathogens by competing for attachment & nutrients.
- Some synthesize vitamins that are absorbed as nutrients by the host (e.g. K & B12).
- Some produce substances that inhibit path.

Disadvantages of Flora:

It has both advantages as well as disadvantages.

- They prevent or suppress the entry of the pathogens.
- Colonies produced by some organisms of normal flora have a harmful effect on the pathogens.
- Endotoxins liberated by normal flora may help the defense mechanism of the body.

Q#3: Differentiate between

1. Archae and Bacteria:

- Likewise the bacteria, archaea are single-cell, simple prokaryotes, lacking the well-defined nucleus and other organelles. Archaea are capable of surviving under the extreme condition and so are considered as extremophiles.
- Archaea are found in the unusual environment like in hot spring, ocean depth, salt brines, while bacteria are found everywhere like in the soil, water, living and non-living organisms.
- The cell wall of archaea is pseudopeptidoglycan, as they have ether bonds with the branching of aliphatic acids, whereas bacteria have lipid membrane ester bonds with fatty acids.
- Archaea exactly do not follow glycolysis or Krebs cycle but uses similar pathway, but bacteria follows these pathways to produce energy.

2. Endotoxin and Exotoxin:

- Endotoxins are the lipopolysaccharide-protein complexes (LPS), responsible for making an integral part of the cell wall of Gram-Negative Bacteria. Exotoxins are the proteins which are secreted by a few species of bacteria. Though endotoxins are considered to be more toxins than exotoxins.

- Endotoxins are the part of the cells, as they are associated with the outer membrane of the Gram-negative bacteria, and is released at the cell lysis, while exotoxins are secreted within the cell and are active in Gram-positive and Gram-negative bacteria. Exotoxins are released from the cell.

- Endotoxins are stable at 250 ° C and do not get denatured, while exotoxins are liable are 60-80 ° C and gets denatured on boiling.

- Sepsis, meningococemia is the disease caused by the endotoxins, while Diphtheria, botulism, tetanus are caused by exotoxins.

3. Protozoe and Fingi:

- Fungi are a group of organisms which are multicellular eukaryotes. Protozoa are a group of organisms in Kingdom Protista which are unicellular animals.

- Fungi are mainly multicellular. Protozoa are unicellular.

- Fungi move through flagella, air or water. Protozoa locomote by flagella, cilia, pseudopodia.

- Fungi cell wall possesses chitin. Protozoa cell wall possesses a pellicle which helps in protection and locomotion.

- Some examples of fungi are Aspergillus, Penicillium, Curvularia, yeasts, Agaricus, Mucor Some examples of protozoa are Amoeba, Paramecium.

4. Host and Parasite:

- Parasite is an organism that lives on the surface or inside another organism and feeds on it. Host is an organism that serves as a source of food and habitat to a parasite.

- The parasite benefits from the host, using it as a

source of food and habitat. Parasites have a negative effect on the survival and the physical condition of the hosts. In some cases, parasites can cause the death of the hosts.

5. Plant cell and Animal cell:

- Animal cells are generally smaller than plant cells. Animal cells range from 10 to 30 micrometers in length, while plant cells range from 10 and 100 micrometers in length.

- Animal cells come in various sizes and tend to have round or irregular shapes. Plant

cells are more similar in size and are typically rectangular or cube shaped.

- Animals cells store energy in the form of the complex carbohydrate glycogen. Plant cells store energy as starch.

- Animal cells do not have a cell wall but have a cell membrane. Plant cells have a cell wall composed of cellulose as well as a cell membrane.