BAL BHARATI PUBLIC SCHOOL PITAMPURA
CLASS XI (SESSION 2020-21)
BIOLOGY
CH- BIOLOGICAL CLASSIFICATION (PART1)

INSTRUCTIONS-

STEP 1- READ THE CHAPTER- **BIOLOGICAL CLASSIFICATION**
UNDERLINE THE DIFFICULT TERMS

LEARNING OBJECTIVES:

1) To elaborate the types of classification
2) To understand the role and characteristics of diverse forms of bacteria

STEP 2- READ THE NOTES CAREFULLY.

TOPIC COVERED :
Types of classification
Kingdom Monera

STEP 3: Visit the YOUTUBE LINK-

https://www.youtube.com/watch?v=2cb_HS5mSjI

Biological Classification

Systems of classification

Two Kingdom Classification:

In his Systema Naturae, first published in 1735, **Carolus Linnaeus** distinguished two kingdoms of living things: Animalia for animals and Plantae (Vegetabilia) for plants. He classified all living organisms into two kingdoms – on the basis of nutrition and locomotion (mobility)

Three Kingdom Classification:

In the 1860s, the German investigator **Ernst Haeckel** proposed a three-kingdom system of classification. Haeckel's three kingdoms were Animalia, Plantae, and Protista. Members of the kingdom Protista included the protozoa, fungi, bacteria, and other microorganisms.

Limitations of Three Kingdom Classification System

- No separation of Prokaryotes and eukaryotes.
- Both unicellular and multicellular organisms are classified under Protista.

Four Kingdom Classification:

In addition to Protista, Plantae and Animalia, the four kingdom classification system included Monera. The studies with electron microscope made it clear that bacteria and related organisms have a different nuclear structure as compared to others. These are the prokaryotes. As a result of this, **Copeland** in the year 1956, introduced the kingdom-Monera. Fungi continued to remain with Plantae in this system.

Five Kingdom Classification System

In the year 1969, this classification came into existence. **R H Whittaker** proposed this system. He created a separate group for fungi. The primary criterion for classification here were:

- Cell structure
- Modes of nutrition
- Reproduction
- Thallus organisation
- Phylogenetic relationships

Six Kingdom Classification System

Carl Woese a Professor in the Department of Microbiology, University of Illinois, came up with the Six Kingdom Classification System in the year 1990. It was also known as the three-domain system as in it organism classification was done in three domains, i.e., Archaea, Bacteria and Eukarya.

It majorly used the basic principles of the five kingdom system but divides the Monera into two domains Archaebacteria, Eubacteria and other eukaryotes in the third kingdom.

KINGDOM : MONERA

Characteristics:

- The Monera cell structure is mostly unicellular and some organisms orm groups or filaments.

- These organisms are the simplest prokaryotic cell structures.
- The cell structure lacks nuclei and many other cell organelles.
- They have a cell wall made of polysaccharides with polypeptide cross links with a chemical called peptidoglycan.
- They lack enclosed sub-cellular organelles like mitochondria and only have ribosomes.
- The genetic material DNA is contained in the cytoplasm called nucleoid.
- Many bacterial species contain rings of DNA called plasmids.
- The cytoplasm is enclosed by plasma membrane that lies beneath the cell wall.
- The plasma membrane is made up of lipids and proteins.
- Some Monera have hair like pilli for adhesion or tail-like flagella for locomotion.
- The source of nutrition for these organisms is usually photosynthesis or chemosynthesis.
- The characteristics also include the shape of the cell that includes round (cocci), rod-like (bacilli), or spiral (spirochetes or spirilla).
- Reproduction is asexually through binary fission or sexually by conjugation. The process of circulation and digestion is carried out through diffusion.
- The Monera kingdom includes all bacteria that may infect animals, humans, and plants. But most of the members are termed as beneficial bacteria, rather than pathogenic bacteria.
- The Monera kill organisms causing pathogenic diseases, breaks down algae, and can even recycle chemical pollutants like hydrogen sulfide and ammonia.
- Bacteria that grow in the root nodules help break down atmospheric nitrogen into fixed nitrogen.
- The bacteria that forms the natural flora of the intestines are very important for proper digestion.
- One of their many characteristics also includes production of antibiotics likes streptomycin that is useful for treatment of infections.

ANTIBIOTICS

Antibiotics are chemicals that kill or inhibit the growth of bacteria and are used to treat bacterial infections. They are produced in nature by soil bacteria and fungi. This gives the microbe an advantage when competing for food and water and other limited resources in a particular habitat, as the antibiotic kills off their competition.

How do antibiotics work

Antibiotics take advantage of the difference between the structure of the bacterial cell and the host's cell.

They can prevent the bacterial cells from multiplying so that the bacterial population remains the same, allowing the host's defence mechanism to fight the infection or kill the bacteria, for example stopping the mechanism responsible for building their cell walls.

An antibiotic can also be classified according to the range of pathogens against which it is effective. Penicillin G will destroy only a few species of bacteria and is known as a narrow spectrum antibiotic. Tetracycline is effective against a wide range of organisms and is known as a broad spectrum antibiotic.

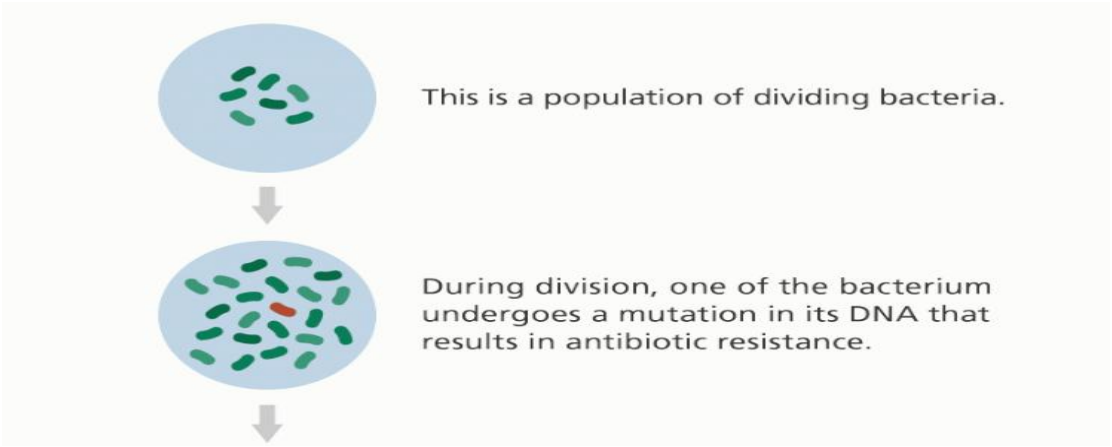
Antibiotic resistance

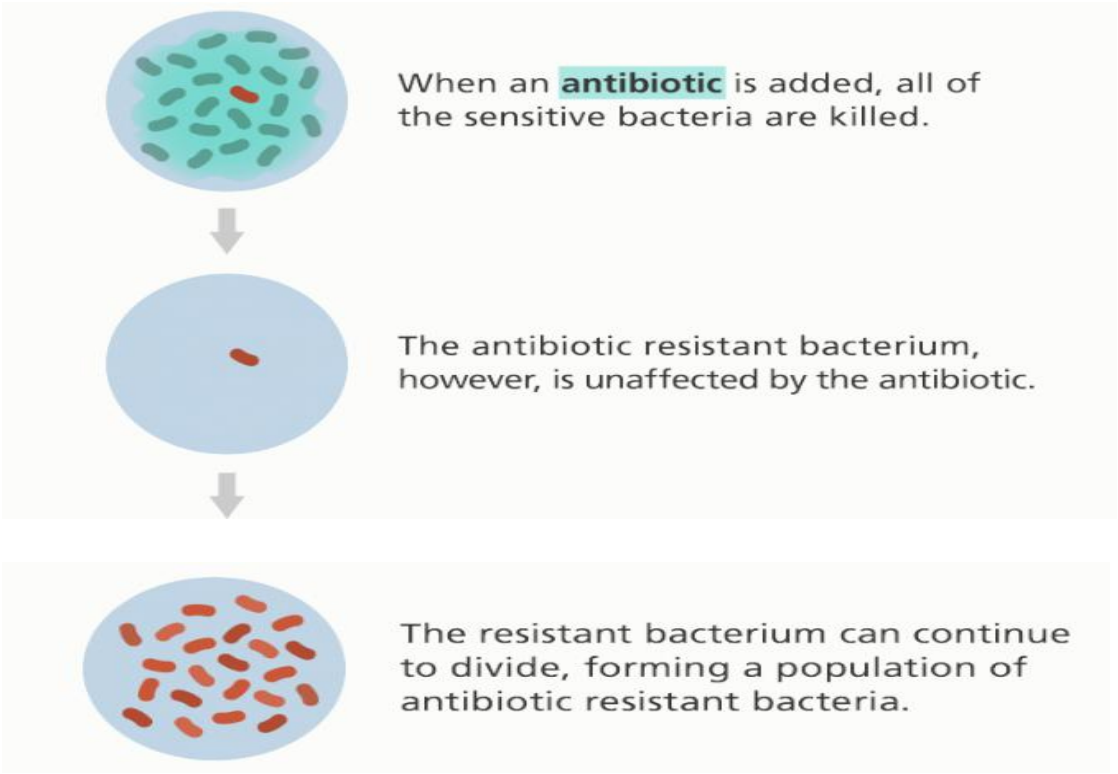
Bacteria are termed drug-resistant when they are no longer inhibited by an antibiotic to which they were previously sensitive. The emergence and spread of antibacterial-resistant bacteria has continued to grow due to both the over-use and misuse of antibiotics.

Treating a patient with antibiotics causes the microbes to adapt or die; this is known as ‘selective pressure’. If a strain of a bacterial species acquires resistance to an antibiotic, it will survive the treatment. As the bacterial cell with acquired resistance multiplies, this resistance is passed on to its offspring. In ideal conditions some bacterial cells can divide every 20 minutes; therefore after only 8 hours in excess of 16 million bacterial cells carrying resistance to that antibiotic could exist.

How is resistance spread?

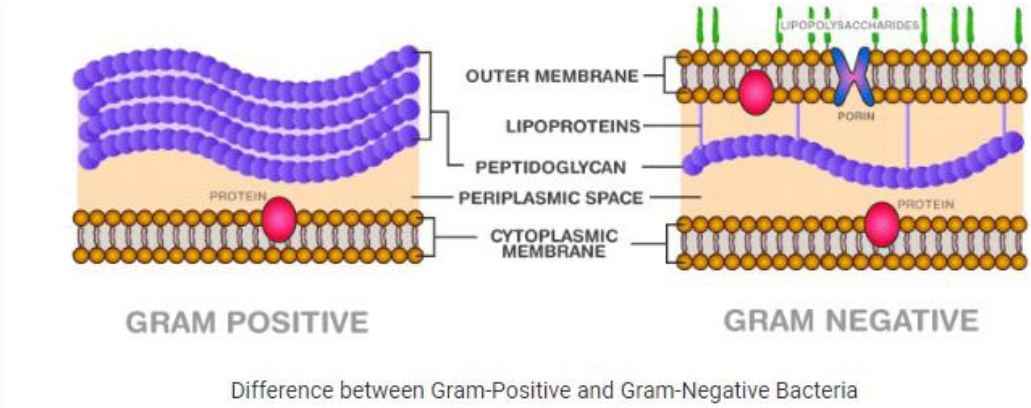
Antibiotic resistance can either be inherent or acquired. Some bacteria are naturally resistant to some antibiotics due to their physiological characteristics. This is inherent resistance. Acquired resistance occurs when a bacterium that was originally sensitive to an antibiotic develops resistance. For example resistance genes can be transferred from one plasmid to another plasmid or chromosome, or resistance can occur due to a random spontaneous chromosomal mutation.





- Monera can be identified by their characteristic of cell wall that can be or not stained by Gram staining. Watch the youtube link given below

  https://www.youtube.com/watch?v=ei6Z7orCpPk



Difference between Gram-Positive and Gram-Negative Bacteria

Gram Staining

This technique was proposed by Christian Gram to distinguish the two types of bacteria based on the difference in their cell wall structures. The gram-positive bacteria retain the crystal violet dye because of a thick layer of peptidoglycan.

This process distinguishes bacteria by identifying peptidoglycan that is found in the cell wall of the gram-positive bacteria. A very small layer of peptidoglycan is dissolved in gram-negative bacteria when alcohol is added.

Difference between Gram-Positive and Gram-Negative Bacteria Key Points

- Gram-positive bacteria have cell wall composed of thick layers peptidoglycan.
- Gram-Negative bacteria have cell wall with thin layers of peptidoglycan.
- Gram-positive cells stain purple during gram staining.
- Gram-negative cells stain pink during gram staining.
- Both gram-positive and gram-negative bacteria produce exotoxins whereas only gram-negative bacteria produce endotoxins.
- Most of the Monera can survive harsh environment by producing spore coat.

ASSIGNMENT

1 Give a few examples of gram-positive bacteria.

2 Which is more harmful- gram-positive bacteria or gram-negative bacteria?

3 Which infections are caused by gram-negative bacteria?

4 **Which of the following organisms can be found in extreme saline conditions?**

a. Eubacteria
b. Archaebacteria
c. Cyanobacteria
d. Mycobacteria

5 **Linnaeus used which kingdom of classification?**

a. Artificial system
b. Natural system
c. Phylogenetic system
d. Asexual system

6 **Smallest taxon of classification is**

a. Kingdom
b. Family
c. Variety
d. Species

7 **In which kingdom are Archaea and Nitrogen-fixing organisms classified?**

a. Animalia

b. Plantae
c. Monera
d. Fungi

8 **What is the main basis of classification in the five kingdom system?**

a. Structure of nucleus
b. Structure of cell wall
c. Asexual Reproduction
d. Mode of Nutrition