Agada Emmanuella Nkem.
18/mhs06/007.
Medical laboratory Science.
MCB 202
Covid-19 break Assignment.

Questions.

1 Discuss Microbial Variation and Hereditary in Bacteria.
2 Explain Micobial Recombination.

Answers.

Micobial Variation and Hereditary in Bacteria.

Microbial Variation in Bacteria can be defined as any change in the genotype of a bacterium or its phenotype. These Variations Could be Heritable or non-heritable.

Heritable Variation : refer to the Genotypic Variations which occur as a result of changes in the genes by way of Mutation while Non-heritable Variations : refer to the phenotypic variations, although are temporarily seen occurs when the bacteria grow under Certain environmental Conditions.

When a bacterial cell devides, the two daughter Cells are generally indistinguishable. Thus, a single bacterial Cell Can Produce a large Population of Identical Cells or Clone. On Solid medium, a Clone is manifested as an easily Isolated Colony.

Occasionally, a spontaneous genetic change occurs in one of the cell. This change is heritable and passed on to the progeny of the variant cell to produce a subclone with characteristics different from the original (wild type) parent leading to Genotypic Variation. It is termed as Vertical Inheritance.

Note that if the change is detrimental to the growth of the cell, the subclone will quickly be overrun by the healthy, wild population but if the change is beneficial,

the Subclone may overtake the wild type population.

Heritable Variations include:

1) Mutation: refers to a change in the genetic material of a cell. A gene will mutate spontaneously, about once in a hundred million cell divisions. Such bacteria are called Mutants. Most mutants die while some adapt to the environment emerging as a new Radiant

Spontaneous Mutations are of two Classes:

a) Point Mutation: Change of a single nucleotide.

b) DNA rearrangement: shuffling of the genetic Information to produce Insertions, deletions, inversions or Changes in Structure.

Both Mutations Occur at a low frequency leading to a Continuous, Slow evolution of bacterial populations.

2) Horizontal transfer of genetic material from one Cell to another: this occurs by three possible Mechanisms:

- Transformation: is the process of uptaking naked DNA fragment from the surrounding environment.

Example: Change from R form of Streptococcus Pneumoniae

Example: Change from R form of Streptococcus Pneumoniae to S form.

- Transduction is the process of transfering genetic material through mediation of bacteriophage. It is the transfer of bacterial DNA by Viruses.
- Conjugation: is transfer of genetic material also occurs by bacterial mating via Conjugation. Any property that is coded on a transmissible plasmid can be transferred to a recipient bacterium.

For the three Mechanisms, the transferred DNA must be stably incorporated into the genetic material of recipient bacterium. It occurs in two ways:

1) Recombination.
2) Establishment of a plasmid.

Non-heritable Variations:

Here, the genetic constitution remains Unchanged and Such variations are neither Permanent nor heritable. They are phenotypic and may revert back to normal state when Conditions are restored.

They include:

1) loss of flagella in *S. typhi* when grown in phenol agar
2) pleomorphism in old Cultures
3) Lack of pigment Production by *S. aureus* in anaerobic Conditions.
4) formation of spheroplasts and protoplasts.
5) S-R variation in *Salmonella typhi* that is Characterized by loss of Vi antigen
6) Production of flagella in *Listeria monocytogenes* occurs at temperature less than 20°C

Importance of Microbial variation in Bacteria

They are Medically relevant because they can mediate the efficient transfer of genes between bacteria, including genes for antibiotic resistance and toxins.

Some bacteriophages have the ability to Convert harmless bacteria into Pathogens.

Microbial Recombination.

Microbial Recombination is the process by which DNA sequences can be exchanged between DNA Molecules.

Bacterial Recombination is a type of genetic recombination in bacteria characterized by DNA transfer from one organism called donor to another organism as recipient.

It occurs in three main ways:

1) Transformation: refers to the uptake of exogenous DNA from surrounding environment.
2) Transduction: refers to virus-mediated transfer of DNA between bacteria
3) Conjugation: the transfer of DNA from one bacterium to another via cell-to-cell contact.

The final result of these processes is the production of genetic Recombinants - individuals that carry not only the genes they inherited from their parental cells but also the genes introduced to their genomes by conjugation, transduction and/or transformation.

Microbial recombination in bacteria is catalyzed by a RecA type of recombinase as they promote repair of DNA damages by homologous recombination.