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1. Discuss microbial variation and hereditary in bacteria

ANSWER

Variation is any change in the genotype of a bacterium or its phenotype. Genotypic variation can occur as a result of changes in the genes by way of mutation, loss or acquisition of new genetic elements. These variations are heritable. Phenotypic variations are seen temporarily when bacteria are grown under certain environmental conditions. These variations are not heritable. The variability of microorganisms is divided into genetic variation and nongenetic variation.

Microbial genetics is concerned with the transmission of hereditary characters in microorganisms. It has played a unique role in developing the fields of molecular and cell biology and has also found applications in medicine, agriculture and the food and pharmaceutical industries.

Hereditary variation in bacteria results from changes in the genetic structures. In distinction from plants and animals, bacteria are predominantly haploid organisms. They contain one genome and combine within themselves the functions of the gamete and the individual.

When a bacteria cell divides, the two daughter cells are generally indistinguishable. Thus, a single bacteria cell produce a large population of identical cells. A spontaneous genetic change occurs in one of the cells. The change is heritable and passed on to the progeny of the variant cell to produce a subclone with characteristics different from the original parent. This is called VERTICAL INHERITANCE.

In both prokaryotic and eukaryotic microbes, the genetic material is DNA. Mutations, heritable changes in the DNA occur spontaneously and the rate of mutation can be increased by mutagenic agents.

2. Explain microbial recombination

ANSWER

Microbial recombination is a type of genetic recombination in bacteria characterised by DNA transfer from one organism called donor to another organism as recipient. This process occurs in three main ways which are;

i. Transformation: The uptake of exogenous DNA from the surrounding environment.

ii. Transduction: The virus-mediated transfer of DNA between bacteria.

iii. Conjugation: The transfer of DNA from one bacterium to another via cell to cell contact.

Recombination in bacteria is ordinarily catalyzed by a RecA type of recombinase. These combinases promote repair of DNA damages by homologous recombination.

The final result of conjugation, transformation and transduction is the production of genetic recombination. Individuals that carry not only the genes they inherited from their parent cells but also the the genes introduced to their genomes by conjugation, transduction or transformation.

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

In some cases, the DNA repair capability provided by recombination during transformation facilitates survival of the infecting bacterial pathogen.