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1. Discuss microbial Variation and Heredity in Bacteria.

The diversity of form and function among microorganisms is unparalleled among other groups of Organisms. Microorganisms exhibit an enormous Capacity to evolve new potentialities. Variation refers to change in an Organism relative to its parent or former state. Hereditary Variation in bacteria is expressed in the form of mutations and recombinations. Mutation is a Stable Inherited change in the properties of Microorganisms (morphological, Cultural, biochemical, biological etc) which is not associated ~~that~~ with the recombination process. Hereditary Variation in bacteria results from changes in genetic structures. In distinction from plants and animals, bacteria are predominantly haploid Organisms, they contain One genome and combine within themselves the function of the gamete and the Individual. Bacterial Variation can also occur by horizontal transfer of genetic material from one cell to another. Mutation and gene transfer work together to accelerate the rate of bacterial evolution. The Spontaneous changes required to produce a new function (eg antibiotic resistance) may occur at a low frequency.

## 2 Explain Microbial recombination

Microbial recombination is a type of genetic recombination in bacteria characterized by DNA-transfer from One Organism called donor to another Organism as recipient. This process Occurs in three Main ways:

- Transformation, the uptake of exogenous DNA from the Surrounding environment.
- Transduction, the Virus-mediated transfer of DNA between bacteria.
- Conjugation, the transfer of DNA from One bacterium to another via Cell to Cell Contact.

The final result of Conjugation, transduction, and/or transformation is production of genetic ~~recombinants~~ Recombinants, Individuals that Carry ~~not~~ not Only the genes they Inherited from their parent Cell but also the genes Introduced to their genomes by Conjugation, transduction and/or transformation.

Recombination in bacteria is Ordinarily Catalyzed by RecA type of recombinase. These recombinases promote repair of DNA damages by homologous recombination.

The ability to undergo natural transformation is present in at least 61 bacterial Species. Natural transformation is Common among pathogenic ~~but~~ bacterial Species. In Some Cases, the DNA repair Capability provided by recombination during transformation facilitates Survival of the Infecting bacterial pathogen. Bacterial transformation is Carried out by numerous interacting bacterial gene products.