SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)
COIMBATORE-35
Accredited by NBA-AICTE and Accredited by NAAC – UGC with A++ Grade
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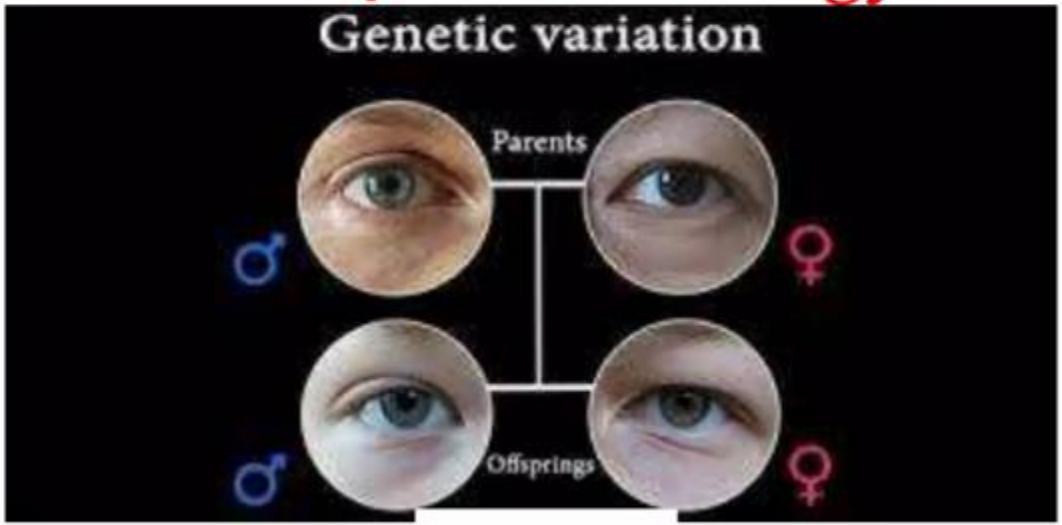
UNIT III: GENETICS AND IMMUNE SYSTEM

TOPIC: **Variation and speciation**

TOPIC OUTLINE

Genetic Variation and its Role in Health/Pharmacology



Genetic variation

- In a very simple language, genetic variation is a measure of the variation that exists in the genetic makeup of individuals within population.
- Variation in alleles of genes that occurs both within and among populations

Genetic Diversity

- The level of biodiversity, refers to the total number of genetic characteristics in the genetic makeup of a species

Crossing Over

- The exchange of genetic material between homologous chromosomes that results in recombinant chromosomes

Phenotypic Variation

- Variation (due to underlying heritable genetic variation); a fundamental prerequisite for evolution by natural selection

Alleles

- Each of two or more alternative forms of a gene that arise by mutation and are found at the same place on a chromosome.

Natural Selection

- The process whereby organisms better adapted to their environment tend to survive and produce more offspring.
- The theory of its action was first fully expounded by Charles Darwin, and it is now regarded as be the main process that brings about evolution.

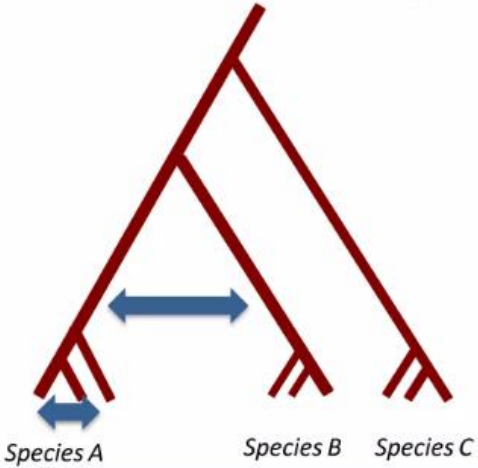
What is genetic variation?

Polymorphisms

- Variation between individuals in a population (within species)

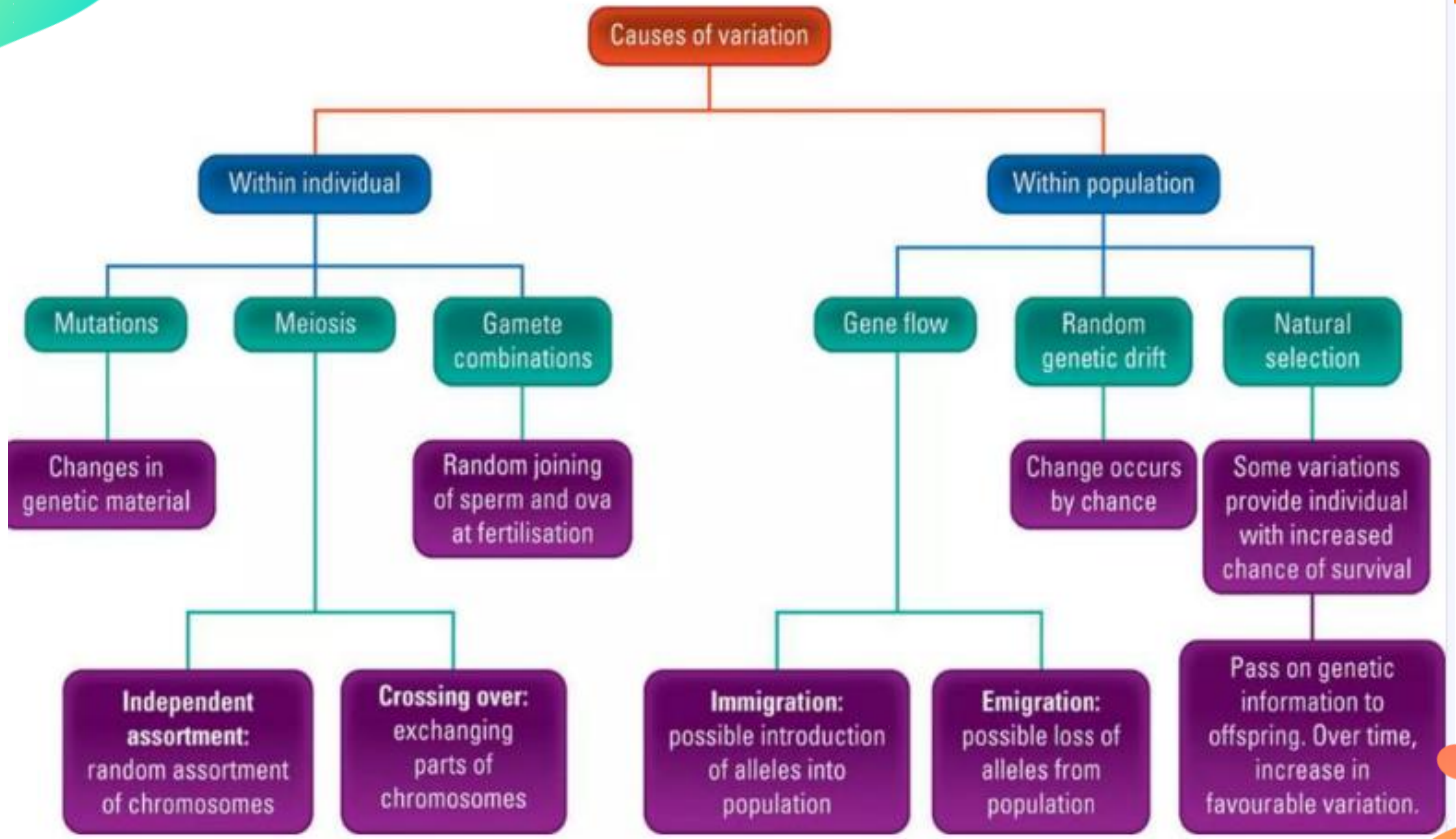
Substitutions

- Fixed variation between individuals of species (between species)



- Genetic variation generally refers to the differences in genes between individual members of a population, or the frequency in which the various gene types are expressed.
- Genetic variation is incredibly important for the survival and adaptation of a species, as it helps in terms of natural selection and evolution.
- Individuals of a species have similar characteristics but they are rarely identical, the difference between them is called variation.
- In genetic variation, the genes of organisms within a population change.
- Gene alleles determine distinct traits that can be passed on from parents to offspring.
- Gene variation is important to the process of natural selection.
- The genetic variations that arise in a population happen by chance, but the process of natural selection does not.

Gene alleles determines the distinct traits of an individual


Causes of variation
Within individual
Within population
Mutations
Meiosis
Gamete combinations
Gene flow
Random genetic drift
Natural selection
Changes in genetic material
Random joining of sperm and ova at fertilisation
Change occurs by chance
Some variations provide individual with increased chance of survival
Independent assortment: random assortment of chromosomes
Crossing over: exchanging parts of chromosomes
Immigration: possible introduction of alleles into population
Emigration: possible loss of alleles from population
Pass on genetic information to offspring. Over time, increase in favourable variation.

DNA Mutation

- Mutations are changes to an organism's DNA and are an important driver of diversity in populations.
- Species evolve because of the accumulation of mutations that occur over time.
- The appearance of new mutations is the most common way to introduce novel genotypic and phenotypic variance.
- Some mutations are unfavorable or harmful and are quickly eliminated from the population by natural selection.
- Others are beneficial and will spread through the population.
- Whether or not a mutation is beneficial or harmful is determined by whether it helps an organism survive to sexual maturity and reproduce.
- Some mutations have no effect on an organism and can linger, unaffected by natural selection, in the genome while others can have a dramatic effect on a gene and the resulting phenotype.

RECAP….

…THANK YOU