

Variation

Variation:

Differences between individuals in the same species, caused by:

- Sexual reproduction: Mixes genes from parents to create unique offspring.
- Mutation: Random changes in DNA.

Types of Variation:

- Genetic variation: Differences in DNA among individuals.
- Phenotypic variation: Observable differences, influenced by genes and environment.
- Continuous variation: A range of phenotypes (e.g., height).
- Discontinuous variation: Distinct phenotypes (e.g., tongue rolling).

Sickle Cell Anemia:

- Caused by a mutation in the hemoglobin gene, leading to misshapen red blood cells that reduce oxygen transport.
- Genotypes:
 - HNHN: Normal hemoglobin.
 - HNHn: Mostly normal hemoglobin (sickle cell trait).
 - HnHn: Sickle cell anemia, life-threatening.
- Protects against malaria, with HNHn carriers having moderate protection and not developing severe sickle cell disease.

Adaptive Features:

- Xerophytes (dry environment plants) conserve water through features like thick cuticles and sunken stomata.
- Hydrophytes (water plants) adapt to aquatic environments with features like wide leaves for floatation and thin waxy cuticles.

Natural Selection:

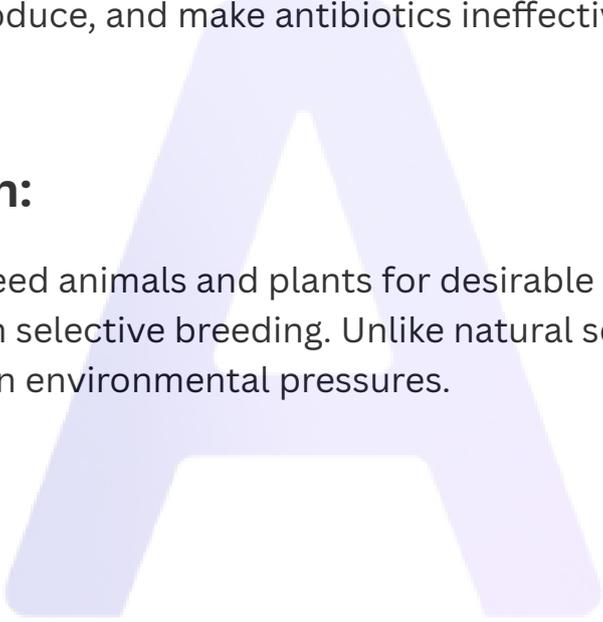
Organisms with favorable traits survive and reproduce, passing on beneficial genes. Over time, populations evolve to better suit their environments.

Antibiotic Resistance:

Random mutations in bacteria can lead to antibiotic resistance, allowing resistant bacteria to survive, reproduce, and make antibiotics ineffective over time.

Artificial Selection:

Humans intentionally breed animals and plants for desirable traits, manipulating traits over generations through selective breeding. Unlike natural selection, this is driven by human choice rather than environmental pressures.



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