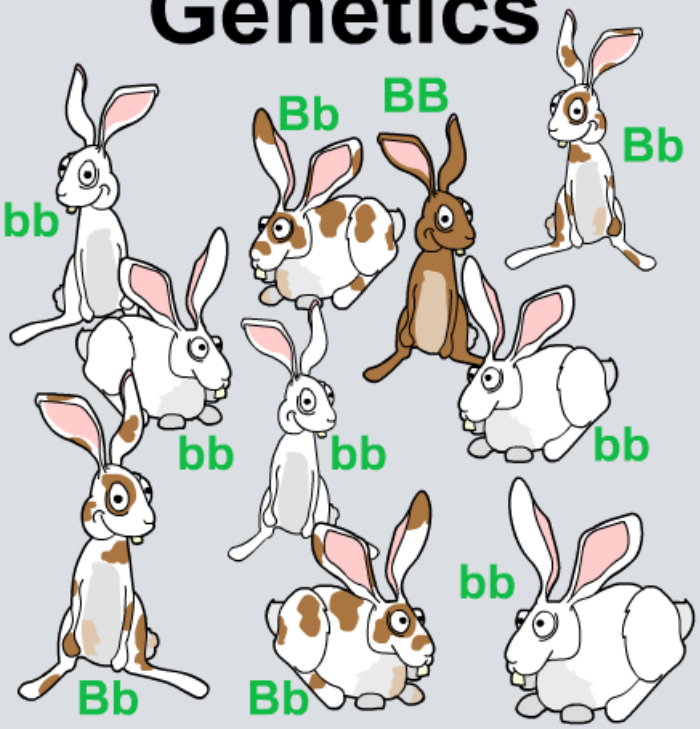
Population Genetics



What is a gene pool?

The **gene pool** can be defined as:

> The total information from all the genes and alleles of the breeding individuals in a population at a particular time.

The gene pool's composition changes from one generation to the next as the relative proportions of alleles vary.

If there is a consistent change in **allele frequency** (the proportion of organisms in the population carrying a particular allele) then a population is evolving.

Genetic drift

Population bottlenecks

A **population bottleneck** occurs when a large, genetically diverse population is drastically reduced by a catastrophic, non-selective event, such as a volcanic eruption.

The total genetic diversity of the few survivors is likely to be much lower than that of the original population. As the population reestablishes itself, this low level of diversity will be maintained.

The cheetah population has an exceptionally low genetic diversity. This is thought to be due to a very narrow bottleneck, where only a single family group survived the last ice age.

The founder effect

Introducing the Hardy-Weinberg principle

The **Hardy-Weinberg principle** is a mathematical model used to calculate the **allele frequencies** of traits with dominant and recessive alleles.

The model assumes that the population:

- is large
- has random mating
- is experiencing no selection
- has no **mutation**, emigration or immigration.

If these assumptions are met then the allele frequencies of the population will remain stable over time.

The Hardy-Weinberg principle

Calculating allele frequencies

Factors affecting the gene pool