

Evolution Versus Genetic Equilibrium

The **Hardy-Weinberg principle** states that allele frequencies in a population will remain constant unless one or more factors cause those frequencies to change.

When allele frequencies remain constant it is called **genetic equilibrium**.

Five conditions are required to maintain genetic equilibrium from generation to generation:

- **there must be random mating,**
- **the population must be very large,**
- **there can be no movement into or out of the population,**
- **there can be no mutations, and**
- **there can be no natural selection.**

Random Mating

Random mating ensures that each individual has an equal chance of passing on its alleles to offspring.

In natural populations, mating is rarely completely random. Many species select mates based on particular heritable traits.

Large Population

Genetic drift has less effect on large populations than on small ones.

Allele frequencies of large populations are less likely to be changed through the process of genetic drift.

No Movement Into or Out of the Population

Because individuals may bring new alleles into a population, there must be no movement of individuals into or out of a population.

The population's gene pool must be kept together and kept separate from the gene pools of other populations.

No Mutations

If genes mutate, new alleles may be introduced into the population, and allele frequencies will change.

No Natural Selection

All genotypes in the population must have equal probabilities of survival and reproduction.

No phenotype can have a selective advantage over another.

There can be no natural selection operating on the population.

According to the Hardy-Weinberg principle, no evolution will take place if all five of the Hardy-Weinberg conditions are met.