

■ Hardy-Weinberg

■ Basic genetics review:

- If we mate two individuals that are heterozygous (e.g., **Bb**) for a trait, we find that
 - 25% of their offspring are homozygous for the dominant allele (**BB**)
 - 50% are heterozygous like their parents (**Bb**) and
 - 25% are homozygous for the recessive allele (**bb**) and thus, unlike their parents, express the recessive phenotype.

What factors can affect the gene pool of a population?

- **Natural selection:**
 - sorts genetic variations and accumulates alleles/genotypes in the population reducing genetic diversity and increasing differences in populations.
- **Gene flow:**
 - Genes are exchanged between gene pools.
- **Immigration:**
 - alleles are gained as they are introduced from other gene pools.
- **Emigration:**
 - alleles are lost as organisms leave the population to join another population and gene pool.

What factors can affect the gene pool of a population?

- **Mutation:**
 - new alleles are spontaneously formed and change the allele frequencies in the gene pool.
- **Geographical isolation:**
 - geographical barriers prevent regular gene flow between populations and over time the populations adapt to the environment via natural selection and eventually the population will form a new separate population and perhaps species.
 - **Deme:** term used to describe a local population that is genetically isolated from other populations. Have a definable genetic or physical characteristic that sets them apart from other populations.

What factors can affect the gene pool of a population?

- **Mate selection/Assortive mating/:**
 - Non-random mating. Individuals may seek out desired phenotypes in their mate, therefore increasing the frequency of the desired allele in the gene pool.
- **Genetic drift:**
 - "chance" events cause the allele frequency in small populations to change randomly from one generation to the next.

What factors can affect the gene pool of a population?

- **Bottleneck effect:**
 - population size is dramatically reduced due to a catastrophic event.
- **Founder effect:**
 - a small number of organisms from a population colonize a new area.

Hardy-Weinberg Principle

■ Hardy-Weinberg Principle:

- Allele frequencies in a population will remain constant (at genetic equilibrium) unless one or more factors cause those frequencies to change.
 - Note: If the gene frequencies do not change the population will not evolve.



Hardy-Weinberg Principle

■ Five Conditions to maintain genetic equilibrium:

- 1. There must be random mating-
 - And all breed and all produce the same number of offspring
- 2. The population must be large.
- 3. There can be no movement in or out of the population.
- 4. There can be no mutations.
- 5. There can be no natural selection.



Hardy Weinberg Equation:

- $1 = p^2 + 2pq + q^2$
 - Where
 - $(p+q)^2 = p^2 + 2pq + q^2$
 - $p + q = 1$
- q = allele frequency of the recessive
- p^2 = allele frequency of the homozygous dominant
- q^2 = allele frequency of the homozygous recessive
- $2pq$ = allele frequency of the heterozygous

	p A	q a
p A	AA (p^2)	Aa (pq)
q a	Aa (pq)	aa (q^2)

