

Intrinsic Mating Barriers

Slide 2 So far we have been looking at the general aspects of the genetic divergence of populations. But what exactly do we mean when we say that enough 'differences' accumulate to hinder interbreeding among different populations? Or, in other words, what types of barriers may develop within different populations to prevent successful interbreeding? In a general sense, there are two types of such intrinsic barriers - barriers that prevent interbreeding, called prezygotic barriers, and barriers that diminish the fitness of offspring produced from interbreeding, called postzygotic barriers.

In either case, mating barriers act to restrict gene flow in some way between members of different populations. As a result, the degree of divergence between populations may increase.

Slide 3 There are several general types of prezygotic mating barriers, ranging from those that preclude any mating events, to instances where different species may interbreed but not produce any offspring. Any differences that arise between separated populations that prevent formation of a zygote when individuals of each population come into contact are defined as prezygotic mating barriers. For example, members of separated populations may develop behavioral differences that preclude interbreeding if and when the separated populations are brought back together. Behavioral differences could include differences in habitat preferences, so that individuals from different populations remain spatially separated, or differences in mating habits, such as mating displays or the timing of mating. Alternatively, if enough physical differences accumulate between the separated populations, interbreeding may be mechanically impossible due to differences in the sizes or shapes of reproductive organs or other structures. Lastly, in some instances mating may still occur, but the gametes from individuals of different populations may not be compatible. For instance, egg cells may not carry the appropriate receptor molecules to bind the sperm cells of members of the opposing population.

Slide 4 As opposed to prezygotic mechanisms, postzygotic mating barriers involve the mating of different species and the subsequent formation of a zygote. However, there is still some level of incompatibility that ultimately results in a barrier to gene flow. Difficulties may occur immediately or soon after zygote formation, resulting in the hybrid zygote or embryo dying during early development. Alternatively, hybrid offspring may survive, but with a reduced fitness compared to non-hybrid offspring. In diploid organisms that carry sex chromosomes, hybrid individuals heterozygous for the sex chromosomes (such as XY males) may have reduced fitness, or may not ever develop, as deleterious recessive alleles inherited on one or the other chromosome are not masked by a second copy of the chromosome.

One oft-cited example of a postzygotic mating barrier occurs when horses and donkeys, two different species, interbreed to produce mules. Mules, as a hybrid offspring, are generally robust organisms. However, the genetic incompatibility of the horse and the donkey result in sterility in the mule. Because mules are infertile, gene flow between the

horse and donkey is effectively blocked, even though they are able to produce hybrid offspring.