Complementation Test Encyclopedia Article

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Complementation Test

A genetic complementation test is used to determine the location and nature of mutations. Complementation tests allow molecular biologists and geneticists to specifically determine whether a **mutation** is in the same **gene** or in the same bacterial cistron as a known (i.e., test) mutation. Complementaion testing allows the classification of independent mutations and the grouping (complementation groups) of such mutations with respect to the genes involved.

Complementation testing measures gene function. In addition to fixing and grouping locations of mutations, complementation procedures test for gene mutation. Essentially, a complementation test looks for restoration of the wild-type phenotype in a mating between organisms with mutant genes. The term wild-type, or wild-type strain is used to describe normal condition (the most abundant condition in a population), with regard to both mutations and phenotypic traits. An organism's phenotype describes the set of expressed **characters and traits** that result from the interaction of an organism's genotype with the environment.

Complementaion testing also allows the determination of the capability of mutants to act independently to supply the genetic information needed to result in the expression of a wild-type phenotype. For example, when two mutations affect the same gene, and neither mutation is capable of generating a wild-type phenotype, if these mutations are combined in the same **cell** the resulting strain must have a mutant phenotype. On the other hand, if the mutations affect different genes, so that each is able to generate some of the gene products required to produce a wild-type phenotype, then between the two genes the sum of the two gene products might be able to generate a wild-type phenotype.

Interference in complementation by **multimeric enzymes** results in negative complementation.

In bacterial **genetics**, complementation testing involves the crossing of mutants so that two mutated genes exist with a cell. Often one of the mutants is attached to a plasmid (small pieces of extrachromosomal **DNA** that are capable of self **replication**) that is then injected into a cell containing the other mutation. The recipient cell now contains two copies of the genes under study (in essence it is partially **diploid** with respect to those genes). If the mutations are located in the same gene there should be no change in observable characters or traits (phenotype). On the other hand, if the mutations exist on different genes the chromosomal pieces will complement each other so that the new cell will show a normal or **wild type** phenotype.