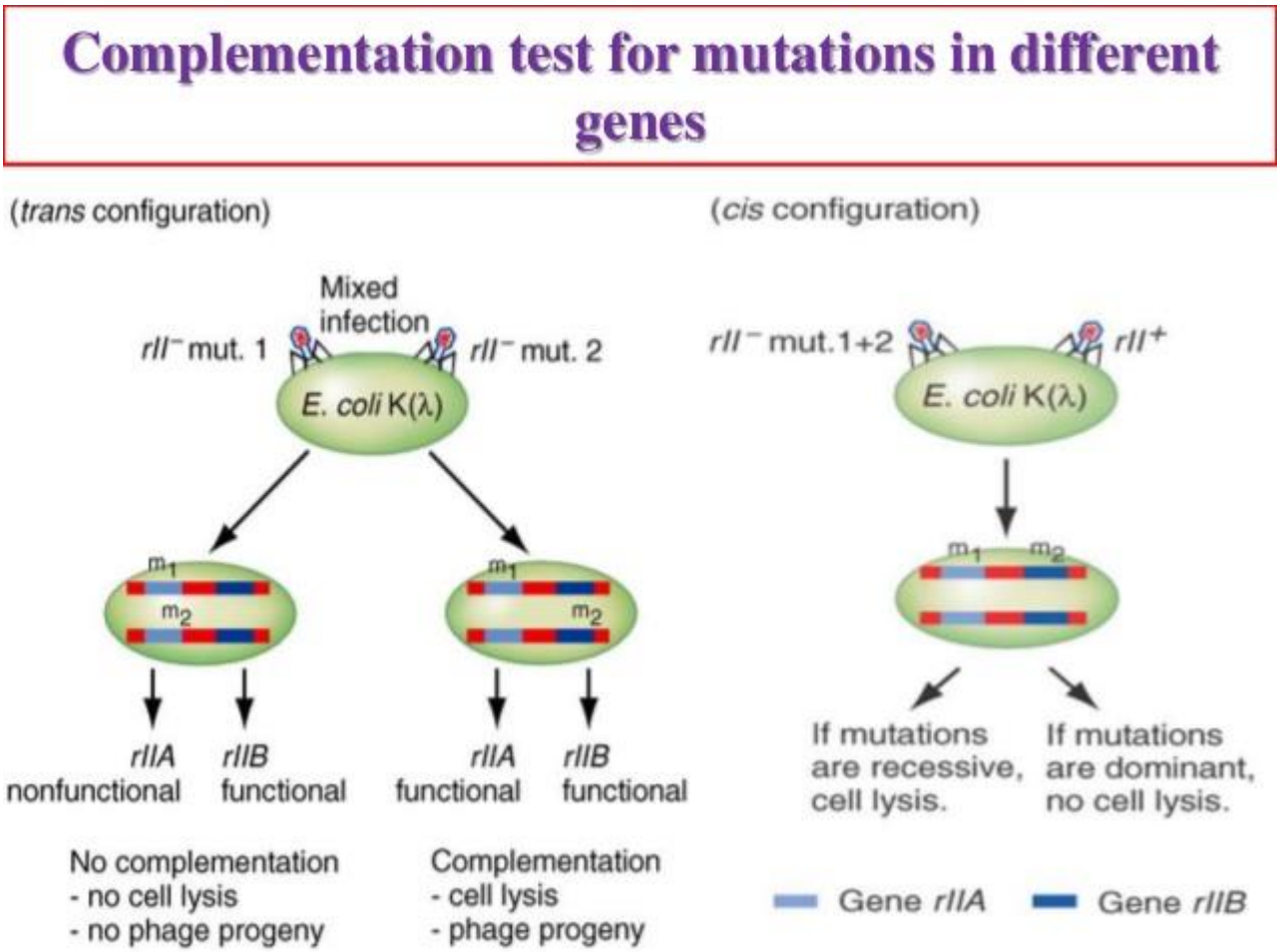
Semester - VI / CC- XIII : Principles of Genetics / Unit 7: Recombination in Bacteria and Viruses /Topic : Complementation Test in Bacteriophage
E-Class : 01

Complementation Test in Bacteriophage

1) What is Complementation Test ?
Experimental determination of any two recessive mutations occurring whether in same chromosome or in different chromosome in a common protoplasm is called complementation test.

2) How many types of complementation test?
It is of two types – 1) *cis*-test & 2) *trans*- Test

3) Define *cis*-test and give an example.
Experimental determination of any two recessive mutations occurring in same chromosome in a common protoplasm is called *cis*-test.
Example: rII locus (rapid lysis) mutations in T4 phage.



4) Define *trans*-test. Give an example.

Experimental determination of any two recessive mutations occurring in different chromosomes in a common protoplasm is called *trans*-test.

Example : T4 rII mutations

5) Explain the results of complementation test.

Complementation test	Gene product	Phenotype	Conclusion
Intragenic *cis*-test	i) The products of two mutations in same gene are inactive. ii) Whereas, the product of normal gene is active.	Therefore, the phenotype will be wild type.	Mutations are in cis-position of a chromosome.
Intragenic *trans*- test	i) The products of two mutations in same gene are inactive	Therefore, phenotype will be mutant.	Mutations are in *trans*-position of a homologous chromosome pair.
Intergenic *cis*-test	i) The products of two mutations in two different genes are inactive. ii) Whereas, the products of two normal gene are active.	Therefore, the phenotype will be wild type.	Mutations are in cis-position of a chromosome.
Intergenic *trans*-test	i) The products of two mutations are inactive. ii) Whereas, the products of two normal genes are active	Therefore, the phenotype will be wild type.	Mutations are in trans position of a homologous chromosome pair.

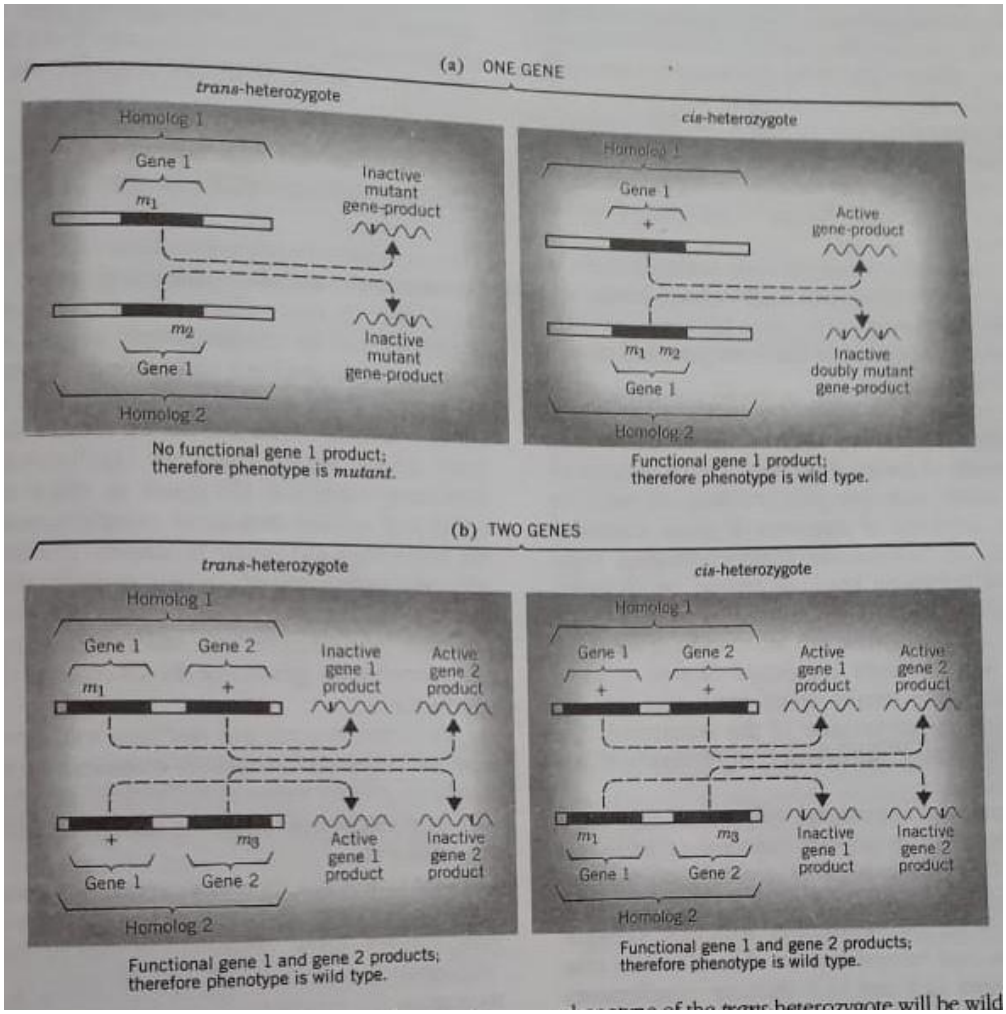


Fig: Interpretation for complementation test. m1- mutation 1 , m2 – mutation 2 & + - no mutation

6) Why is *trans*-test called complementation test ?

In intragenic *trans*- mutations, the mutational effects determine mutant phenotype but in intergenic *trans*-mutations, mutational effects determine wild phenotype.

Conversely, in both intra and intergenic *cis*-mutations, mutational effects determine wild phenotype only.

Therefore, trans-test is commonly called complementation test and *cis*-test acts as control.

7) Mention some limitations of complementation test.

i) It can't determine dominant and co-dominant mutations.

ii) It can't detect polar mutations.

iii) It can't depict the effect of *cis*-acting genes, segments of promoter regions and segments of operator regions.

iv) Genes in which mutations occur that exhibit intragenic complementation are not detected.

8) Distinguish between Complementation and Recombination

Points	Complementation	Recombination
What is	Complementation is the result of the interaction of gene products.	Recombination is the direct interaction between homologous chromosomes
Mechanism	Complementation but no need of breakage of chromosomes.	It involves breakage of chromosomes and reunion of parts.
Detection	It is determined by phenotype (wild or mutant) of each trans heterozygote.	It is determined by examining the progeny of heterozygotes.