Hello everyone, I'm Doctor Sunita Borkar from PES RSN college Farmagudi, Ponda. In this module we are going to highlight the differences between generalized and specialized transduction. At the end of this presentation, the students will be. able to compare generalized and specialized transduction.

Generalized transduction is a mode of gene transfer of random fragments of the bacterial chromosome from a donor cell to a recipient cell that is mediated by a bacteriophage.

During generalized transduction that was discovered by Zinder and Lederberg in the year1952, a phage Infects the donor bacterial cell. This donor cell has its own chromosome which is called as the endogenote and the phage protein coat that contains its own DNA is injected into a donor cell. This phage DNA,during its proliferation takes over the cellular machinery of this host cell and makes its own viral particles in the form of proteins, the tail, the tail fibers, and the basal plate. The generalized transduction, which has been studied in more detail in the T4 virus that has a head, a tail, the tail fibers, and the hexagonal basal plate.

The bacterial chromosome is broken into pieces. as the nucleotides of this chromosomal DNA of the host are

utilized for the synthesis of the viral DNA. Occasionally during the phage assembly, the pieces of bacterial DNA are packed in a phage coat. that is,the protein capsid. This phage is called as a defective phage or the abnormal phage. In generalized transduction since it is the random fragments of this bacterial chromosome,which are picked up and transferred to the recipient cell, the recipient cell receives a piece of this chromosome via the bacteriophage as the exogenote.

When this phage infects a new host cell in that actually is acting as a recipient here now that is the recipient Bacterium. The donor bacterial DNA brought from the donor cell gets integrated into the endogenote of the bacterial chromosome resulting in the formation of the recombinant. This recombinant bacterium is different from the recipient cell as well as the donor cell with respect to its Genotype and the phenotype. The Cell divisions of the cell will result in every cell having the donor bacterial DNA. In specialized transduction It is only the transfer of specific genes or restricted genes from the donor to the recipient. For example the Lambda phage through site specific recombination is able to integrate between the Gal and the Bio operon, and during the excision it can carry a Gal

gene with it from the donor cell. This Gal gene

as taken by the virus along with its piece of its chromosome when

it infects a recipient cell that does not have the ability to

metabolize galactose, that after the specialized transduction

that it acquires the ability to utilize galactose since a Gal

gene has now come from the donor cell through this lambda virus.

Along with the prophage, the bacterial Gal gene also becomes.

Integrated into the new host DNA, resulting in the

formation of a lysogenic cell that can now metabolize Galactose

So if we compare the generalized and specialized

transduction, we see that the vector involved in generalized

transduction can be a virulent phage or a temperate phage in its lytic cycle .

But in specialized transduction,the vector is always a temperate

phage . A virulent phage can never be a vector in the specialized

Transduction. During generalized transduction it is any random

fragment of the donor gene that is transferred from the donor to

the recipient, whereas in specialized transduction it is a

specific donor gene like the GAL gene or the Biotin synthesizing

gene that is transferred.

Generalized transduction occurs during the bacteriolysis phase,

where as the specialized transduction occurs during the

lysogenic phase. The cause of the specialized transduction is

error during excision.Generalized transduction is

mostly seen in the T even phage family, like the T2, T4. T6 that

infect E. coli where they can transfer any fragment, such as

a gene for the synthesis of Histidine, lysine , tryptophan and so on, whereas specialized

transduction examples. we have are Lambda phage of Salmonella that

transfers the gal or the bio gene and epsilon phage of

another epsilon phage of this salmonella including the P1

phage of E. coliI. So to summarize, differences between

generalized transduction and specialized transduction.

Generalized transduction occurs during the lytic life cycle

of virulent and temperate phages. Specialized

transduction occurs during the lysogenic cycle of temperate

phages. Phages utilize the bacterial cells as host and

enter the lytic cycle. Phages utilize the bacterial cell as

host and enter the lysogenic cycle in specialized

transduction. The viral DNA begins to replicate immediately

in the bacterial cytoplasm in generalized transduction. Where

as viral DNA integrates into theDNA of the bacterium and

replicates later. Any bacterial genes are randomly packed into

the new phage particles. The Bacterial genes adjacent to

previously incorporated virus are packed into the new phage

Particles, In generalised transduction some new phages

have no viral DNA, whereas in specialized transduction some

new phages have both viral and bacterial DNA. The donor bacterial genes are incorporated

into chromosome of the new bacterium in generalized

transduction. The donor bacterial genes are incorporated

into the chromosome of new bacterium together with the

genome of transducing phage in specialised transduction.

The references for gene transfer mechanisms include

Prescott, Harley and klein.

Genetics a conceptual approach. Gardner, principles of

genetics.

Thank you.