Quadrant II – Transcript and Related Material

Programme: Bachelor of Science (Third Year)

Subject: Microbiology

Paper Code: MIC 107

Paper Title: Microbial Genetics

Unit: 2: Gene Transfer Mechanisms

Module Name: Transduction: Abortive and Complete Transduction

Module No: 13

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Notes:

Horizontal gene transfer (HGT) is the transfer of genes between cells of the same generation and is common among bacteria. In bacteria, genes can be transferred through various mechanisms of HGT such as transformation, transduction and conjugation. During HGT, a piece of donor DNA, the exogenote, must enter and become a stable part of the recipient cell's chromosome (endogenote). As this occurs, the recipient becomes temporarily diploid for a portion of its genome and is called a merozygote . The exogenote has four possible fates in the recipient . First, when the exogenote has a sequence homologous to that of the endogenote, integration may occur; that is, it may pair with the recipient DNA and be incorporated to yield a recombinant genome. Second, the foreign DNA sometimes persists outside the endogenote and replicates to produce a clone of partially diploid cells. Third, the exogenote may survive, but not replicate, so that only one cell is a partial diploid. Finally, host cell nucleases may degrade the exogenote, a process called host restriction.

In transduction, bacterial genes become packaged into a viral coat, are transferred to another bacterium by the virus, and become incorporated into the bacterial chromosome by crossing over. In generalized transduction, random fragments of bacterial chromosome become incorporated into phage coats and are transferred to other bacteria during phage

infection. In specialized transduction, DNA near the site of phage integration on the bacterial chromosome is transferred from one bacterium to another. Generalised transduction may be abortive or complete.

Abortive / Unsuccessful transduction is a transduction event in which the fragment of donor gene or DNA is not integrated in the genome of the recipient chromosomes. Because the DNA fragment lacks an origin of replication, it is only inherited by one daughter cell at each cell division. In other words , abortive transduction is the failure of a transducing DNA segment to be incorporated into the recipient chromosome, but rather existing as a non replicating particle in only one cell of a clone. This results in the formation of micro colonies. Abortive transductants are bacteria that contain non integrated, transduced DNA and are partial diploids. In all cases, the transferred fragment could be diluted during the proliferation phase.

Complete/ successful transduction is the transduction in which the transferred genetic fragment is fully integrated into the endogenote of the recipient bacterium after pairing and cross over .The DNA remains double stranded during the transfer and both strands are integrated into the endogenote .Clone of cells as partial diploid is obtained and a change in phenotypic characters of the organism is observed.

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