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Notes

Conjugation Part 2

Hfr Strains

Hfr strain was discovered by William Hayes and Luca CavalliSforza.

The F factors can exist alone in **autonomous state** replicating independent of the host chromosome or in **integrated state** by integrating into the bacterial chromosome, called **episomes**.

When the **F factor integrates** into the bacterial **chromosome Hfr strain** is formed. The integrated F factor, replicates as part of the host chromosome.

In Hfr matings, the cell almost **never acquires the Hfr phenotype**, because to become Hfr, the recipient cell **must receive a complete copy of the F factor**. However, only part of the F factor is transferred at the beginning of conjugation; the rest lies at the end of the donor chromosome. All of the donor chromosome would have to be transferred for a complete

functional F factor to be found in the recipient, and that would take about 100 minutes at 37°C. This is an extremely rare event, because mating pairs typically break apart long before the second part of the F factor is transferred.

F Prime

Abnormal excision of the F-factor from the Hfr chromosome can transfer chromosomal genes to the excised F-plasmid

Because the F factor integrates at one of many sites on the chromosome, many different host chromosome segments can be picked up in this way.

Eg. *E. coli* strain in which the F factor has integrated next to the lac region.

If the looping out is not precise, then the adjacent lac host chromosomal genes may be included in the loop. Then, by a single crossover, the looped-out DNA is separated from the host chromosome to produce an F factor carrying the lac genes of the host.

F factors containing bacterial genes are called F' (F prime) factors, and they are named for the genes they have picked up. ***Eg***. An F ' with the lac genes is called F' (lac).

Cells with F' factors can conjugate with cells. As in F conjugation, a copy of the factor is transferred to the cell, which then becomes F '. The recipient also receives a copy of the bacterial gene(s) on the F ' factor

When a F' x F- , the Recipient is partially diploid (merodiploid), having two copies of one or a few genes and only one copy of all the others in the genome. This particular type of conjugation is called F-duction, or sexduction. It provides a way to study particular genes in a diploid state in *E. coli*