

Genetic Transfer
Recombination

- Vertical gene transfer
- Horizontal gene transfer
- Occurs during reproduction, between generations of cells
- Transfer of genes between cells of the same generation

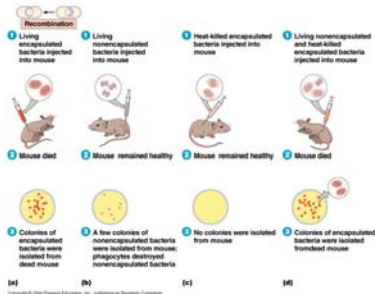
Gene transfer in bacteria

- There are three types of gene transfer
 1. Transformation
 2. Conjugation
 3. Transduction

All types of gene transfer

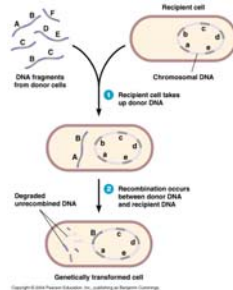
- Involve unidirectional transfer of information (donor-->recipient)
- Require the integration of newly acquired DNA "homologous recombination"
- Increases genetic diversity

Griffith's experiments with *Streptococcus pneumoniae*



Transformation

- The transfer of genes, naked DNA and a competent cell
- Occurs naturally in only a few cells
- Best when donor and recipient are closely related

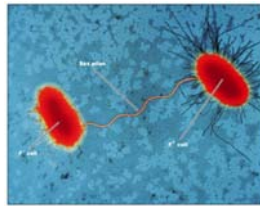


Competent Bacteria

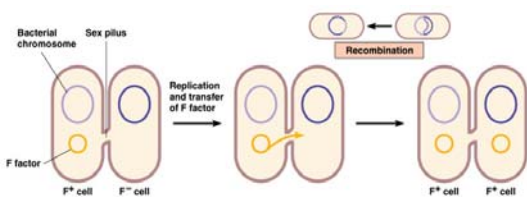
- Acinetobacter
- Bacillus
- Haemophilus
- Neisseria
- Some Staphs and Streps
- E.coli is not naturally competent but can be altered for research

Conjugation

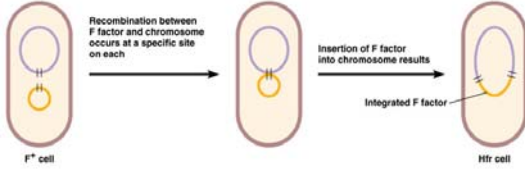
- Transfer of genes between 2 bacterial cells
- Gram negative cells use a sex pilus
- Mediated by plasmid
- F(+) cells have F plasmid, F(-) lack F plasmid



Conjugation between (F+) and F(-)



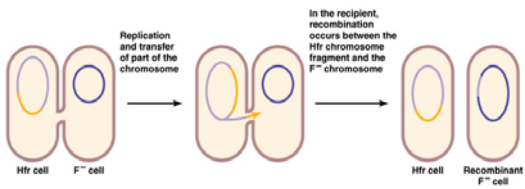
F plasmid can integrate into the chromosome creating Hfr cell



(b) When an F factor becomes integrated into the chromosome of an F⁺ cell, it makes the cell a high frequency of recombination (Hfr) cell.

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Conjugation between Hfr cell and F(-)



(c) When an Hfr donor passes a portion of its chromosome into an F⁻ recipient, a recombinant F⁻ cell results.

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Genetic Recombination

- Exchange of genes between two DNA molecules
 - Crossing over occurs when two chromosomes break and rejoin

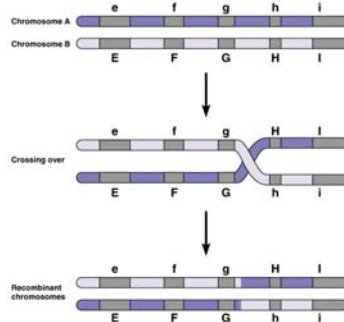


Figure 8.23

Plasmids

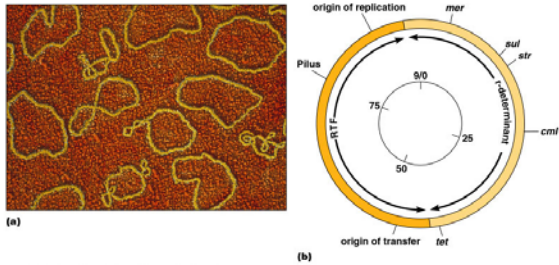


Figure 8.29

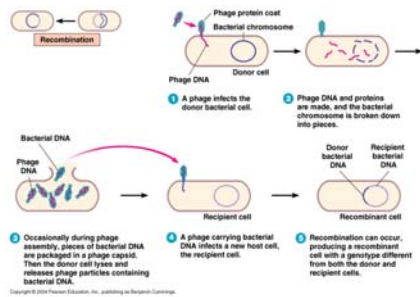
Transduction

- Transfer of genes inside a bacteriophage (virus) that infects recipient bacteria
- Generalized transduction: occurs with lytic or lysogenic phage
- Specialized transduction: occurs with lysogenic phage

Generalized Transduction

- All genes are equally likely to be packaged into phage coat and transferred
- Examples: phage P1 of *E. coli*
- P22 of *Salmonella*

Generalized Transduction



Specialized Transduction

- Only certain genes are transferred
- Example: toxin products of bacteria

Specialized Transduction

