

BACTERIAL RECOMBINATION

By

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Bacterial Recombination

Conjugation

Transformation

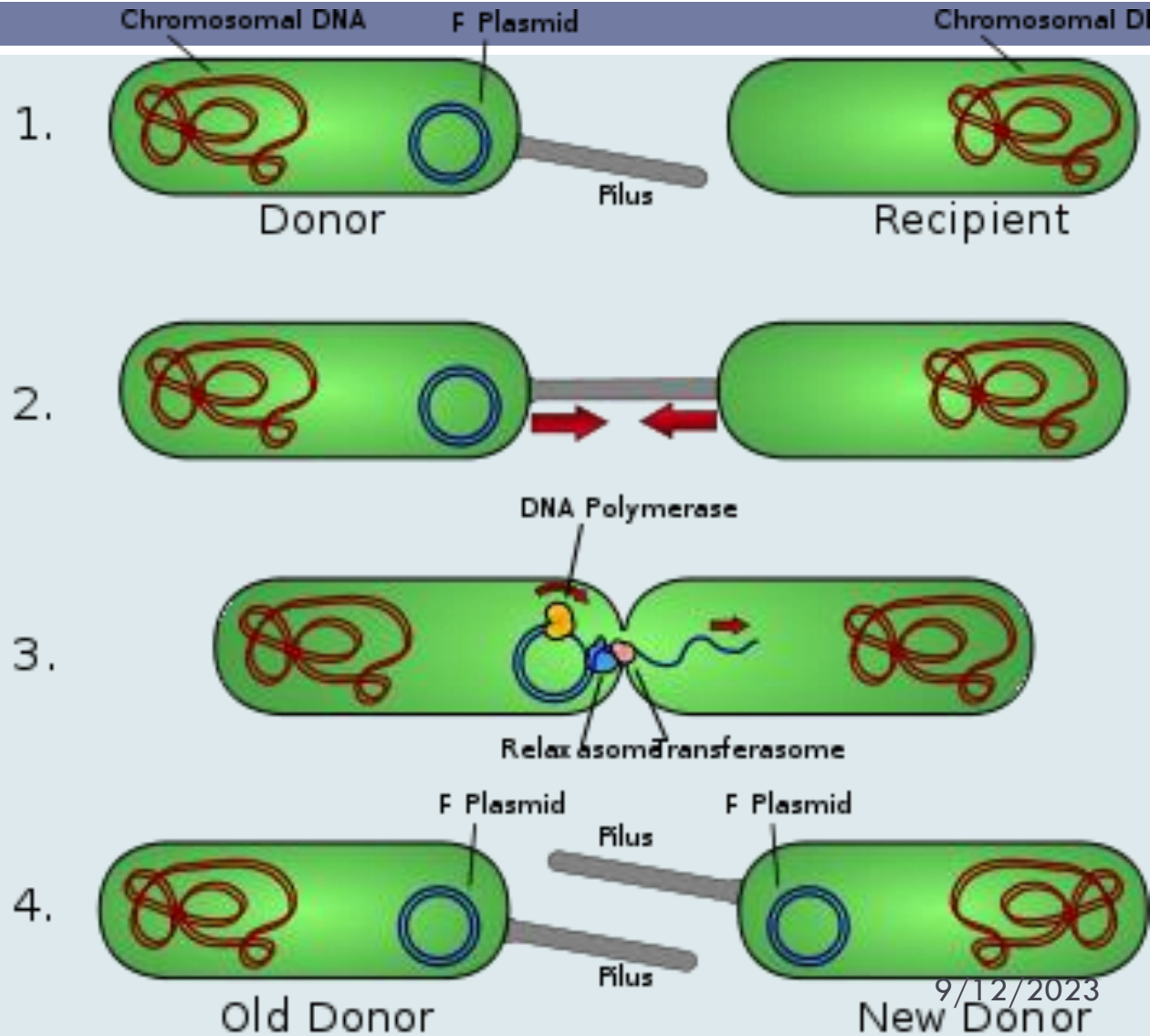
Transduction

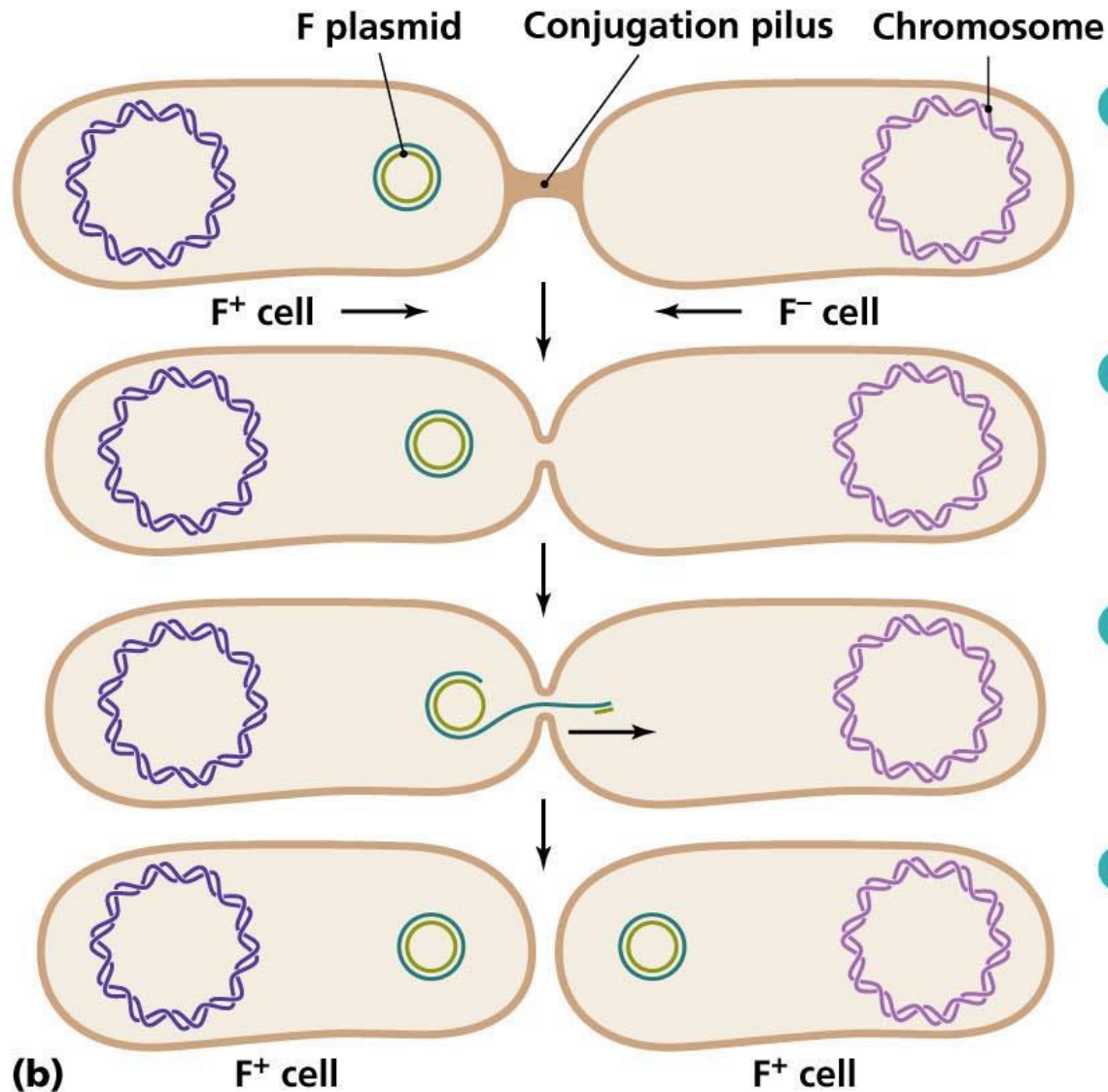
9/12/2023

Conjugation

- F^+
 - ▣ Contain Plasmid (Extra chromosomal DNA)
 - ▣ Known as Sex factor or F factor
- F^-
 - ▣ Lacks circular DNA in cytoplasm
- Sex pili close contact between F^+ and F^-
- Transfer of genetic material via Conjugational tube

Conjugation





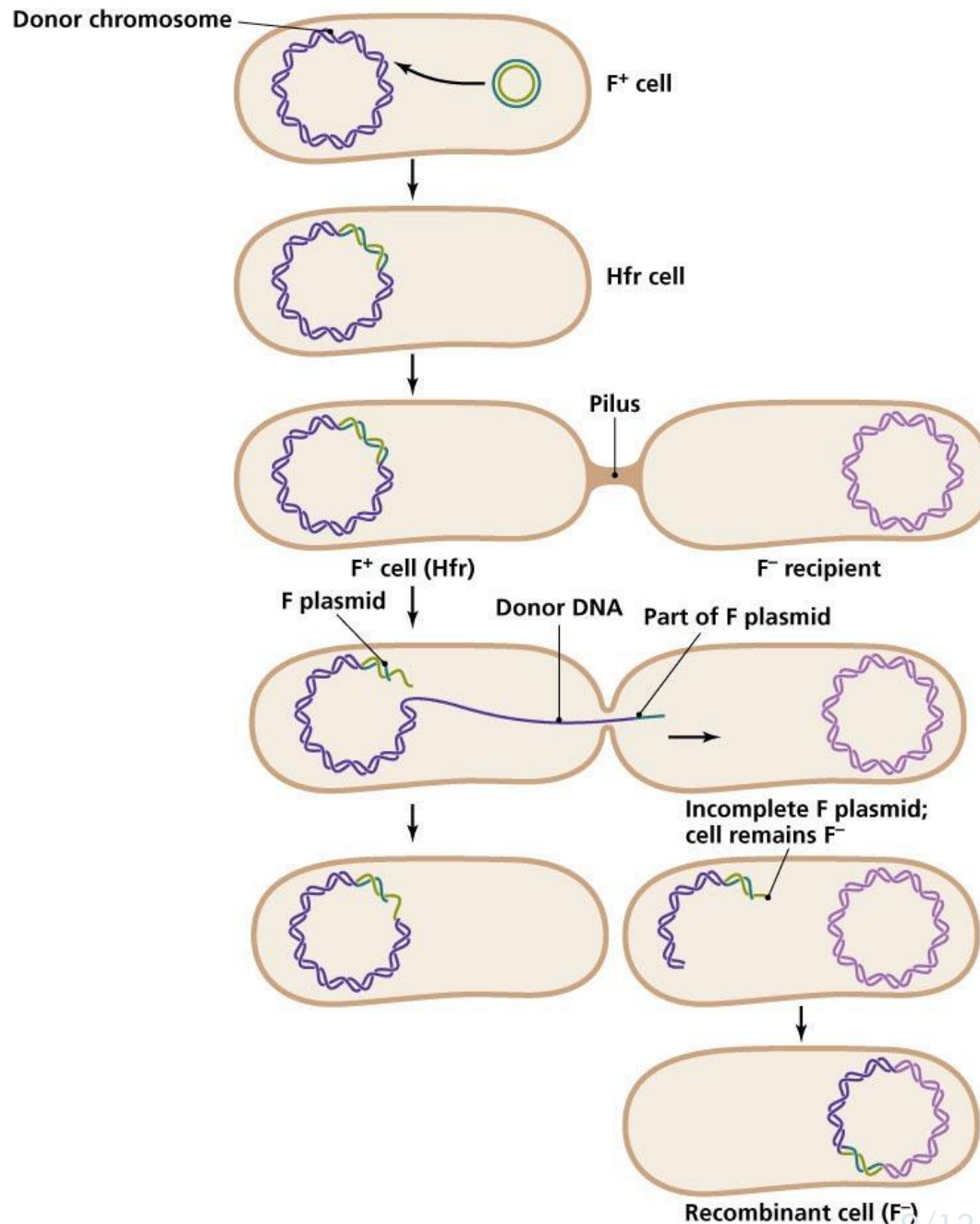
1 Donor cell attaches to a recipient cell with its pilus. The pilus draws the cells together.

2 The cells contact one another.

3 One strand of plasmid DNA transfers to the recipient.

4 The recipient synthesizes a complementary strand to become an F^+ cell; the donor synthesizes a complementary strand, restoring its complete plasmid.

Hfr



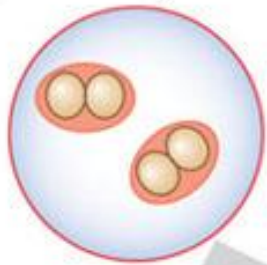
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Transformation

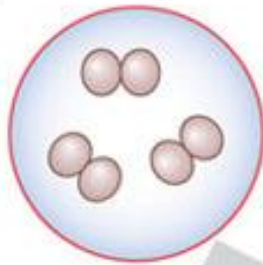
- Griffith 1928 worked with *Diplococcus pneumonia*
- Avery, Macleod and McCarty 1944 – Transformation Principle
- Limited amount of genetic material transfer from one bacterium to another
- Gene gun, Electroporation, Microinjection are some techniques of genetic engineering based on transformation principle

- Transformation only occurs naturally in bacteria that are competent, meaning there are alterations of the cell envelope that enable the cell to absorb naked DNA in the surrounding environment.
- Genera that have naturally competent members include *Streptococcus*, *Staphylococcus*, *Haemophilus* and *Pseudomonas*. Some bacteria, such as *Escherichia coli*, can be made competent under laboratory conditions and used in biotechnology.

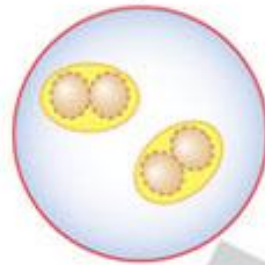
**Living S cells
(control)**



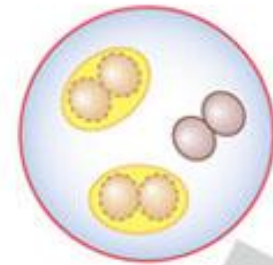
**Living R cells
(control)**



**Heat-killed
S cells (control)**



**Mixture of heat-killed
S cells and living
R cells**



RESULTS

Mouse dies



Mouse healthy



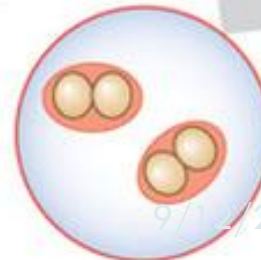
Mouse healthy



Mouse dies



**Living S cells
are found in
blood sample**

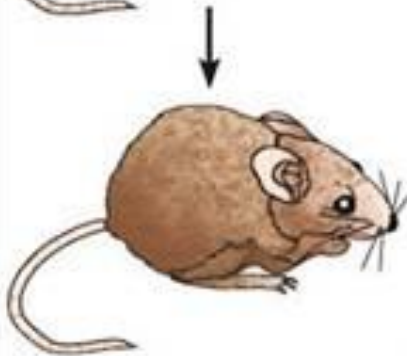
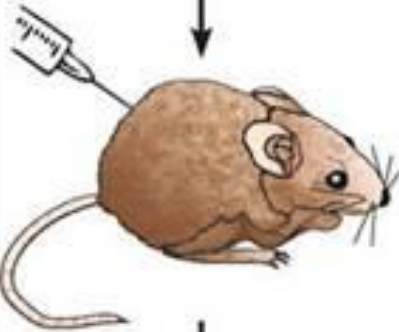


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Experiment 1



R cells injected

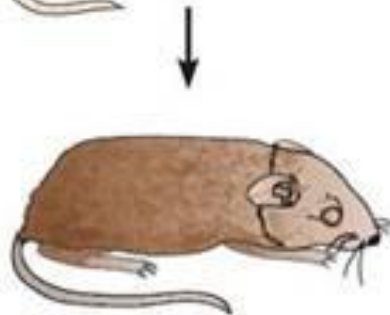
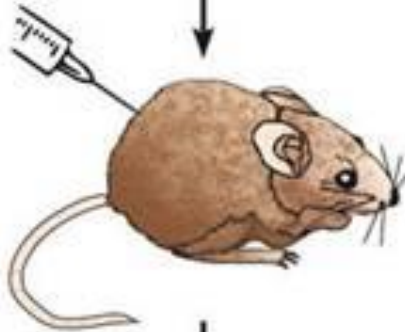


Mouse lives

Experiment 2



S cells injected

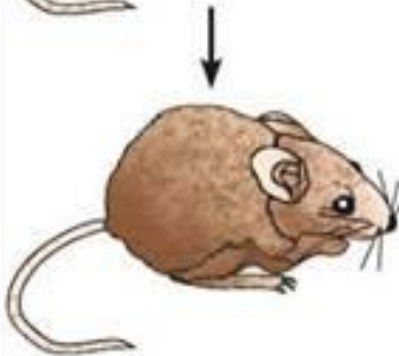
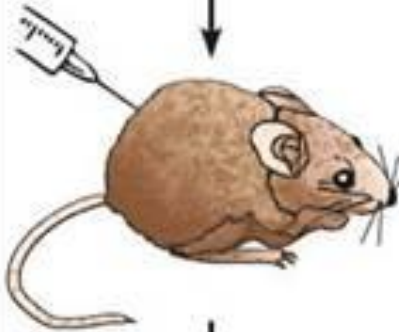


Mouse dies

Experiment 3

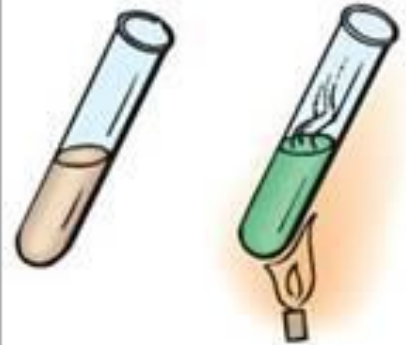


Heat-killed S cells injected

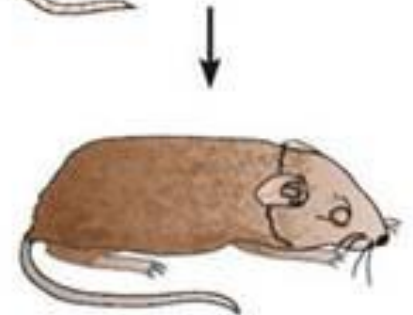
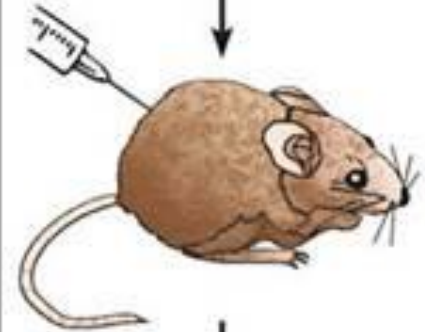


Mouse lives

Experiment 4

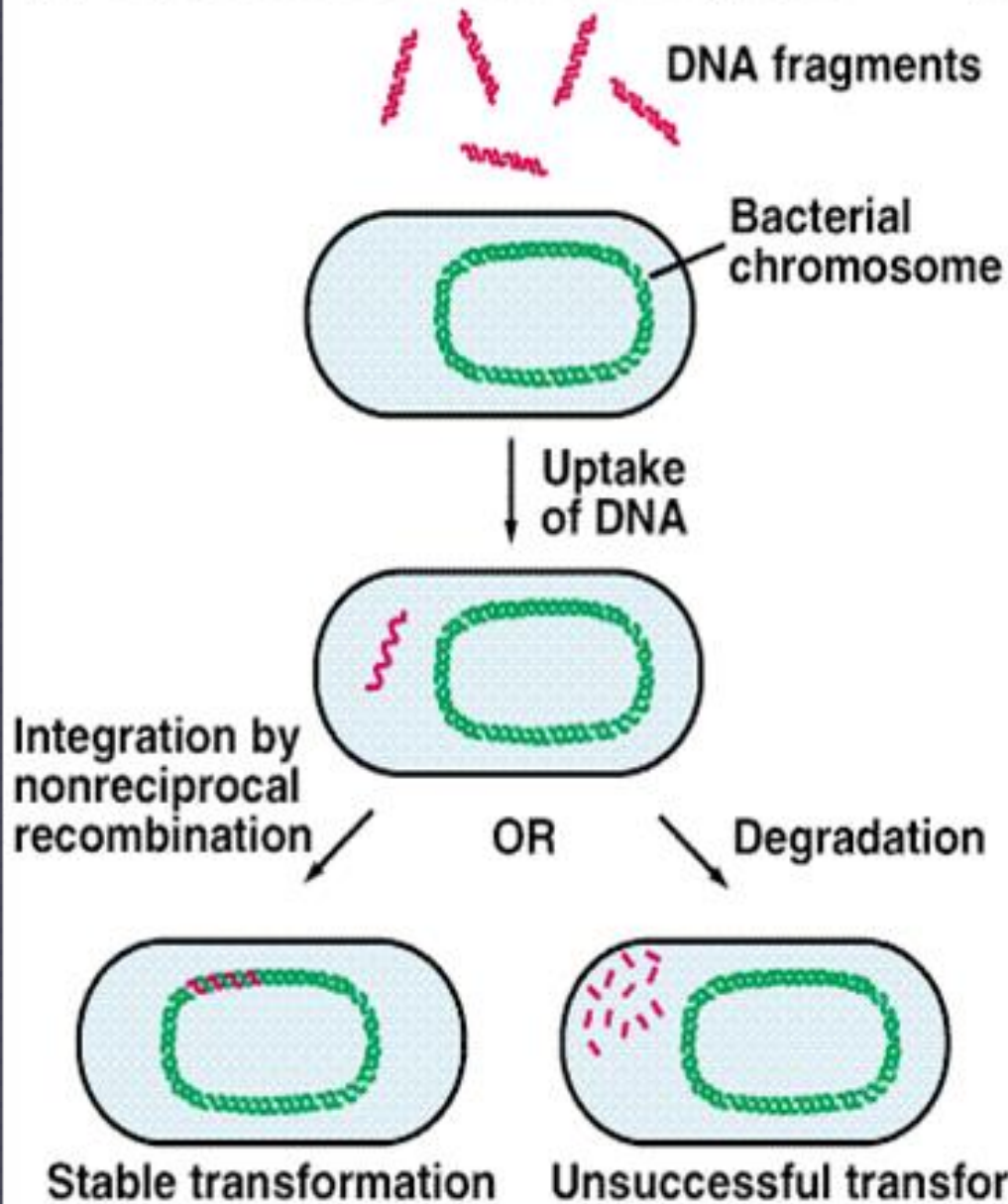


R cells and heat-killed S cells injected

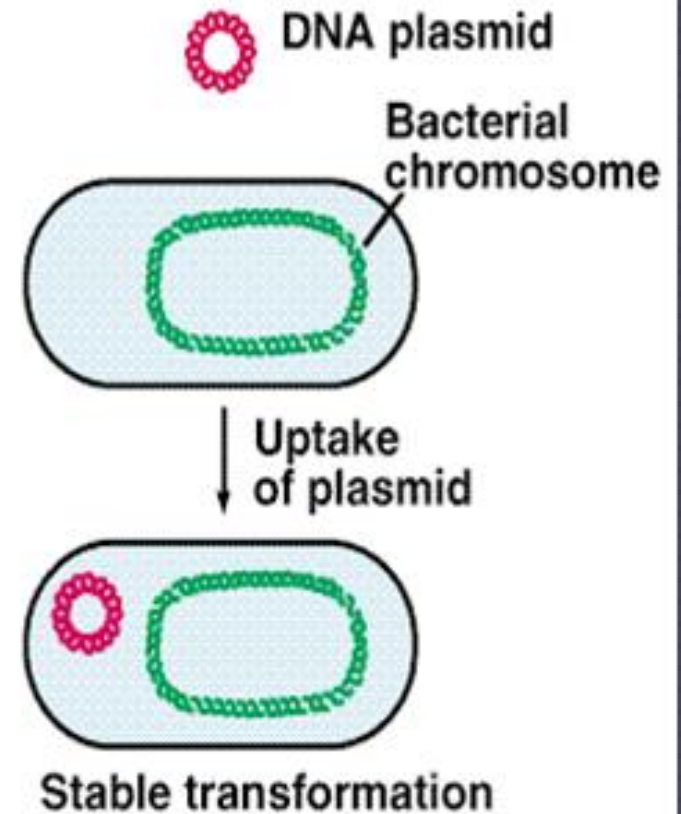


Mouse dies

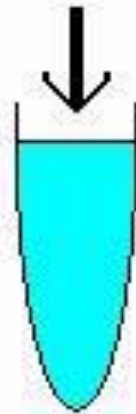
(a) Transformation with DNA fragments



(b) Transformation with a plasmid



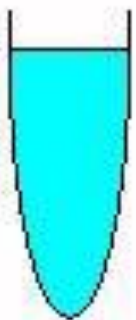
Mix of dead smooth and rough live cells



Protease added



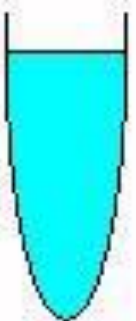
Mice Die



RNase added



Mice Die



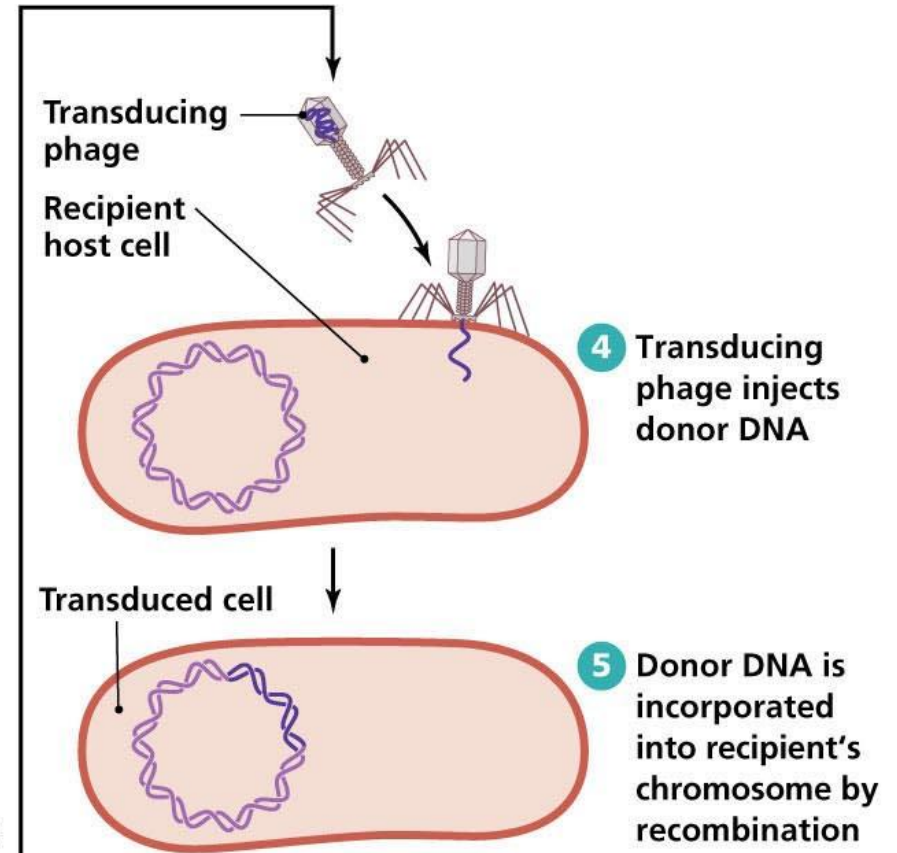
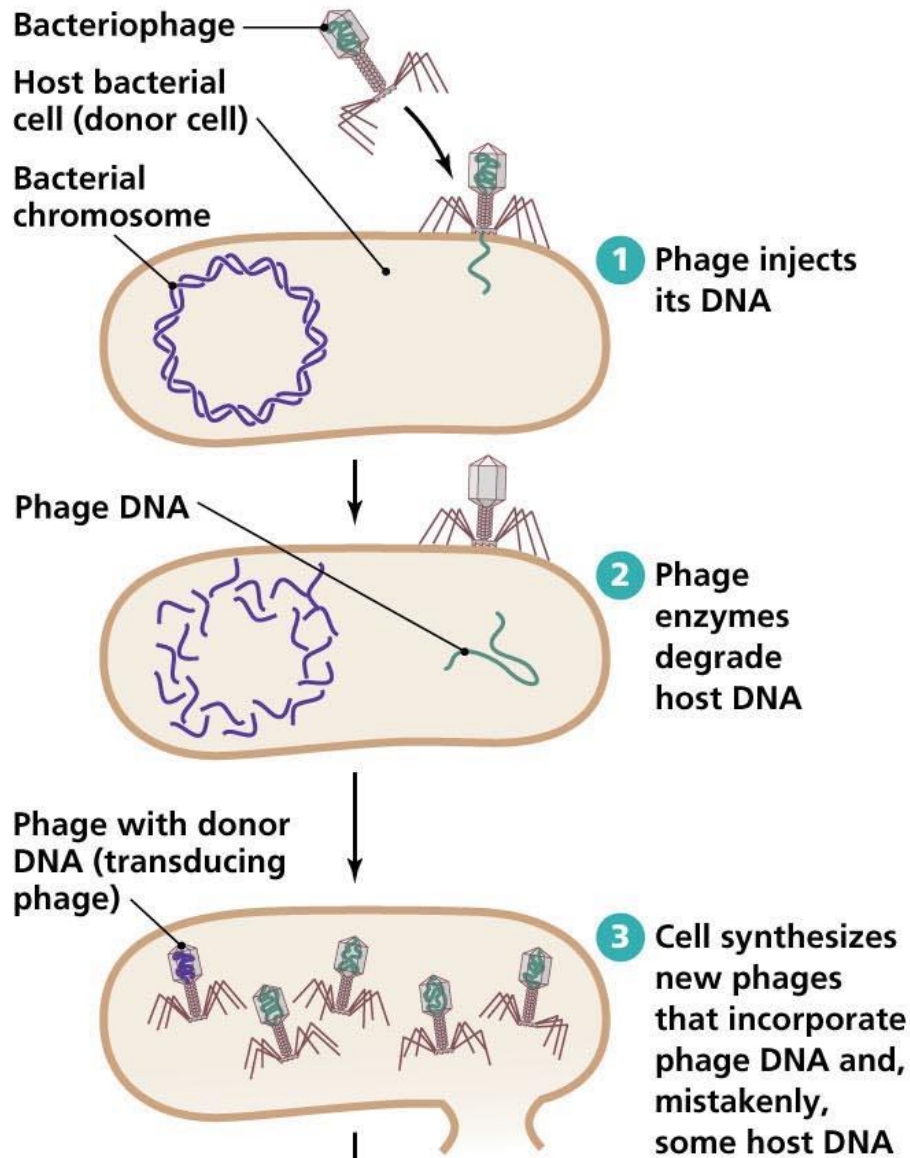
DNase added



Mice Live

Transduction

- Zinder and Lederberg – 1952
- Donor bacterium, Bacteriophage carrier and Recipient Bacterium
- Carrier bacteriophage attach the bacterium
- Donor bacterium receive the genetic material
- Bacterium DNA degraded, replication and protein synthesis occur
- New bacteriophage form
- Releases and infected to recipient bacterium





Thankyou