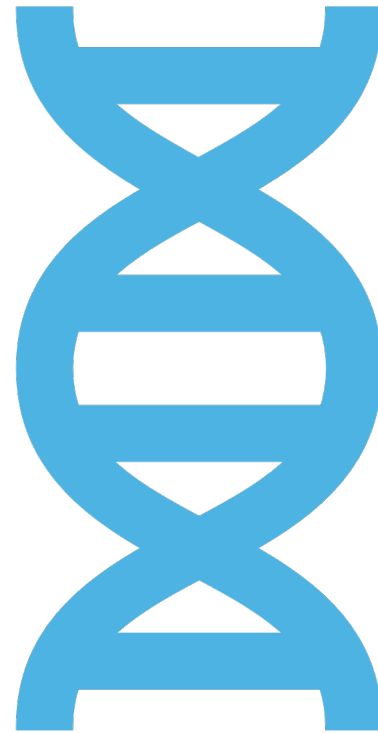


Genetic Exchange of Information

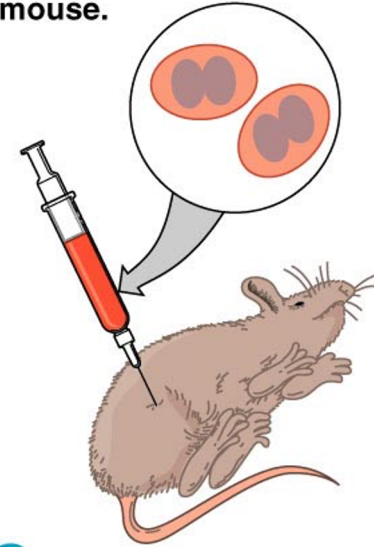
- Conjugation
- Transformation
- Transduction



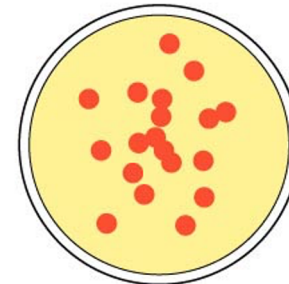
Genetic Exchange in Prokaryotes

Griffith's experiment

- 1 Living encapsulated bacteria injected into mouse.



- 2 Mouse died.



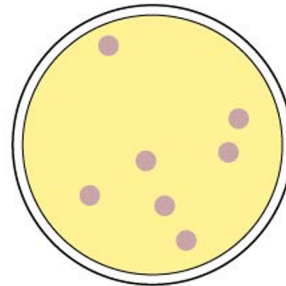
- 3 Colonies of encapsulated bacteria were isolated from dead mouse.

(a)

- 1** Living nonencapsulated bacteria injected into mouse.



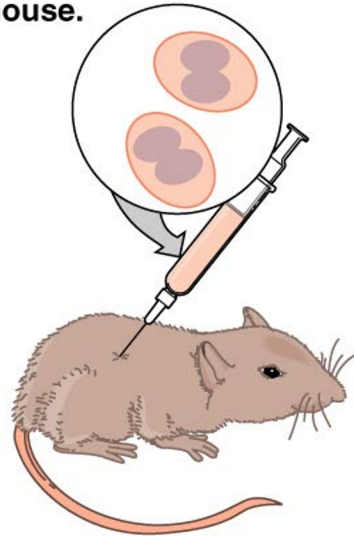
- 2** Mouse remained healthy.



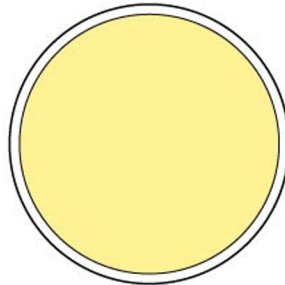
- 3** A few colonies of nonencapsulated bacteria were isolated from mouse; phagocytes destroyed nonencapsulated bacteria.

(b)

- 1** Heat-killed encapsulated bacteria injected into mouse.



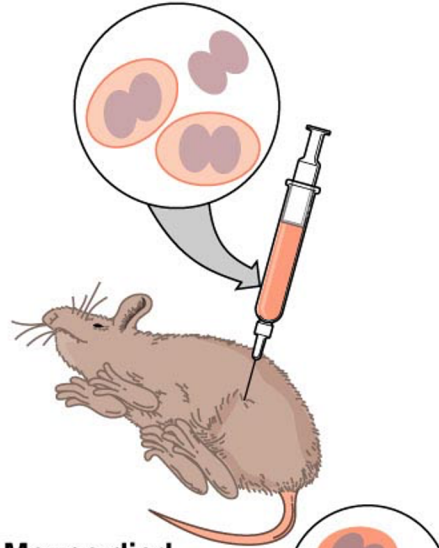
- 2** Mouse remained healthy.



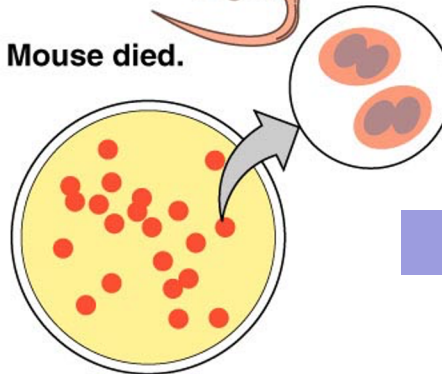
- 3** No colonies were isolated from mouse.

(c)

- 1** Living nonencapsulated and heat-killed encapsulated bacteria injected into mouse.



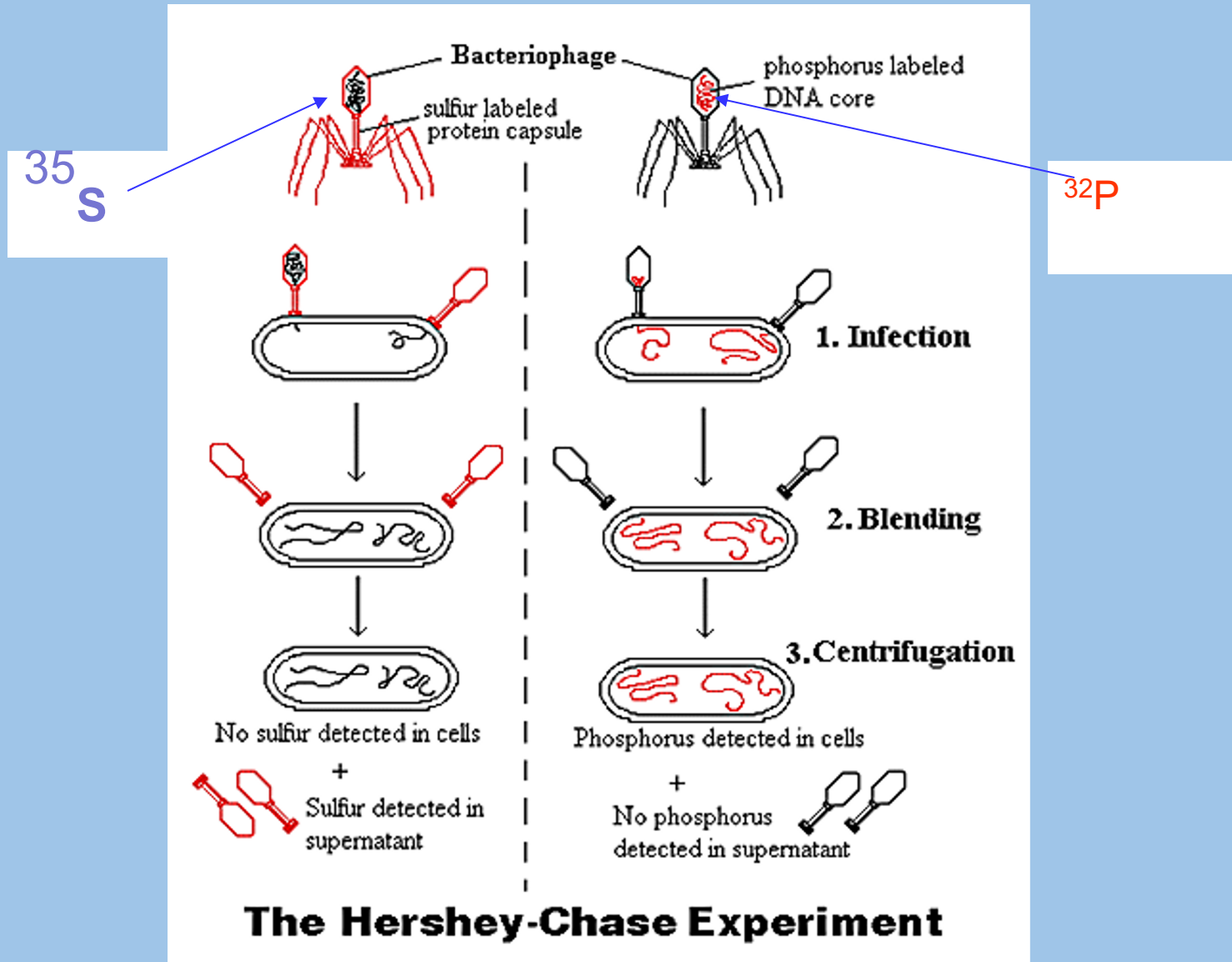
- 2** Mouse died.



- 3** Colonies of encapsulated bacteria were isolated from dead mouse.

Transformant principle

(d)



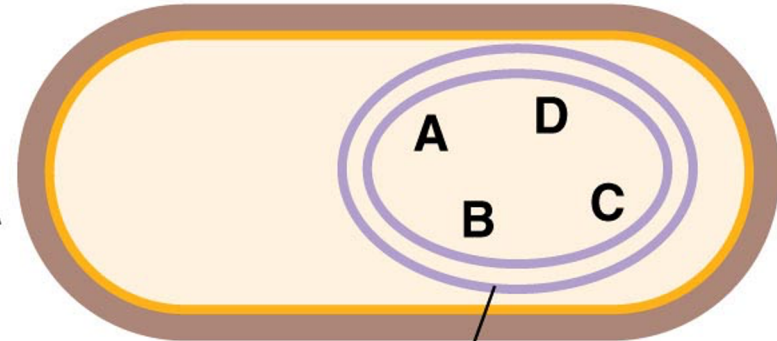
Only DNA component carries the genetic information

Transformation

Recipient cell

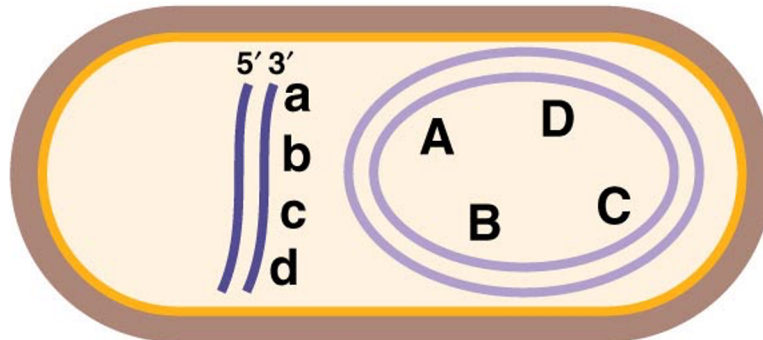
5' 3'
a
b
c
d

DNA fragments
from donor cells

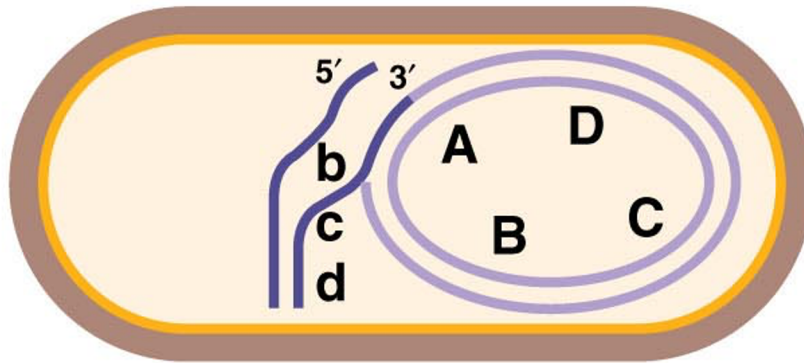


Chromosomal DNA

1 Recipient cell takes up donor DNA

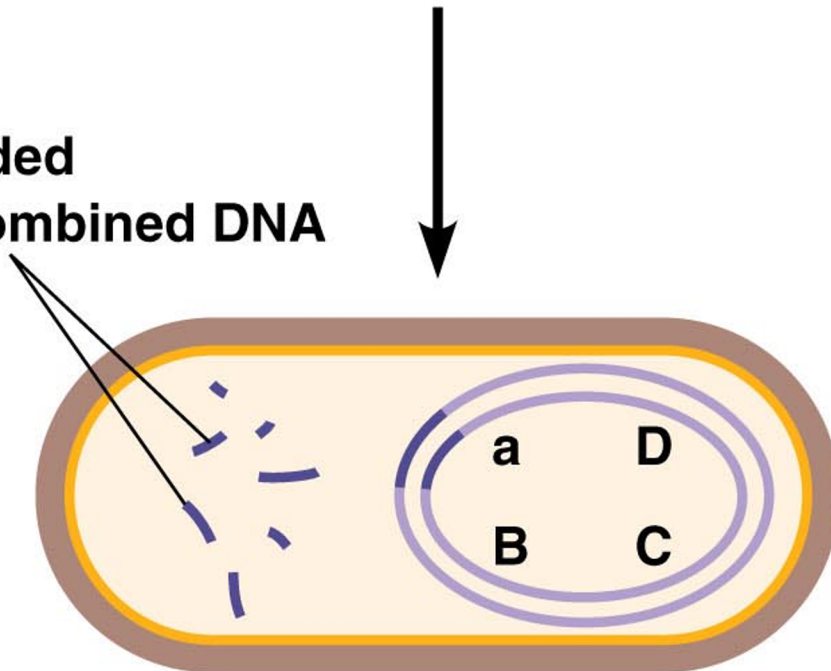


2 Donor DNA aligns with complementary bases



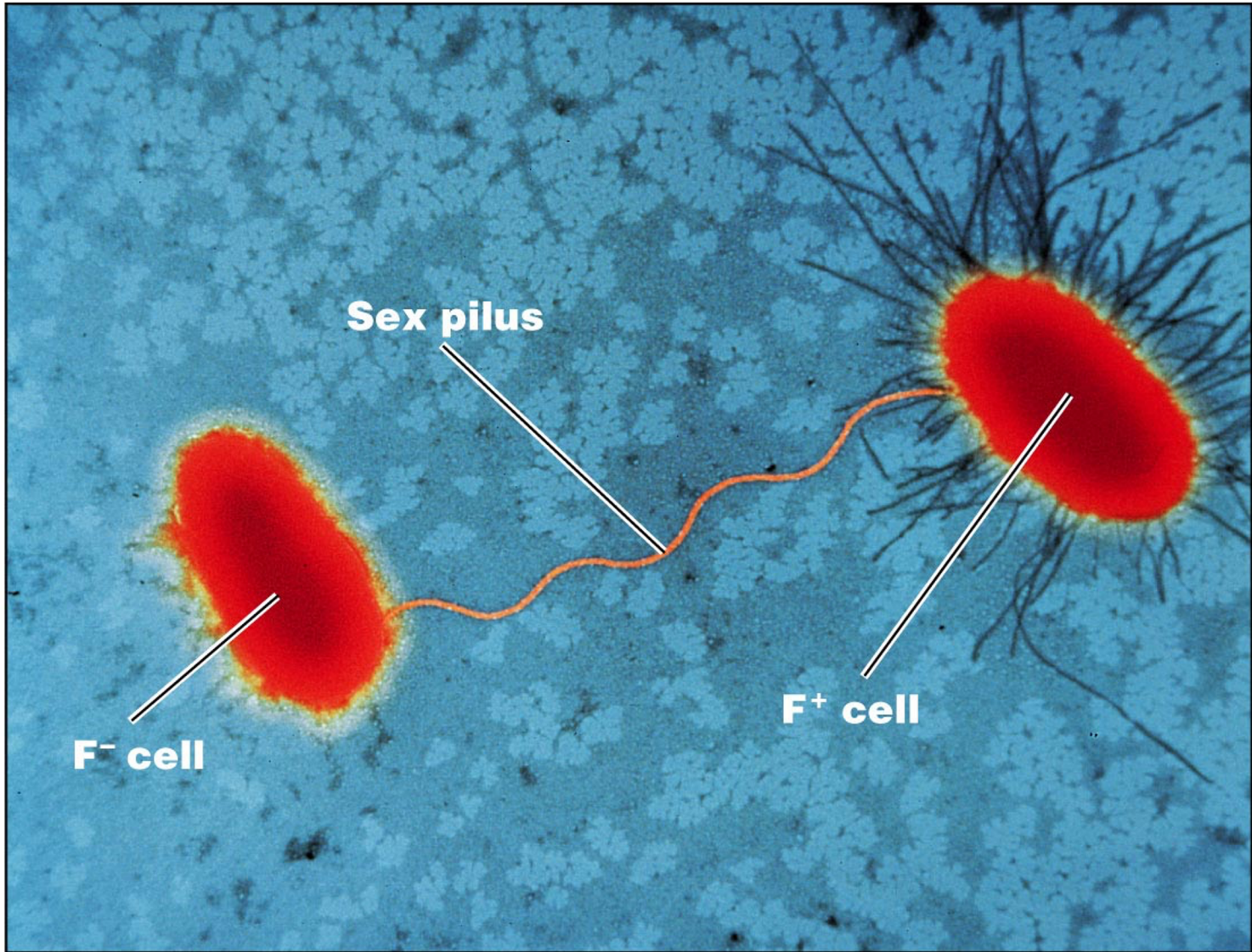
3 Recombination occurs between donor DNA and recipient DNA

Degraded unrecombined DNA



Genetically transformed cell

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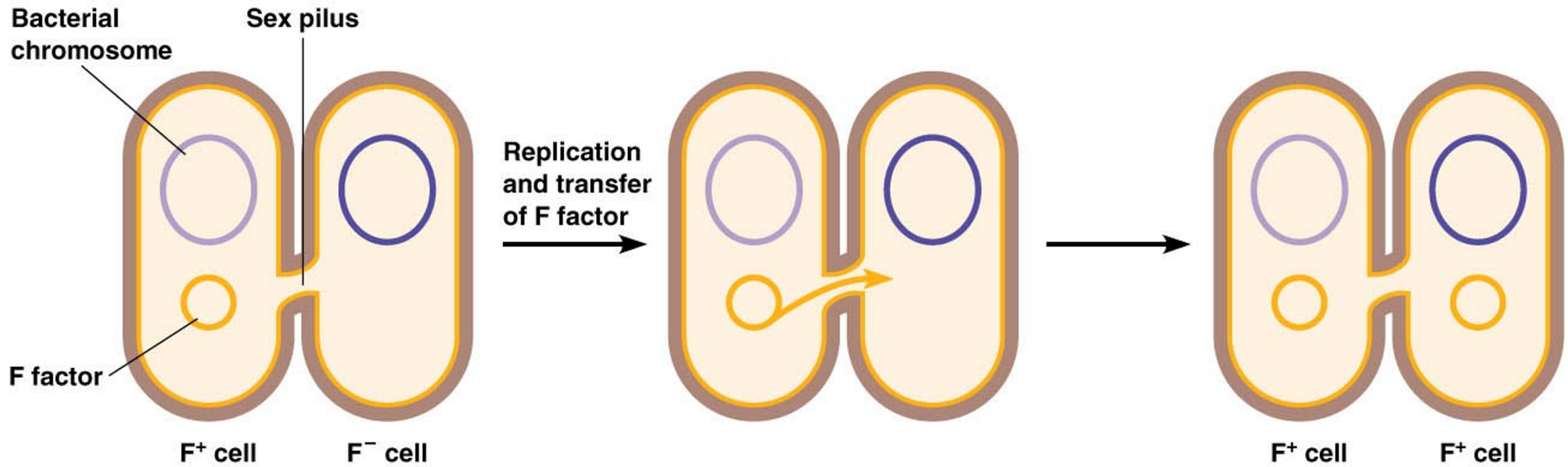
TEM

1 μm

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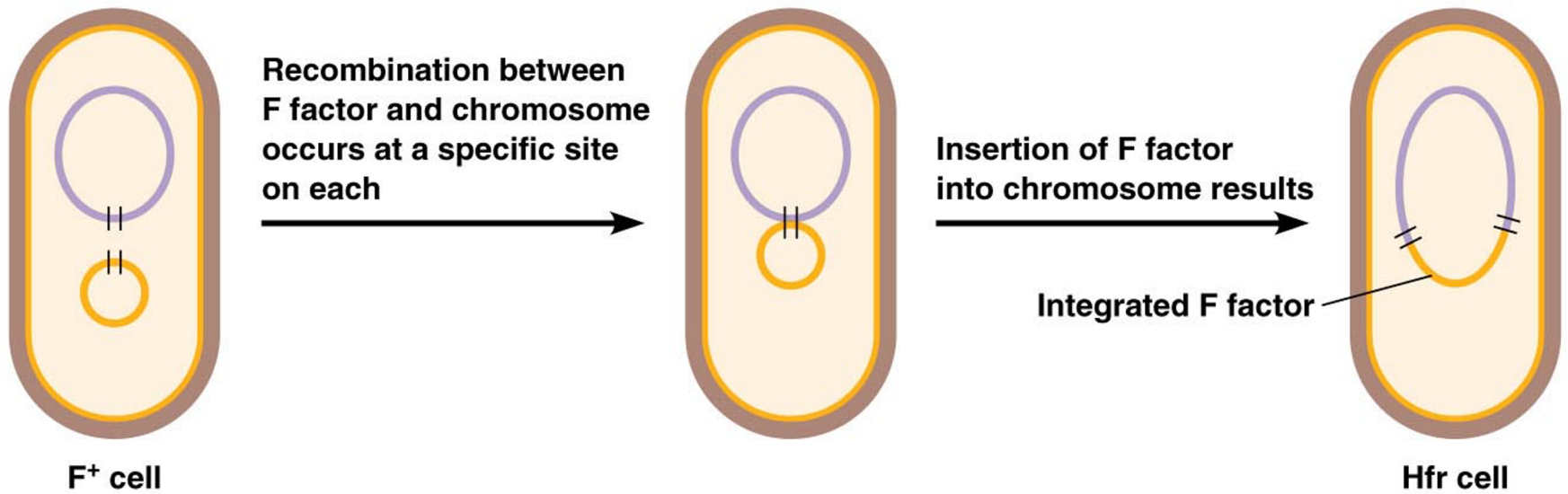
Figure 8.25

Conjugation

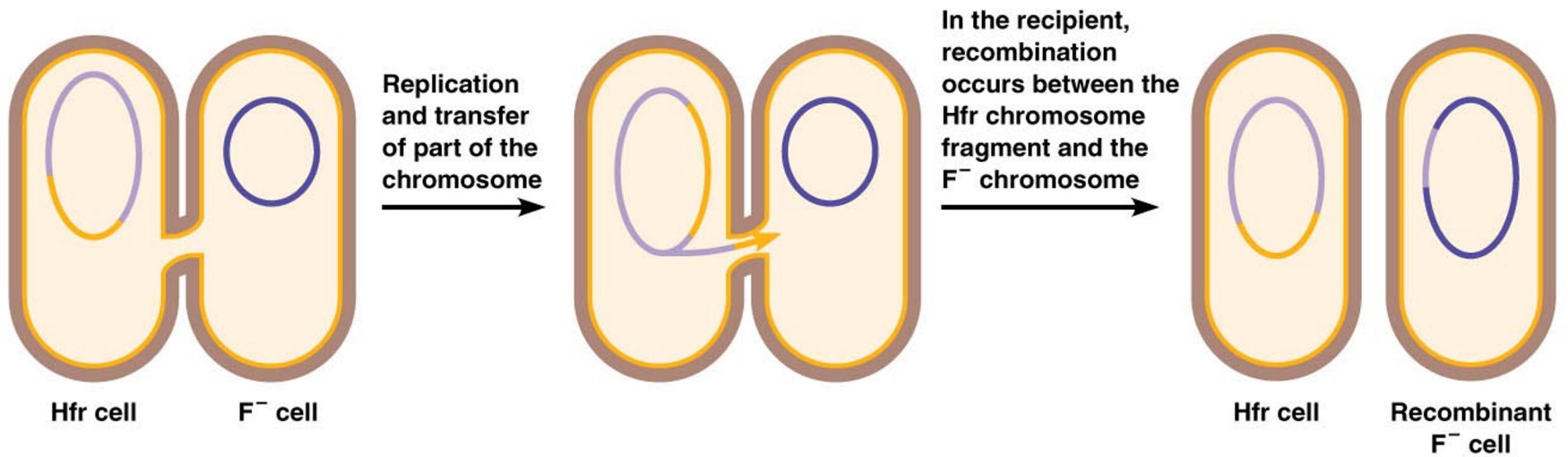


(a) When an F factor (a plasmid) is transferred from a donor (F^+) to a recipient (F^-), the F^- cell is converted into an F^+ cell.

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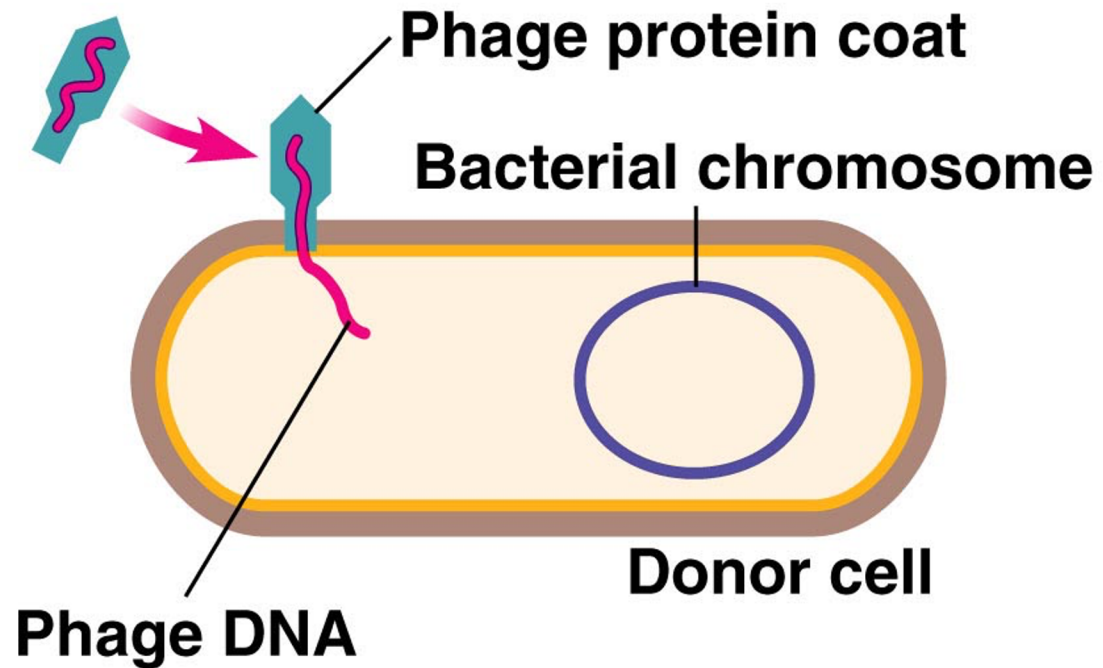
(b) When an F factor becomes integrated into the chromosome of an F⁺ cell, it makes the cell a high frequency of recombination (Hfr) cell.



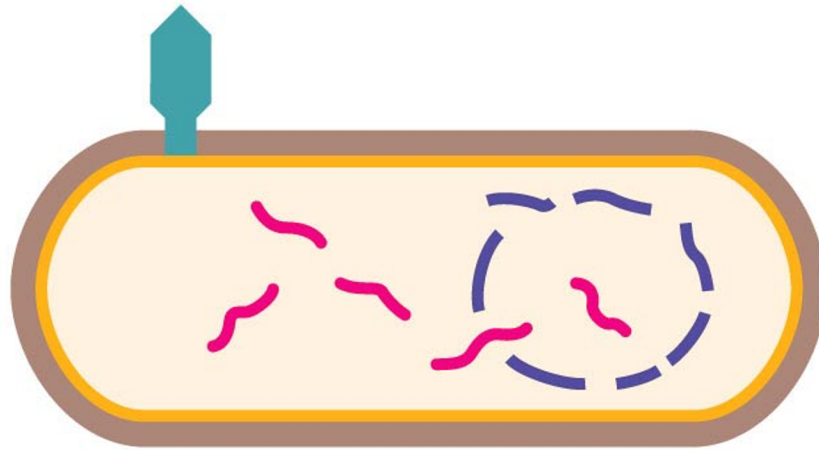
(c) When an Hfr donor passes a portion of its chromosome into an F⁻ recipient, a recombinant F⁻ cell results.

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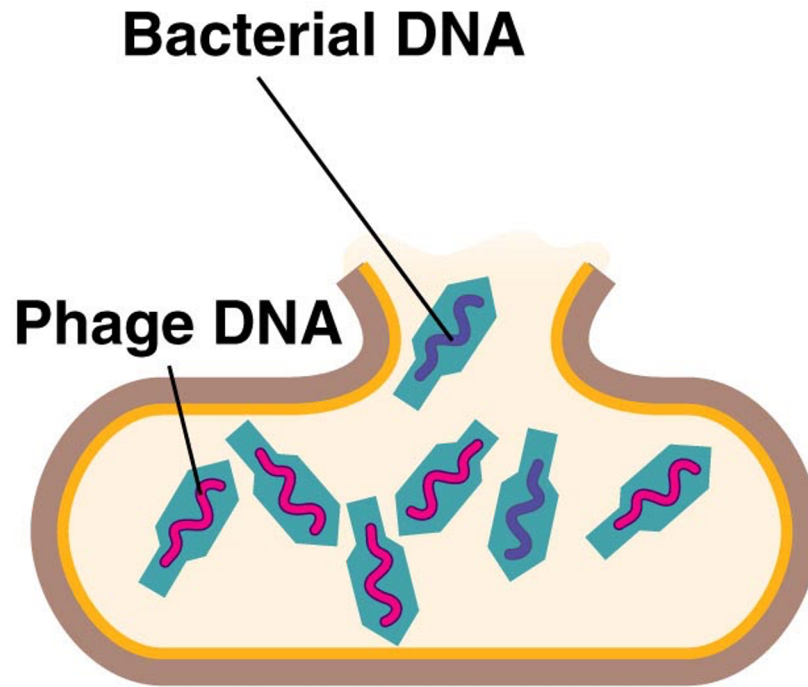
Transduction



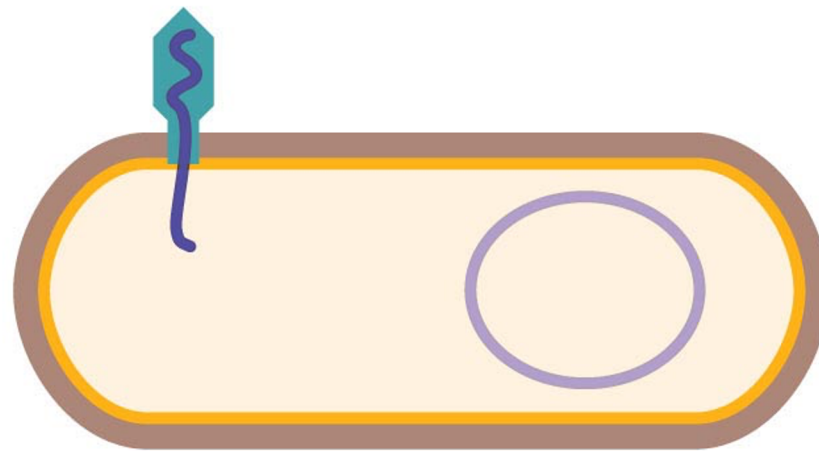
- 1** A phage infects the donor bacterial cell.



- 2** Phage DNA and proteins are made, and the bacterial chromosome is broken into pieces.

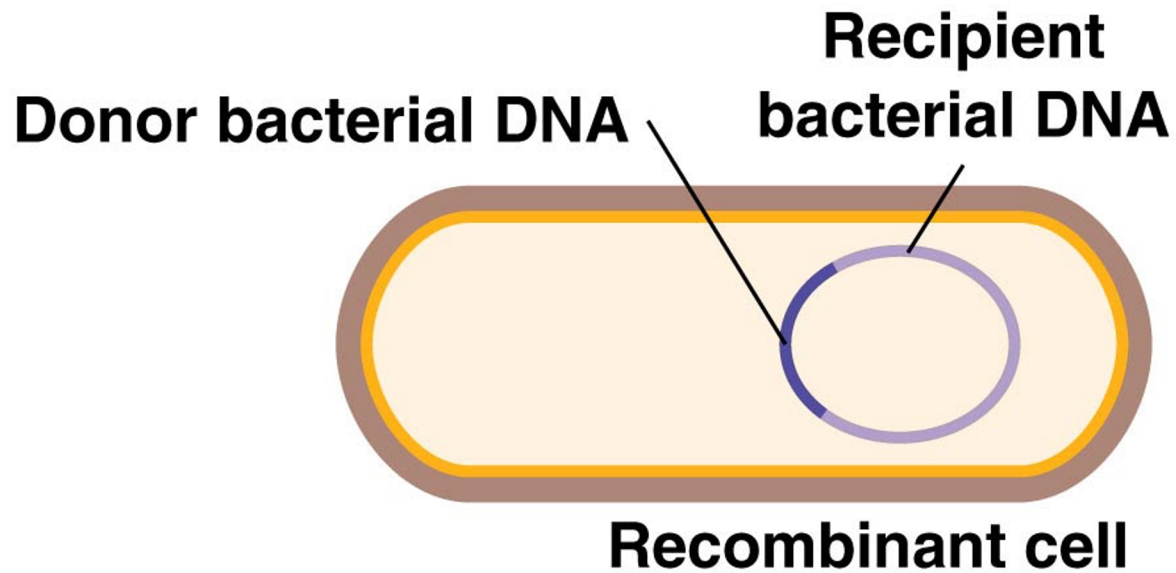


- 3** Occasionally during phage assembly, pieces of bacterial DNA are packaged in a phage capsid. Then the donor cell lyses and releases phage particles containing bacterial DNA.



Recipient cell

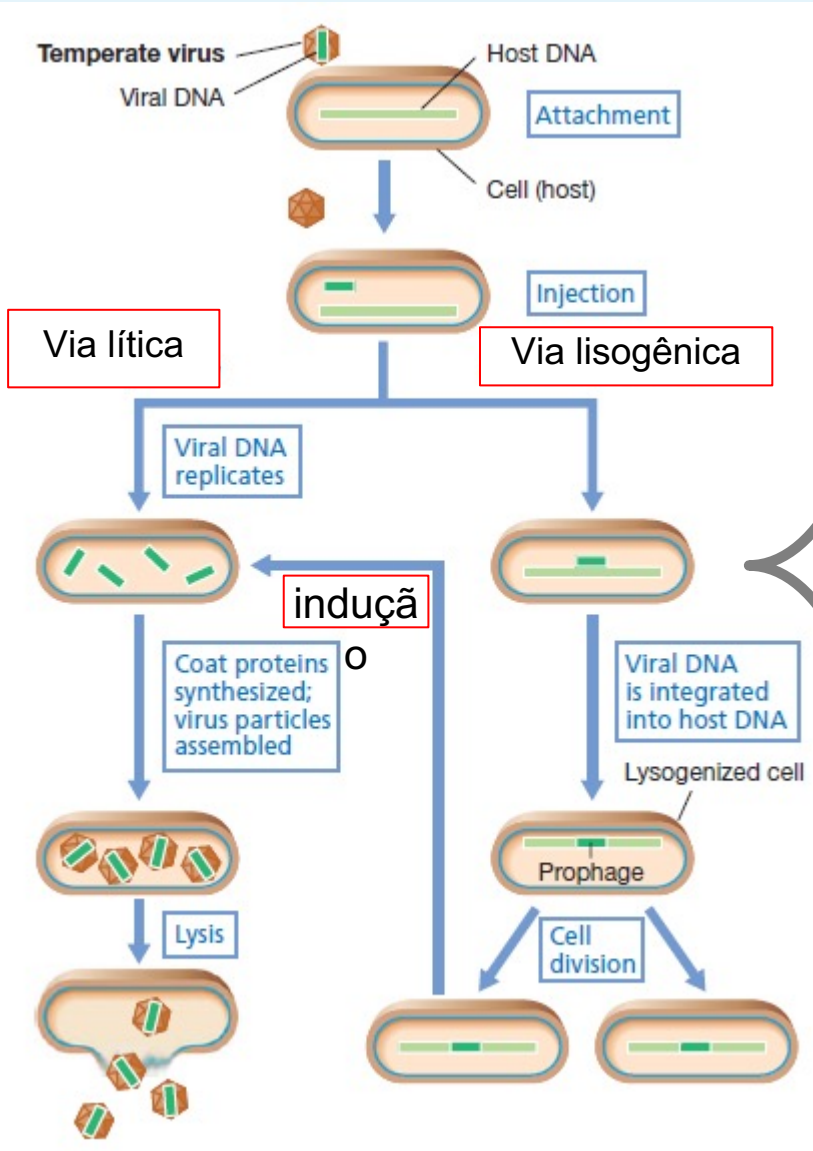
- 4** A phage carrying bacterial DNA infects a new host cell, the recipient cell.



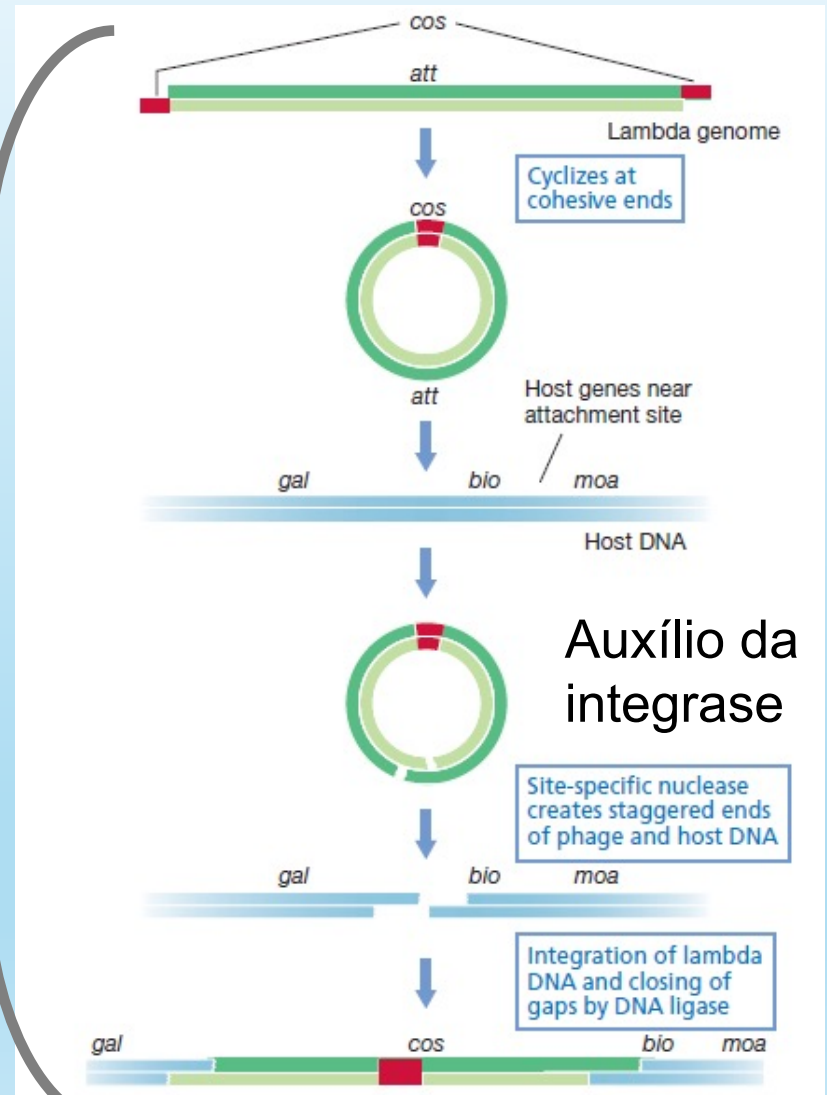
- 5** Recombination can occur, producing a recombinant cell with a genotype different from both the donor and recipient cells.

Ciclo Lítico e Via Lisogênica

Vias líticas e lisogênicas

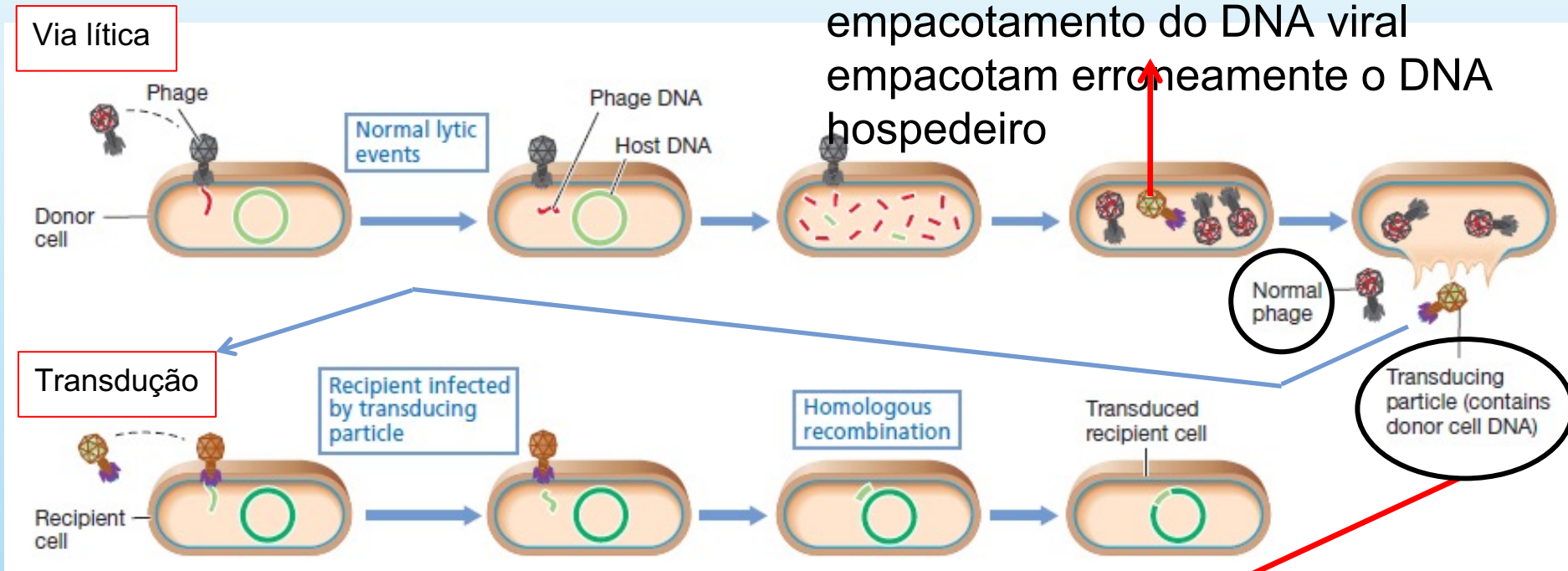


Integração na via lisogênica



Transdução Generalizada

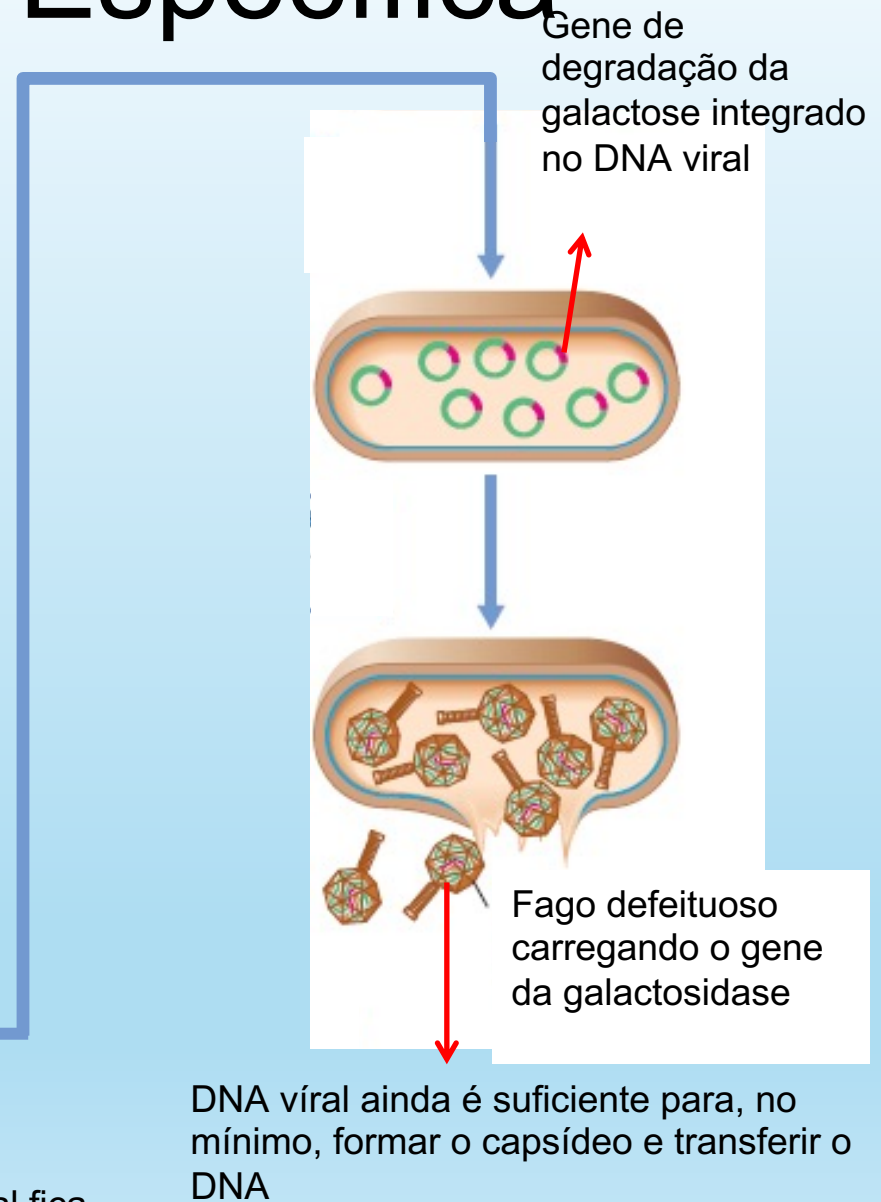
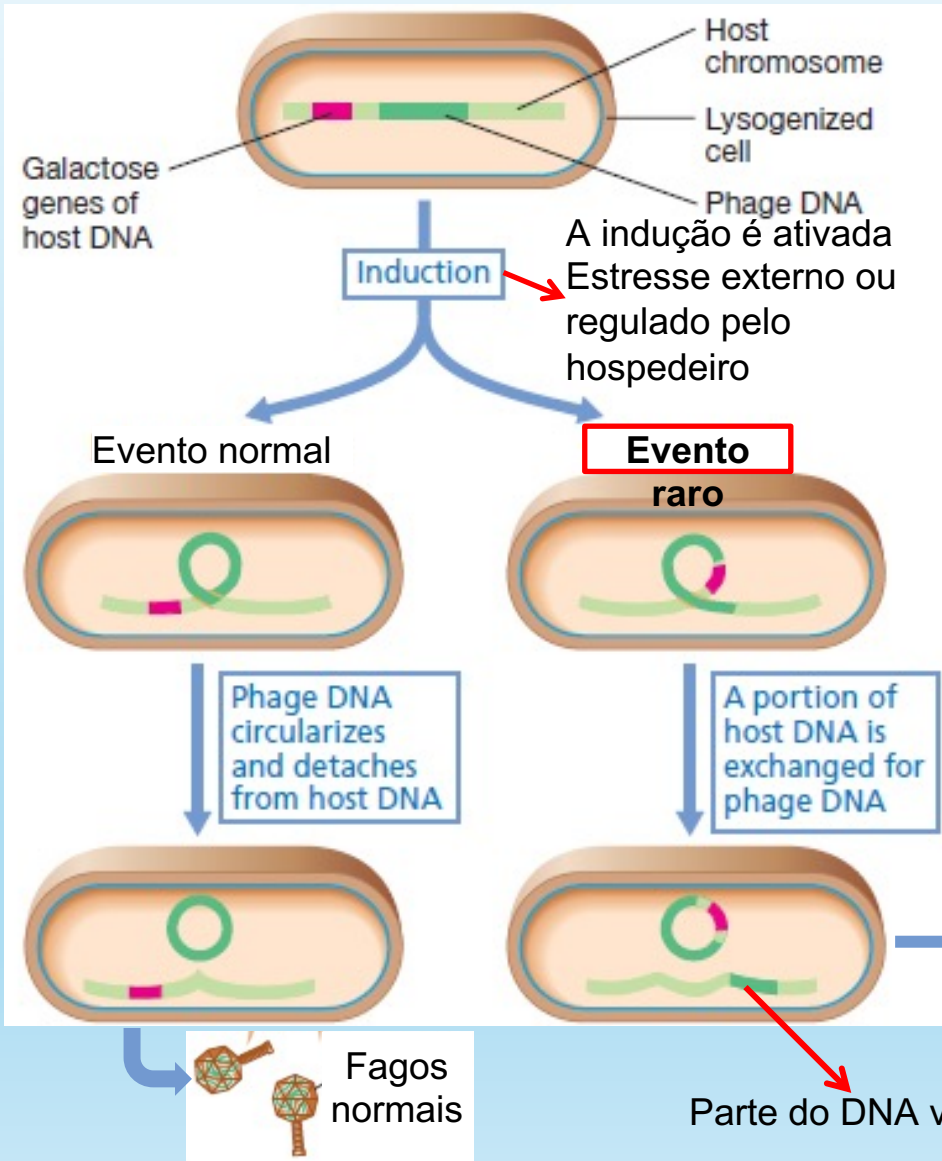
As enzimas envolvidas no empacotamento do DNA viral empacotam erroneamente o DNA hospedeiro

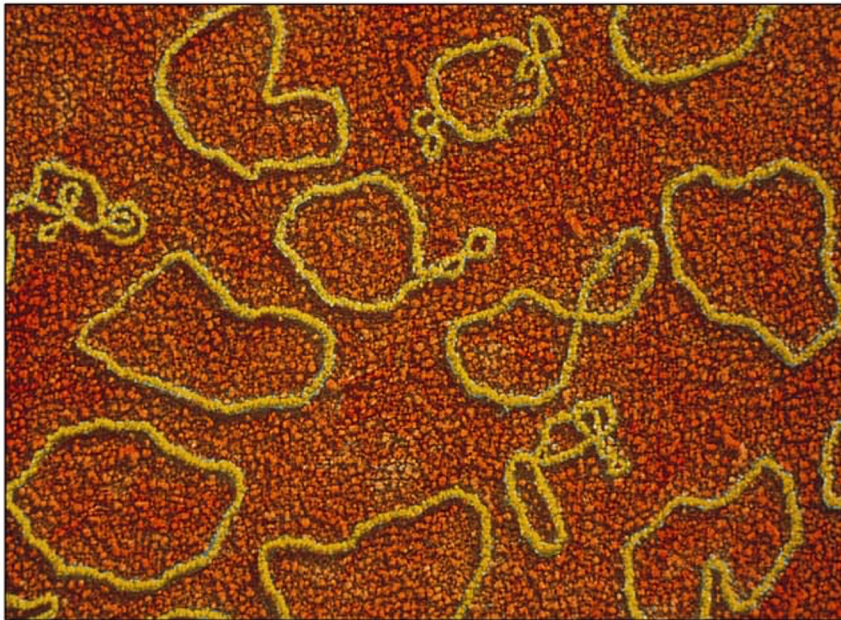


Partículas defeituosas – não promovem infecção viral

- Apenas uma pequena parcela dos vírus que carregarão um fragmento do DNA genômico da célula de origem.
- Essa parcela diminuta, centenas ou milhares de virus transfectores entre milhões de virus normais, será suficiente para permitir o uso da transdução no laboratório e para causar efeito na natureza.

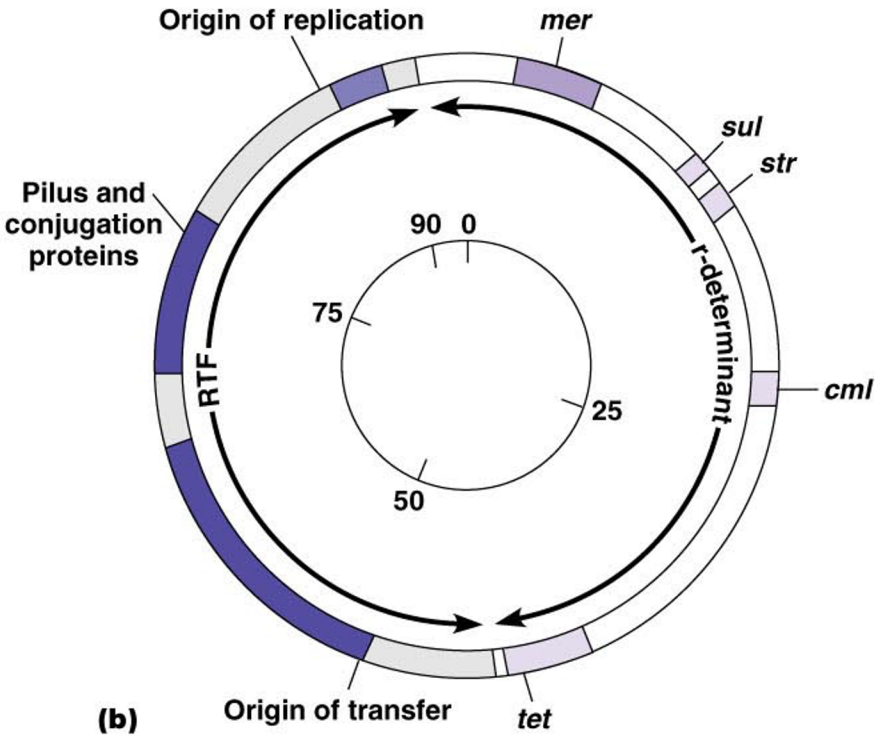
Transdução Específica





(a)

SEM | 10 nm



(b)

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Figure 8.28 - Overview

Table 10.6 Properties of transposons

Designation	Characteristics
Kinds of transposons	
Insertion sequences	Relatively short pieces of DNA, 750 to 2,000 bp long, that encode only a transposase; designated IS followed by an italicized number, e.g., <i>IS1</i> , <i>IS2</i> , <i>IS3</i>
Composite transposons	One or more genes flanked by matching insertion sequences; designated Tn followed by an italicized number, e.g., <i>Tn5</i> , <i>Tn10</i>
Mechanism of transposition	
Cut and paste	The transposon is cut out of the DNA where it resides and is inserted in a new location.
Replicative	The transposon is replicated; one copy remains at its original location, and the other is located at a new one.

IS2

1327 bp; 41 IR

tnp

Insertion sequence

(a)



Tn5

5.7 kb

Transposon

IS50L

IS50R

kan str bleo

tnp

(b)



Target sequence



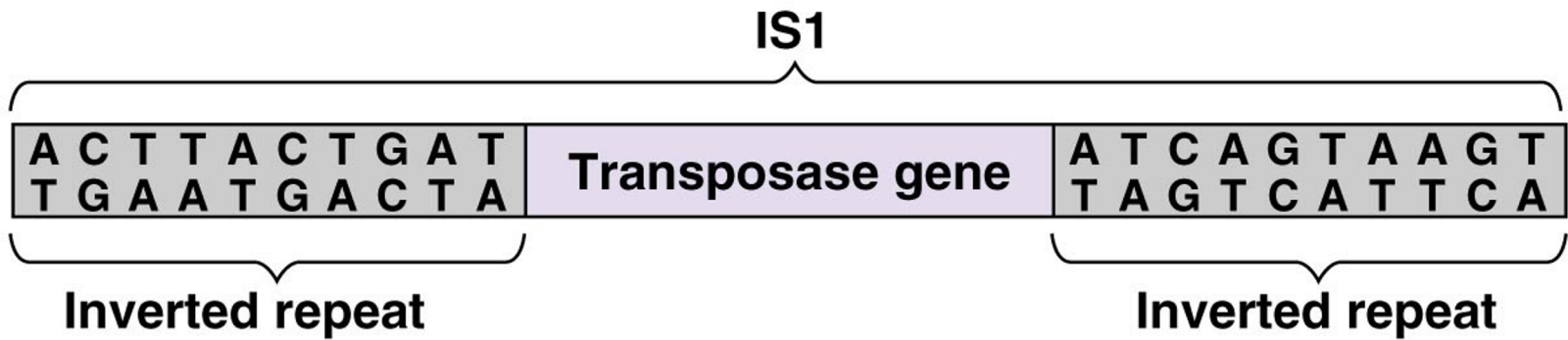
Transposable element

Insertion

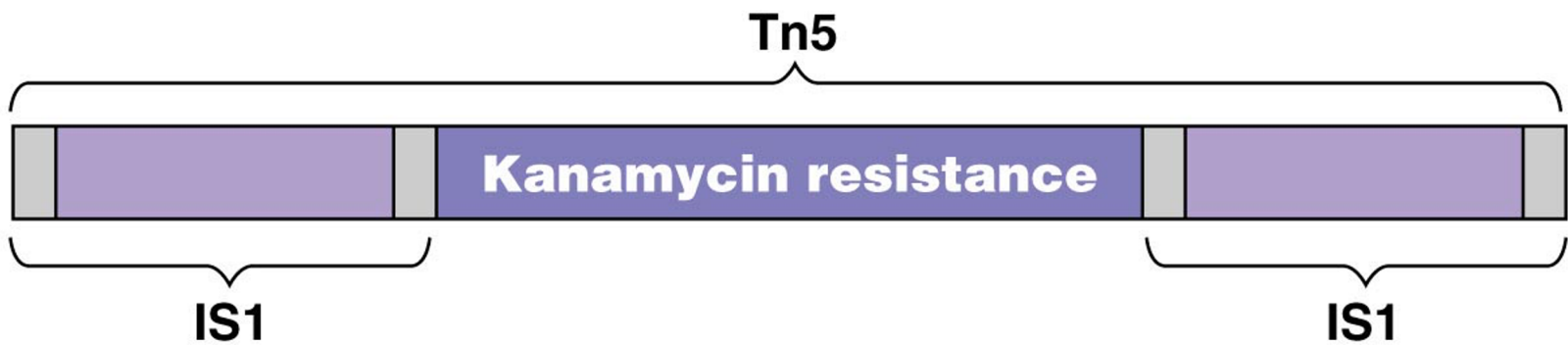


Duplicated target sequence

Transposition



(a) Insertion sequence IS1



(b) Complex transposon Tn5

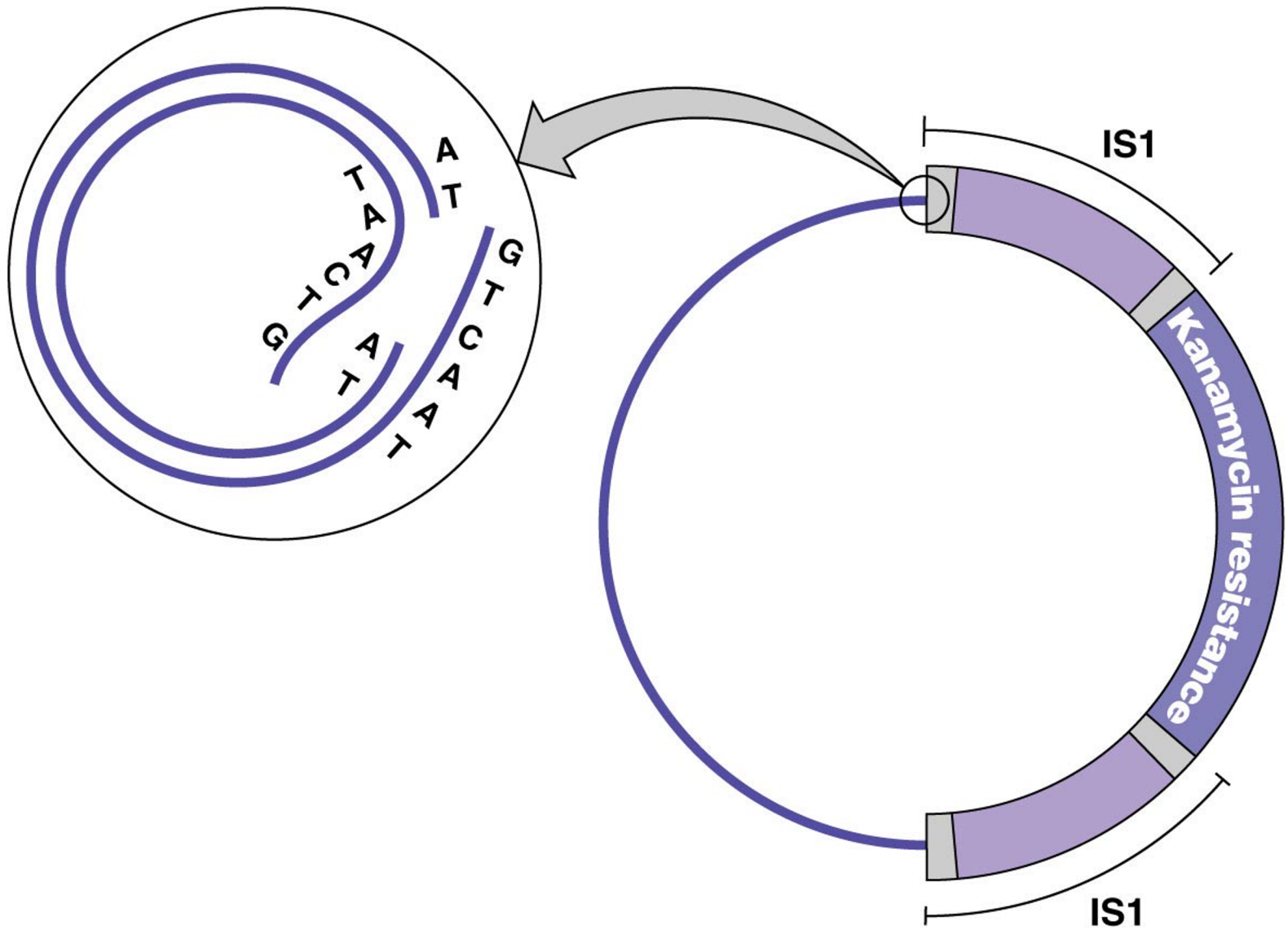
ACTTACTG

TGAATGACTA	AT	Transposase gene	ATCAGTAAGT
			TA

GTCATTCA

1 Transposase cuts DNA, leaving sticky ends.

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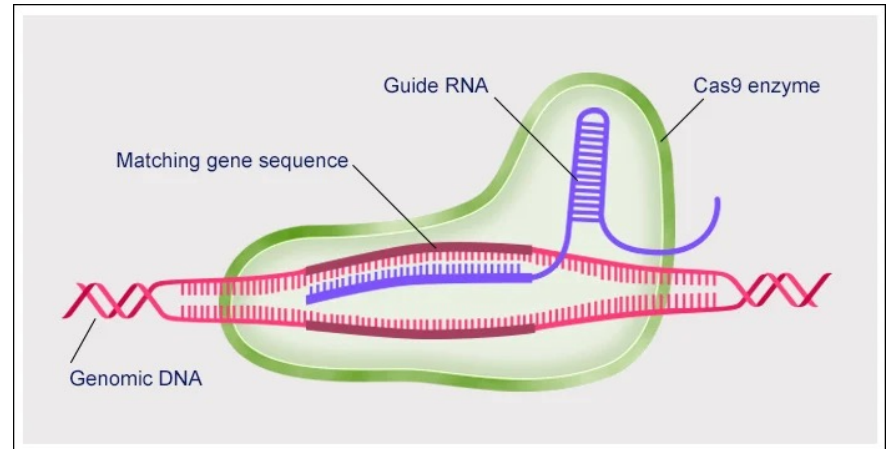
2 Sticky ends of transposon and target DNA anneal.

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Figure 8.29, step 2

CRISPR

Clusters of
Regularly
Interspaced Short
Palindromic
Repeats



Como a CRISPR funciona?

