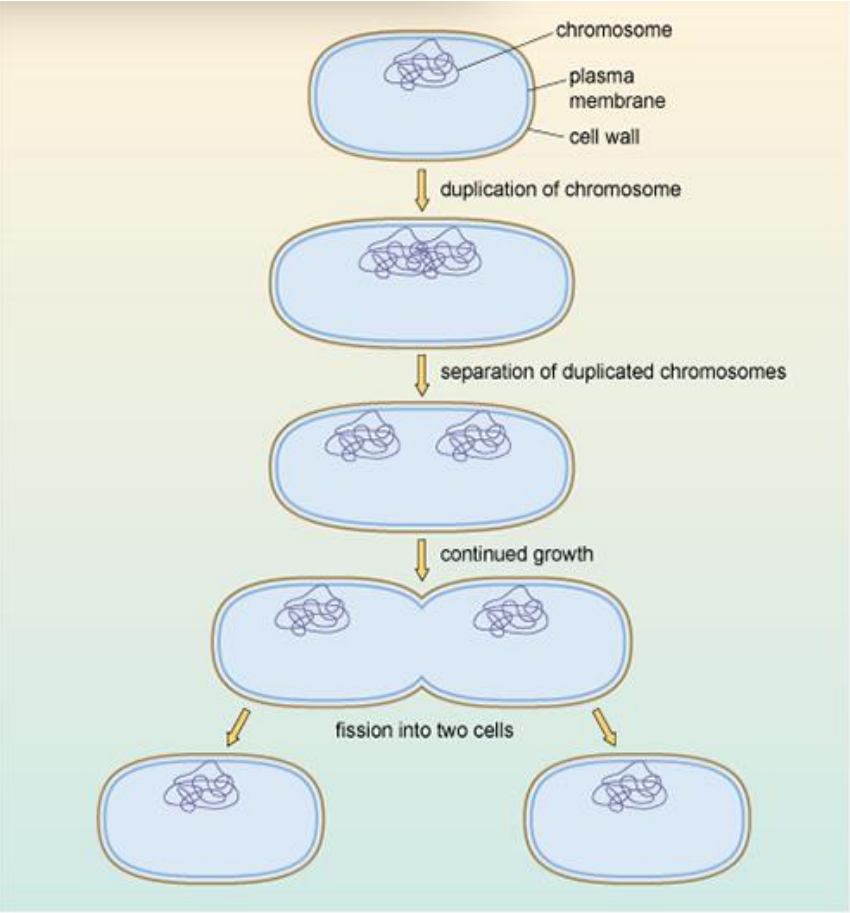
Gene Transfer in Bacteria

Gene transfer occurs when genetic information is passed from one organism to another. This occurs through two mechanisms: vertical gene transfer and horizontal gene transfer.

1- Vertical gene transfer : is referred to as the transfer of genetic information, including any genetic mutations, from a parent to their offspring, bacteria reproduce by binary fission, where the cell divides into two identical daughter cells.

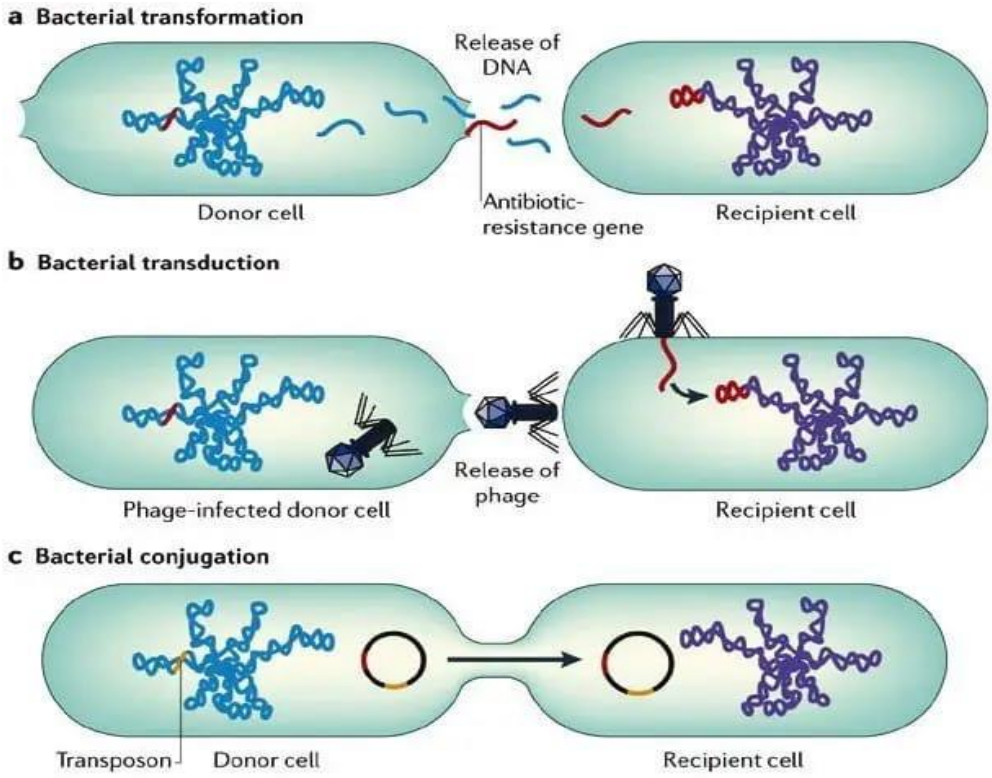


Vertical Gene Transfer

2- Horizontal Gene Transfer: It is the process of transferring genes between different species and genera, and it is important in the genetic development of microorganisms, because provides the possibility of forming new genetic for local strains, which increase the bacteria's ability to adapt, efficiency, and competitiveness. and also plays a role in the biological and environmental diversity.

There are three types of horizontal gene transfer :

- ✓ Transformation: It is the process of transferring genetic information by including a piece of DNA within the genome of the receiving living cell without the need for direct contact between the two cells and vectors.
- ✓ Transduction: It is the process of transferring DNA, which contains the desired genetic information, from one bacterium to another through natural vectors such as viruses.
- ✓ Conjugation: is the transfer of plasmid DNA by direct contact or physical stimulation between different bacterial species and genera, which provides the transfer of antibiotic resistance factors and virulence factors, and is one of the most common horizontal gene transfer processes. This is done through direct contact between the two conjugated cells, the donor which contains the plasmid symbolized by F+ (Donor Fertility plasmid), and the recipient devoid of plasmid, symbolized by F- (Recipient Fertility plasmid), by extending what is called the pili to form pilus, or conjugation bridge, between them.



Horizontal Gene Transfer

Characteristics of plasmid

1-genetic structure that is found in some prokaryotic cells such as bacteria and some eukaryotic cells such as plants and fungi.

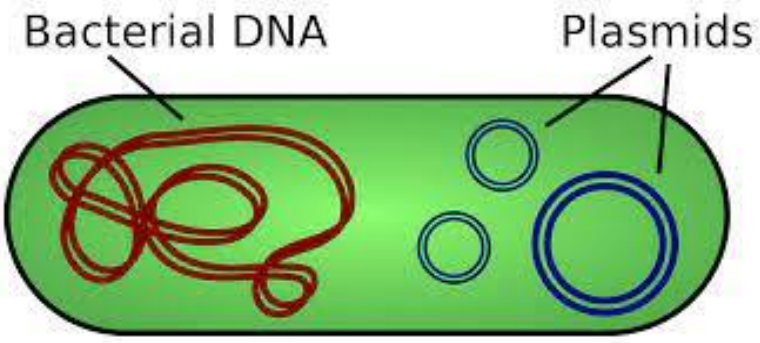
2-The plasmid is an extra chromosomal DNA which means it is not a chromosome and can replicate independently of the chromosome

3-It is a small circular double-stranded DNA

4-Bacteria can live without plasmid as all the genes required for the bacteria are found on its chromosomal DNA

5-Plasmid contain suitable markers (antibiotic resistant)

6-Plasmid contain suitable restriction sites that can be used for inserting DNA fragments for cloning.



Materials and Method for Conjugation

1- We take a loop full of the received *E.coli* bacteria and mix it with 750 µl of normal saline (NS) in an Eppendorf tube and shake for one minute with a Vortex device to disintegrate the cells.

2- We add two loops full of donor bacteria *Agrobacterium tumefaciens* also shook for one minute.

3- Centrifuge the tube for 8 minutes at 8000 rpm/ minute. Discard 600 µl of the filtrate and mix the remainder well. Then, it was withdrawn using a microliter and placed dropwise in the middle of a 9.0 cm plastic dish containing solid NA medium alone and incubated at 37 °C (E.coli receptor temperature) for 24 hours.

4- The drop was then scraped off and mixed in an Eppendorf tube containing 1.0 ml of NS. Dilutions 10^{-1}, 10^{-2} and 10^{-3} were prepared from the mixture. 100 µl of each were taken individually and spread on a plate containing solid NA recipient bacteria medium supplemented with antibiotics for the donor and recipient bacteria. They are 30 µg/ ml Amoxicillin and 50 µg/ ml Kanamycin, respectively, then incubated at 37 °C for the recipient.

	Amoxicillin 30 µg/ ml	Kanamycin 50 µg/ ml
A. tumefaciens	Resistant	Sensitive
E.coli	Sensitive	Resistant