

**Horizontal Gene Transfer**

Horizontal gene transfer is the process of a pre-existing bacterial cell receiving new genetic material. This allows for genetic diversity and increased variability in genomes. Horizontal gene transfer can lead to greater survival for strains of bacteria because they can receive genes that are advantageous for a specific environment.

Review the types of horizontal gene transfer and then use the table below to review their differences and requirements.

| Name of the type of horizontal gene transfer | What happens | Requirements | Important information & distinguishing factors for this type of horizontal gene transfer |
|----------------------------------------------|--------------|--------------|------------------------------------------------------------------------------------------|
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**Thought Questions:**

1. Circle the correct option for the donor and the recipient in each of the following types of horizontal gene transfer. Note: The donor should be where the DNA came from directly before it went into the recipient cell.
  - a. Conjugation
    - i. Donor: Bacterial cell, environment, virus, other (list it here)
    - ii. Recipient: Bacterial cell, environment, virus, other (list it here)
  - b. Transformation
    - i. Donor: Bacterial cell, environment, virus, other (list it here)
    - ii. Recipient: Bacterial cell, environment, virus, other (list it here)
  - c. Transduction
    - i. Donor: Bacterial cell, environment, virus, other (list it here)
    - ii. Recipient: Bacterial cell, environment, virus, other (list it here)
2. Where are two places a fertility factor can be stored? What is the terminology used with each place?
3. There are two types of transduction that differ based on which genes can be transferred to a recipient cell. Below, list what their names are and which genes can move using each method.
4. Read the following situations and identify which type of horizontal gene transfer is being discussed. Assume that all donor and recipient cells are competent and have a fertility factor for these examples.

| Situation                                                                                                                                                                                                                                                                                                                                                                               | Horizontal Gene Transfer Type |
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| A scientist wants to make insulin using bacteria. They make a plasmid containing a gene coding for the insulin protein and mix it in a test tube with nutrients. Then, they add many E. coli bacteria into test tube.                                                                                                                                                                   |                               |
| Someone uses a lot of hand sanitizer and antibacterial soap every day. 99.9% of the bacteria are killed but a few remain alive on their hands. They now garden and the bacteria on their hands donate bacterial resistance genes to some bacteria living in the soil.                                                                                                                   |                               |
| Someone uses a lot of hand sanitizer and antibacterial soap every day. 99.9% of the bacteria are killed but a few remain alive on their hands and can transfer them to food items. Despite killing all living bacteria on the food item after handling it by cooking it, the food has antibacterial resistant bacteria on it after being untouched and being left uncovered for a week. |                               |
| <i>Hint:</i> Long periods of heat, such as those used in cooking, can render many viruses inactive and destroy them. For this example, pretend all viruses on the food would be rendered inactive by cooking it.                                                                                                                                                                        |                               |