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**Cloning**

 The cloning is a process of generating a genetically identical copy of a cell or an organism. This process can occurs in nature when organisms such as bacteria and yeast (organisms lacking a cell nucleus) create a genetically

identical duplicates of them using binary fission or budding.Cloning in biotechnology refers to processes used to create copies of DNA fragments (molecular cloning), cells (cell cloning) or organisms (organism cloning).

Molecular cloning refers to the process of making multiple molecules. Cloning

is commonly used to amplify DNA fragments containing whole genes, but it

can also be used to amplify any DNA sequence such as promoters, noncoding sequences and randomly fragmented DNA *in-vitro* by a process known as polymerase chain reaction, or PCR, a technique that is used widely in basic biological research.

**What are types of Cloning?**

1. Gene cloning.

2. Cell cloning.

3. Reproductive cloning.

4. Therapeutic cloning

**Steps of Cloning for any DNA fragment**

1. Choosing the host cell (bacteria, insect and mammalian cell) and a

cloning vector.

2. Breaking apart a strand of DNA and amplifying desired DNA fragment

by PCR.

3. Preparation of the vector by treatment of the plasmid and the foreign

DNA with the same restriction enzyme.

4. Ligation of desired DNA fragment and vector.

5. Inserting the newly formed pieces of DNA into host cells.

6. Screening/selection, selecting out the cells that were successfully

transfected with the new DNA.

**Cloning vector**

 1. A cloning vector is a DNA molecule that has an origin of replication and is capable of replicating in a bacterial cell.

2. A vector is used to amplify a single molecule of DNA into many copes. A DNA fragment must be inserted into a cloning vector.

3. Most vectors are genetically engineered plasmids or phages.

4.There are also cosmid vectors, bacterial artificial chromosomes, and yeast artificial chromosomes

**Characteristics of cloning vectors**

1. it must be small in size (easy to isolate).

2. It must be self-replicating inside host cell (containing ori ★replication

origin).

3. Non- toxic to the host cell.

4. It must possess restriction site for Restriction Endonuclease enzymes

5. It must possess some marker gene such that it can be used for later

identification of recombinant cell.

6. it must possess multiple cloning site.

7. The large numbers of copies.

★ori is a DNA segment recognized by the cellular DNA-replication enzymes

 (without replication origin, DNA cannot be replicated in the cell).

**Types of cloning vector:**

 Different types of cloning vectors are used for different types of cloning

experiments and the vector is chosen according to the size and type of DNA

to be cloned

1-Plasmids

2-- Phages

3- Cosmid

4-Bacterial artificial chromosomes

5- yeast artificial chromosomes

6-Human artificial chromosome (HAC)



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