

# BIOTECHNOLOGY AND CLONING

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Biotechnology is the use or alteration of cells or biochemical with various techniques to provide a product or process for human welfare. Important recent discoveries in the field of biotechnology, microbiology, biochemistry, immunology, cytology, molecular biology, genetics and chemical engineering have led to a tremendous advancement in the field of biotechnology.

## Scope of Biotechnology

Production of alcohols, organic acids, glycerol, acetone and other substances through fermentation process.

**Food Supplements :** Food processing industries such as baking and making of cheese butter pickles etc. through microbiology activity.

**Production of antibodies and monoclonal antibodies :** Monoclonal antibodies are produced from B lymphocyte hybridoma cells by tissue culture technique. Different antibodies are extracted from different cultures of different bacteria & fungi.

**Genetic Engineering :** It is a process by which DNA sequence of interest is manipulated by different in vitro technique.

**DNA Libraries :** It is also called a gene library. It is an in-vitro collection of different cDNA (complimentary single stranded DNA produced from RNA).

Radioactive cDNA i.e. cDNA probe is used to find out a particular gene in a chromosome.

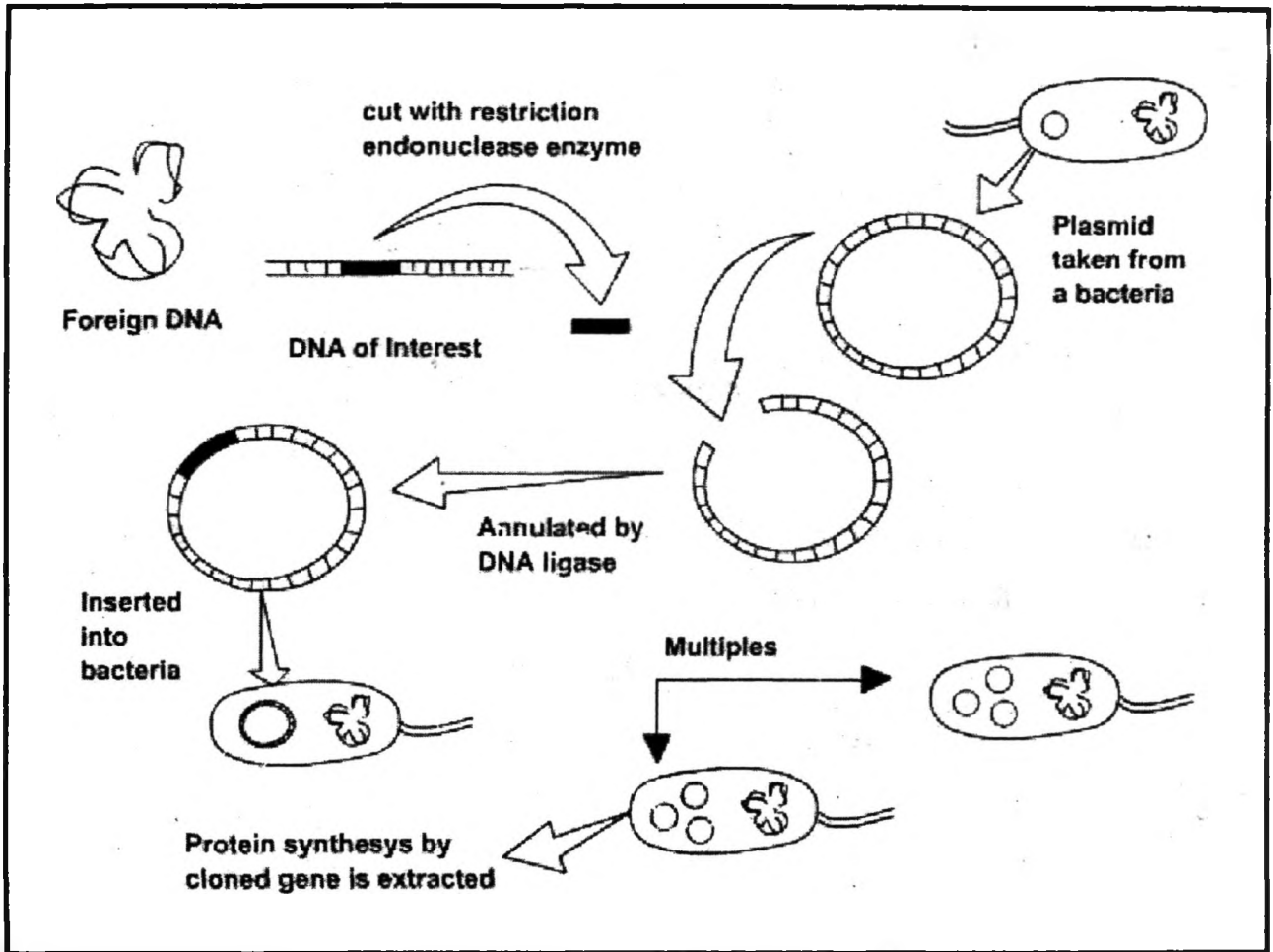
**Genetic Mapping :** It is a process of identifying DNA sequences and genes in different chromosomes of human genome.

The **human genome project** is an international effort to map the various types of human chromosomes and sequence their 3 billion base pairs. The human genome is believed to have 100,000 genes and as yet each chromosome has been assigned at most about 200 genes.

## Recombinant DNA Technology

In this technique a particular sequence of DNA or gene is cloned to get its product in great quantity. Both the foreign DNA of interest and vector DNA (plasmid and phage DNA) is cut by restriction end nuclease enzyme (molecular knife). Then the foreign gene is glued with vector DNA by DNA ligase enzyme to produce recombinant vector DNA (rDNA) which is introduced into bacteria. In bacteria culture bacteria is multiplied and foreign gene is cloned as well, for example human insulin gene is cloned and insulin is produced artificially in the way. In this process several other techniques are used. Ultra centrifugation, gel electrophoresis, chromatography etc. are used for separation of different biomolecules.

**P.C.R. Technique:** This is a DNA Xeroxing process by polymerase chain reaction (P.C.R.) a small sample of DNA transforms into multiple copies within a few minutes and after 30 cycles 1 million copies of DNA is produced within 3 hrs. So, a small sample of DNA in a strand of hair can produce sufficient copies to carry out forensic test.



**DNA Fingerprinting:** Every person has a unique sequence of repetitive DNA. This sequence is isolated from genome and then identified with radioactively labeled DNA probe. This is DNA fingerprint which is compared with suspected person for probing criminals.

**Gene Therapy:** Gene therapy provides the body with healthy genes to replace defective genes. It also includes the use of genes to treat other human illnesses such as diabetes and AIDS.

**Transgenic Plants and Animals:** Free living organisms in the environment that

have had a foreign gene inserted into them are called transgenic organisms. For example transgenic goats have been similarly engineered to secrete tissue plasminogen activator (t-Pa) in their milk and it

dissolves blood clots in the treatment of heart attack and arterial blockage.

### Cloning of Animals

Cloning of animals means production of animals which are genetically identical to the donor animal by some sophisticated technique.

It was started from early 1970s by the cloning of frogs and toads. Recently 'Dolly' became the first fully grown mammal to be cloned. Cloning of sheep was not at all easy. After 227 attempts the embryo grew into a lamb.

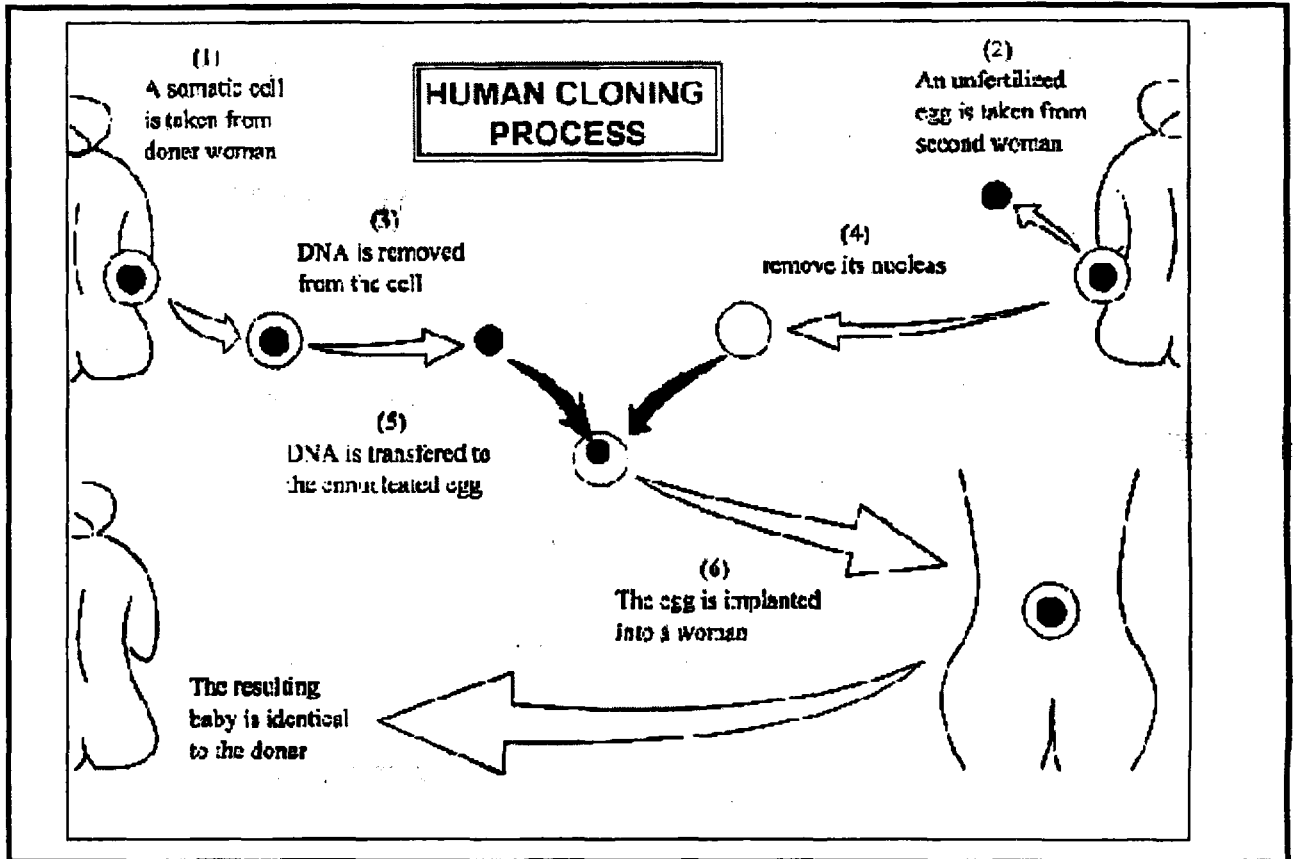
Human cloning is far more complicated with greater risks. The process of human cloning following 'Dolly Method' can be like this- A somatic cell is taken from a man or woman. DNA from the cell is removed

and transferred into a enucleated unfertilized egg which is collected from a second woman. Then the egg is implanted into a surrogate mother. The resulting baby will be genetically identical to the donor man or woman.

But this is not correctly possible because somatic cells are specialized. There are many genes

implemented. There is every chance of black marketing of cloned embryo.

The advantages of human cloning are no less. Gynecologists can search for the cause of spontaneous abortion. Oncologists can understand the case of rapid cell growth in cancer. There will be advancement in medicine, genetics and cause of aging. Childless



that have been turned off. Again the chromosomes of cloned baby match the age of the donor, baby will look much older. Cloned human will never be a replica of the donor. It will be like identical twins with different fingerprints.

### Advantages & Disadvantages

There are many disadvantages of human cloning. There will be many deformities, miscarriages and death of embryo or young baby. Baby might look like more aged. No proper law regarding human cloning is yet

couple and even unmarried man can have child like them. Stem cell research from cloned embryo has a great importance in regeneration and replacements of organs. A few countries including India is carrying out stem cell research with great results.

Researches on cloning should go on for the welfare of human being. It has got a lot of promises so far as human cloning is concerned. Researches in that direction should not be banned and scientists should achieve a lot of perfection in the process before they start to clone human beings.