**Genetic Disorders**

A genetic disease is any disease caused by an abnormality in the genetic [makeup](https://www.medicinenet.com/beauty_quiz/quiz.htm) of an individual. The genetic abnormality can range from minor to major -- from a discrete mutation in a single base in the DNA of a single gene to a gross chromosomal abnormality involving the addition or subtraction of an entire chromosome or set of chromosomes. Some people inherit genetic disorders from the parents, while acquired changes or mutations in a preexisting gene or group of genes cause other genetic diseases. Genetic mutations can occur either randomly or due to some environmental exposure.

There are a number of different types of genetic disorders (inherited) and include:

1. Single gene inheritance
2. Multifactorial inheritance
3. Chromosome abnormalities
4. Mitochondrial inheritance

**Single Gene Inheritance Disorders**

Single gene inheritance is also called Mendelian or monogenetic inheritance. Changes or mutations that occur in the DNA sequence of a single gene cause this type of inheritance. There are thousands of known single-gene disorders. These disorders are known as monogenetic disorders (disorders of a single gene).

Single-gene disorders have different patterns of genetic inheritance, including

* autosomal dominant inheritance, in which only one copy of a defective gene (from either parent) is necessary to cause the condition;
* autosomal recessive inheritance, in which two copies of a defective gene (one from each parent) are necessary to cause the condition; and
* X-linked inheritance, in which the defective gene is present on the female, or X-chromosome. X-linked inheritance may be dominant or recessive.

Some examples of single-gene disorders include

1. [cystic fibrosis](https://www.medicinenet.com/cystic_fibrosis/article.htm),
2. alpha- and beta-thalassemias,
3. [sickle cell anemia](https://www.medicinenet.com/sickle_cell/article.htm) ([sickle cell disease](https://www.medicinenet.com/sickle_cell/article.htm)),

**Common Multifactorial Genetic Inheritance Disorders**

Multifactorial inheritance is also called complex or polygenic inheritance. Multifactorial inheritance disorders are caused by a combination of environmental factors and mutations in multiple genes. For example, different genes that influence [breast cancer](https://www.medicinenet.com/breast_cancer_facts_stages/article.htm) susceptibility have been found on chromosomes 6, 11, 13, 14, 15, 17, and 22. Some common chronic diseases are multifactorial disorders.

Examples of multifactorial inheritance include

1. [heart disease](https://www.medicinenet.com/heart_disease_coronary_artery_disease/article.htm),
2. [high blood pressure](https://www.medicinenet.com/high_blood_pressure_hypertension/article.htm),
3. [cancer](https://www.medicinenet.com/cancer/article.htm)

**Mitochondrial Genetic Inheritance Disorders**

This type of genetic disorder is caused by mutations in the non-nuclear DNA of mitochondria. Mitochondria are small round or rod-like organelles that are involved in cellular [respiration](https://www.medicinenet.com/lungs_design_and_purpose/article.htm) and found in the cytoplasm of plant and animal cells. Each mitochondrion may contain 5 to 10 circular pieces of DNA. Since egg cells, but not sperm cells, keep their mitochondria during [fertilization](https://www.medicinenet.com/ovulation_and_fertility_pictures_slideshow/article.htm), mitochondrial DNA is always inherited from the female parent.

[Mitochondrial disease](https://www.medicinenet.com/mitochondrial_disease/article.htm) includes eye diseases.

**Cloning**

The process of generating a genetically identical copy of a [cell](https://www.britannica.com/science/cell-biology) or an organism. Cloning happens often in nature—for example, when a cell replicates itself asexually without any [genetic](https://www.britannica.com/science/genetics) alteration or [recombination](https://www.britannica.com/science/recombination-genetics). [Prokaryotic](https://www.britannica.com/science/prokaryote) organisms (organisms lacking a cell [nucleus](https://www.britannica.com/science/nucleus-biology)) such as [bacteria](https://www.britannica.com/science/bacteria) create genetically identical duplicates of themselves using [binary fission](https://www.britannica.com/science/binary-fission) or [budding](https://www.britannica.com/science/budding-reproduction). In [eukaryotic](https://www.britannica.com/science/eukaryote) organisms (organisms possessing a cell nucleus) such as humans, all the cells that undergo [mitosis](https://www.britannica.com/science/mitosis), such as [skin](https://www.britannica.com/science/human-skin) cells and cells lining the [gastrointestinal tract](https://www.britannica.com/science/gastrointestinal-tract), are [clones](https://www.britannica.com/science/clone-genetics); the only exceptions are [gametes](https://www.britannica.com/science/gamete) ([eggs](https://www.britannica.com/science/egg-biology) and [sperm](https://www.britannica.com/science/sperm)), which undergo [meiosis](https://www.britannica.com/science/meiosis-cytology) and genetic recombination.

## Types of Cloning

When we speak of cloning, we typically think of organism cloning, but there are actually three different types of cloning.

* **Molecular Cloning:**Molecular cloning focuses on making identical copies of DNA molecules in [chromosomes](https://www.thoughtco.com/facts-about-chromosomes-373553). This type of cloning is also called gene cloning.
* **Organism Cloning:**Organism cloning involves making an identical copy of an entire organism. This type of cloning is also called reproductive cloning.
* **Therapeutic Cloning:**Therapeutic cloning involves the cloning of human embryos for the production of [stem cells](https://www.thoughtco.com/understanding-stem-cells-373346). These cells could be used to treat disease. The embryos are eventually destroyed in this process.

## Cloning Problems

What are the risks of cloning? One of the main concerns as it relates to human cloning is that the current processes used in animal cloning are only successful a very small percentage of the time. Another concern is that the cloned animals that do survive tend to have various health problems and shorter lifespans. Scientists have not yet figured out why these problems occur and there is no reason to think that these same problems wouldn't happen in human cloning.

## Cloned Animals

Scientists have been successful in [cloning a number of different animals](https://www.theguardian.com/gall/0,8542,627251,00.html). Some of these animals include sheep, goats, and mice.

## Cloning and Ethics

Should humans be cloned? [Should human cloning be banned](https://www.thoughtco.com/should-human-cloning-be-banned-721486)? A major objection to human cloning is that cloned embryos are used to produce embryonic stem cells and the cloned embryos are ultimately destroyed. The same objections are raised with regard to stem cell therapy research that uses embryonic stem cells from non-cloned sources. Changing developments in [stem cell research](https://www.thoughtco.com/stem-cell-research-373345), however, could help ease concerns over stem cell use. Scientists have developed new techniques for generating embryonic-like stem cells. These cells could potentially eliminate the need for human embryonic stem cells in therapeutic research. Other ethical concerns about cloning involve the fact that the current process has a very high failure rate. According to the Genetic Science Learning Center, the cloning process only has a success rate of between 0.1 to 3 percent in animals.

## The Advantages of Cloning

Benefits of cloning include being able to create tissue and organs that doctors can use when needed for surgery on the original. If labs can clone and grow only the parts needed, this would eliminate the moral and ethical issues associated with cloning an entire person. Other benefits include growing stem cells, cloning lab mice genetically engineered for the specific study, bringing back extinct species, reproducing a pet that died and cloning livestock for food.

## The Disadvantages of Cloning

One of the main drawbacks of cloning is that if the original organism has genetic defects, these transfers to the clone as a copy of the original. The first clone, Dolly the sheep, born to a surrogate in 1996, was a genetic copy of a six-year old sheep. Dolly only lived to six years old herself, the bottom end of a sheep's average life expectancy. At the age of five she developed arthritis, and the researchers put her to sleep at age six because of tumors in her lungs, which may have been in the genome of the original.

# 5 Most Important Techniques Of Biotechnology

Biotechnology refers to the application of various biological organisms and processes for production of useful substances or effects in the field of medicine, industry and agriculture. Biotechnology is the use of complete living cells or parts of living cells to produce new or improved products of service systems.

There are various techniques of biotechnology such as:

**Genetic Engineering:**

Cell culture, Tissue culture, bio-processing, Protein engineering, monoclonal antibody production and biosensor technology. Some major techniques are:

**(i) Genetic Engineering:**

The utilization of genetic machinery of life for production of any special substance is called genetic engineering. The genetic modification of micro-organisms sons is brought about by simple recombination or by complex genetic manipulations. Some of the techniques are: isolation of genes, synthesis of genes, recombinant DNA, gene cloning etc.

**(ii) Cell culture or Tissue culture:**

Tissue culture is the technology of artificially growing micro­organisms or cells or tissue or organs to the desired genetic purify such as high yield and disease resistance.

The microbes in culture are used in recombinant DNA technology and in a variety of industrial processes and plant cells and tissues are used varieties of genetic manipulations. For example haploid breeding and somatic cultures are being used for production of artificial seeds. Embryo culture technique has also helped extending the range of distant hybridization for plant breeding purposes.

**(iii) Microbial Technology:**

Under this micro-originations have been harnessed by man for the production of useful materials. Such as development of microbial enzymes active in extreme temperatures, novel antibiotics, bioactive proteins and other bio-molecules for industrial use.

**(iv) DNA Fingerprinting:**

It is a technique by which an individual can be identified at molecular level. DNA is the basic genetic material that carries a blue print for our life but varies significantly from one person to another. What DNA fingerprinting does is to look inside, regions of DNA that show a great deal of variations from one person to another. However, these regions account for a small proposition of own genetic material but variations are such that one can locate these regions, highlight and identify them using DNA probes and a pattern, a series of bands or stripes on x-ray film. These DNA patterns are unique to an individual, except in case of identical twins, who have the same DNA. The samples required for DNA finger printings are drop of blood, semen, saliva and the body part such as bones, tissues, skull, hair, teeth etc.

**(v) Monoclonal Antibodies:**

Monoclonal antibodies are antibodies that are produced by one type of immune cell. This is produced when a foreign substance is injected into a vertebrate such as a mouse or human, some of the immune systems B- cells turns into plasma cells and start to produce antibodies  
that bind to that antigen. But each B-cell produces only one kind of antibody. The monoclonal antibodies are widely used as diagnostic and research reagents and are currently being utilized in many diagnostic procedures including measuring protein level and drug level in serum, identifying infectious agents, identifying tumour antigens and auto- antibodies.