

# Cloning

By definition, cloning is the **deliberate production of genetically identical individuals**. Each newly produced individual is a clone of the original. Monozygotic identical twins are natural clones. Concerning sexual reproduction, the child gets half its genes from his father and half from the mother. This combination is the fundamental basis for human variation and diversity. Clonal Reproduction means that all of child's genes would come from the body cell of a single individual.

## Cloning techniques

The best known technique is Somatic Cell Nuclear Transfer, SNCT. Parthenogenesis is an alternative cloning technique. An egg with a full set of 46 chromosomes is chemically or electrically induced to begin dividing and differentiating.

The sandwich method or chimera consists of 4–8 cell stage embryos, gently pressed together so that cells adhere to each other. The fused embryo is reimplanted into the uterus of pseudopregnant recipient. Such embryos show normal development and consist of a mixture of cell types of the 2 components. Injection chimeras are made by injecting cells into the blastocystic cavity of expanded blastocysts with zona intact. They are implanted in the uterus for further development.

## Therapeutic cloning

In therapeutic cloning the initial stages are identical to adult DNA cloning. Stem cells are removed with the intent of producing tissue or a whole organ for transplant back into the person who supplied the DNA. This way the patient wouldn't need immunosuppressive drugs, there is no danger of organ rejection. Besides, pluripotent cells can be cultured indefinitely in an undifferentiated state and still retain their development potential after prolonged culture.

## History

It has become relatively widespread since **Dolly's** birth report in **1997**. Dolly was the first clone of a mammal produced from an adult cell. The cloning procedure included the listed steps: A cell was taken from the mammary tissue of a 6 year old sheep while its DNA was in a dormant state then fused with an egg without nucleus. The "fertilized" cell was then stimulated with an electric pulse. Out of 277 attempts at cell fusion only 29 began to divide. These were all implanted in ewes of which only 13 became pregnant and only Dolly was born.

Looking at Dolly's telomeres, they were shorter than normal meaning that they were aging more rapidly than normal, faster than the cells from a normal sheep. This was not found on other telomeres from cloned cattle or mice which had longer telomeres than normal. These cells showed other signs of youth and seemed to have an extended life span than cells from a natural conceived cow.

## Perspective of cloning

Cloning does not appear to be a good reproductive technology for humans. Dolly was so unhealthy that it had to be euthanized because she was suffering from lung cancer and arthritis. Although it appears that all organs were properly formed in the cloned animals, many of them had debilitating diseases. The transferred nucleus doesn't have the same program mimicking the natural embryo and it is up to scientists to do it. The completion of reprogramming is what causes the embryo to have a near-normal development.

Several risks are associated with cloning like: high failure rate, development problems, abnormal gene expression patterns, telomeric differences. They tend to be much bigger at birth than their natural counterparts, this is referred to as Large Offspring Syndrome, LOS. The abnormally large organs may lead to blood flow and breathing problems. The reasons for this are several like nucleus incompatibility, cell division and surrogate implantation failure. The pregnancy itself is likely to fail. Hans Scholer said: "To obtain 1 normal organism, you are paving the way with a lot of dead or malformed fetuses".

## Links

### Related articles

### Sources