**Effects of cloning**

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 Course

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 Submission date

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Introduction

 Cloning is the generation of a genetically identical copy of an organism or a cell. Cloning takes place all the time in nature. For scientists to make a clone, they transfer the DNA from an animal’s somatic cell into an egg cell that has had its nucleus removed. The egg develops into an embryo that contains the same genes as the donor of the cell. The embryo is then implanted into an adult female’s uterus so that it can grow.

 There are three different types of cloning; the first type of cloning is reproductive cloning, which creates copies of whole animals. In this procedure, the DNA is removed from an ovum and replaced with the DNA extracted from a cell taken from an adult animal. Next, the fertilized ovum, which is called a pre-embryo now, is implanted in a womb, which then develops into a new animal. Thus, this procedure produces a duplicate of an existing person. Based on studies done on animals, it results in animals being born with severe genetic defects. This is the main reason why many in the medical field think it to be a profoundly unethical procedure to be carried out on humans.

The second type of cloning is gene cloning, which creates copies of genes or segments of DNA. In this procedure, identical twins are produced, basically by reproducing how twins are created naturally. A few cells are extracted from a fertilized embryo, which are induced to develop into duplicate embryos. The twins that are thus formed have identical DNA. Although this procedure has been used on various animal species, there has been only limited experimentation done on humans.

Lastly, the third type of cloning is therapeutic cloning, which creates embryonic stem cells. The initial stages of this procedure are practically the same as Reproductive Cloning. However, in this, the stem cells are extracted from the pre-embryo, with the intention of generating a whole organ or tissue, so that it can be transplanted back into the person who gave the DNA. The pre-embryo, however, dies during the process. The aim is to create a healthy organ or tissue of a sick person, in order to transplant it into them, instead of relying on organs from other people

 The following steps give a general idea of the scope of the molecular gene cloning process. The first step is the isolation and preparation of the source DNA that you want to clone. The second step is the preparation of the clone vector. There are also several examples of clone vectors which include plasmids, bacteriophages, and cosmid. The third step is combining the vector and DNA fragments suitably so that they form the recombinant DNA molecule. The fourth step is the introduction of this recombinant DNA (vector + insert) into the host recipient. The fifth step is selecting the host cells that have the correct recombinant DNA introduced into them. The sixth and final step is Ensuring the insert is expressing itself to serve the purposes it was cloned. Often, transgene expression is carried out using a strain or cell line different from the one that was used to clone it.

 There are several examples of cloning which include fragmentation and budding which are natural methods of cloning observed in prokaryotic organisms. There are also several examples of artificial cloning which include Dolly, the sheep, and Elizabeth Ann, the ferret.

 Cloning in general has both positive and negative impacts on the environment and animals

 ***Positive effects of cloning***

 Cloning appears to be a wonderful approach to restoring populations since many organisms in the world are near endangerment and extinction. Cloning can also be useful in the increment of the diversity of genetic traits through the use of genetic information from already deceased species, this can be used to bring about desired changes in the genetic makeup of individuals thereby introducing positive traits in them, as well as for elimination of negative traits. Cloning can also be applied to plants to remove or alter defective genes, thereby making them resistant to diseases.

Gene Cloning may hold the key to understanding differentiation and cancer. Cloning can also be used to treat Down's syndrome, liver failure, kidney failure, leukemia, spinal cord injury, and genetic diseases.

Therapeutic cloning offers several significant benefits since there is a minimum risk of tissue rejection after a transplant using therapeutic cloning because the replacement organ is the exact match with the recipient. Furthermore, researchers can use therapeutic cloning to treat genetic disorders by manipulating genetic sequences to correct the problem causing the inherited disorder.

 ***Negative effects of cloning***

Although cloning may have advantages to human generation, it may also result in the reproduction of humans with specific capabilities and cause the abuse of the cloned individuals by others and their producers as tools. There are several side effects of human cloning, including both the physical safety of the process and societal principles. High failure rates of viable embryos, health issues with cloned offspring, loss of genetic diversity, and rights of cloned individuals are some of the negative effects of cloning in humans.

Researchers have observed some adverse health effects in sheep and other mammals that have been cloned. These include an increase in birth size and a variety of defects in vital organs, such as the liver, brain and heart. Other consequences include premature aging and problems with the immune system. Cloning is also inefficient and can stress the offspring and surrogate mother, raising ethical concerns. Reproductive cloning may also have adverse effects on familial and societal relations and on the gene pool in altering reproductive patterns and the resulting genetic characteristics of a population, including posing harm to future generations if deleterious genetic mutations are introduced.

Cloning can also affect genetic diversity because the loss of cellular uniqueness and genetic diversity poses one of the greatest potential dangers to any organism. Through cloning, flaws in a single copy of DNA can be magnified. In the case of multiple copies of one human baby, a serious disease or defect could affect a lot of people.

 To sum up, even though many species have been cloned successfully, the process is still technically difficult and inefficient. The success rate in cloning is quite low: most embryos fail to develop, and many pregnancies end in miscarriage. Because the risks associated with reproductive cloning in humans introduce a very high likelihood of loss of life, the process is considered unethical. Therefore, cloning has more side effects than positive impacts.