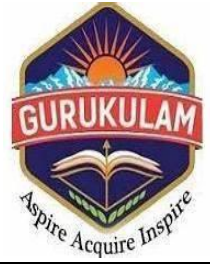




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DEPARTMENT OF ZOOLOGY

A REVIEW ON HUMAN CLONING



DEPARTMENT OF ZOOLOGY
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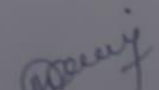



Topic: HUMAN CLONING - A REVIEW

Academic Year: 2023-24

Undertaken by

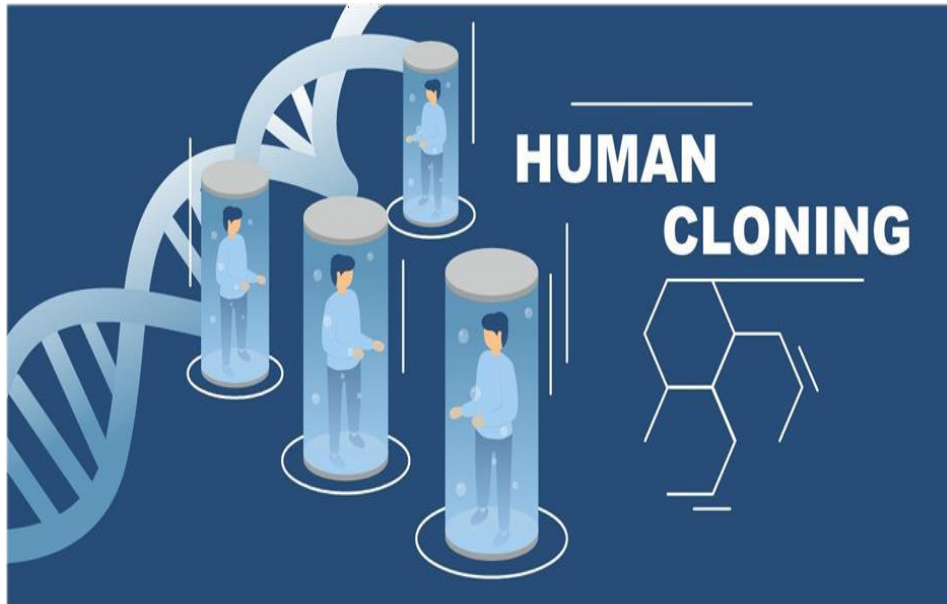
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TOPIC

A Review on Human Cloning



Under The Supervision

By

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ABSTRACT

The word “Clone” means, “Identical”, identical in all aspects. In biological point of view, two or more organisms are said to be clones of each other if they are morphologically, anatomically and more important, genetically identical. Clones have identical genome. Since the protein synthesis and metabolisms controlled by an organism’s genome, clones are identical in all aspects.

Cloning is done by nature in many lower level organisms like Monerans, Fungi, and in some eukaryotes. Cloning can be clearly observed during reproduction of these organisms by a process called “binary fission” in which a single cell grows and divides into two identical daughter cells. They are Clones. This can also be observed during “multiple fission” in some protozoans like plasmodium.

Cloning can be done artificially to produce genetically identical organisms. Several methods have been developed to clone an organism. The most applied method is “**Somatic Cell Nuclear Transfer (SCNT)**”. This method has been widely used to produce a large number of identical organisms. The first fully cloned animal was a **sheep named Dolly**. It was clone by SCNT technology.

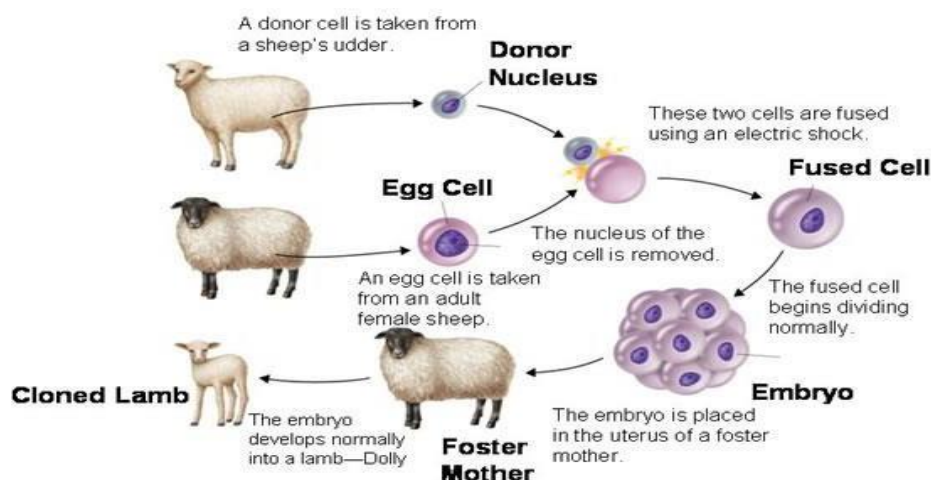


Somatic Cell Nuclear Transfer

In **Somatic Cell Nuclear Transfer**, an egg from a female is taken and its nucleus is taken out and is disposed. Then, a cell from the body of same organism is taken; it must be a cell other than the reproductive cells. Any body cell other than the reproductive cell is called a Somatic Cell. The nucleus of this somatic cell is taken out carefully and it is inserted into the previously 'enucleated' cell. It is not just insertion; it is fused with the hollow egg using electricity. This fools the egg that it has been fertilized.

Let me explain it with an example. Suppose we want to clone a cow named 'A'. We will first request the cow to donate an egg. Since this has donated us an egg, it is called a 'Donor'. Now that we've the egg, we will carefully suck out the nucleus from it and keep the 'enucleated cell' safely. After that, we will again go to the donor cow and take a cell from some other body part. These cells are diploid. Again, pull out the nucleus and this time keep the nucleus safe. Now, carefully insert this nucleus into the previously enucleated cell and apply an electric current of suitable voltage.

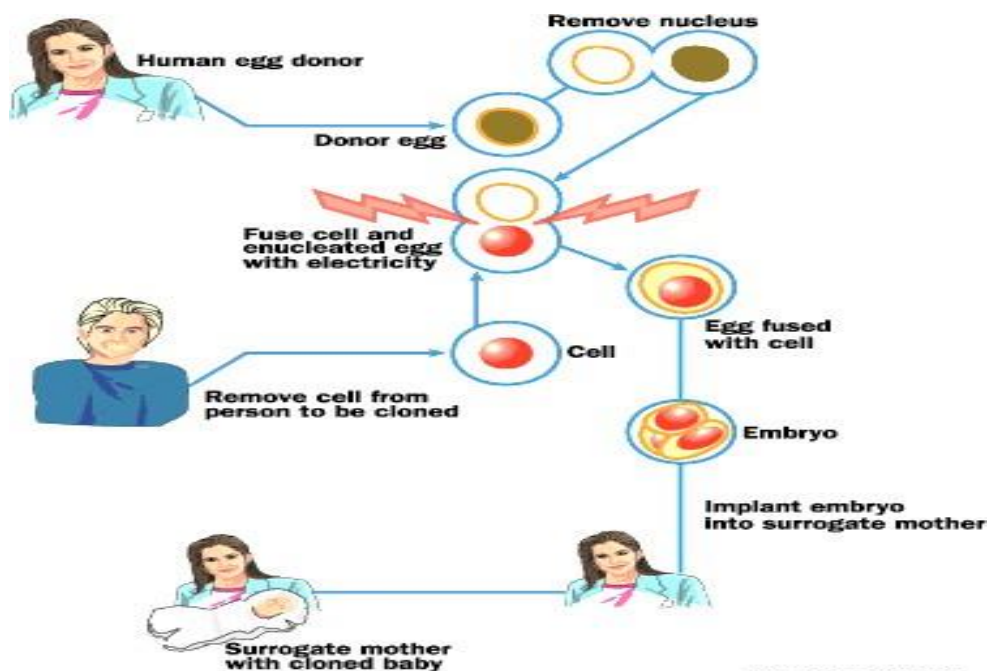
That's it! If we've done everything perfectly, the egg (which now pretends to be a zygote) should develop into an embryo and slowly into a cow which is clone of the donor cow, look at below picture, it describes the **SCNT** technology. This is how Dolly was cloned.



Human Cloning

Scientists have managed to clone a number of animals like sheep, cow, mice etc. But, their dream of cloning a human remained unfulfilled. There have been many attempts of cloning a human. It has become more of an ethical and social issue rather than a scientific advancement. Many scientists claimed that they have cloned a human. In 2004, a South-Korean scientist and his team claimed that they have successfully cloned 11 human embryos for the purpose of extracting stem cells; later it was confirmed that it was a false statement.

Scientists say that it is in fact possible to clone a human by using the famous SCNT. A cell, which contains DNA, is taken from the person who is being cloned. Then the enucleated egg is fused together with the cloning subject's cell using electricity. This creates an embryo, which is implanted into a surrogate mother through in vitro fertilization. If the procedure is successful, then the surrogate mother will give birth to a baby that's a clone of the cloning subject at the end of a normal gestation period. Success rate is estimated to be about 2%.



Types of Human Cloning

Human cloning can be of two types, namely Reproductive cloning and Therapeutic cloning. Reproductive cloning is done to duplicate a human to his/her offspring who exactly resembles his/her parent. Therapeutic cloning is done to grow stem cells from the embryonic clone.

1. Reproductive cloning:

Reproductive cloning makes use of somatic cell nuclear transfer (SCNT) technique to develop the embryo. This technique involves the donation of egg cell with nucleus from the female donor. The nucleus of the egg cell is removed creating an enucleated egg. The person who is being cloned acts as somatic cell donor. The somatic cell should contain DNA as its genetic material. The somatic cell is fused with the enucleated egg in artificial medium using electricity. The high voltage makes pores in somatic cell membrane and facilitates the infusion of egg cell in to the somatic cell. This results in formation of embryo.

The embryo, is then implanted into the surrogate mother's uterus for gestation. At the end of gestation period, the surrogate mother gives birth to the cloned baby of the cloned subject. But usually the success rate for this procedure is very less and only one or two out of 1000 embryos would reach the world.

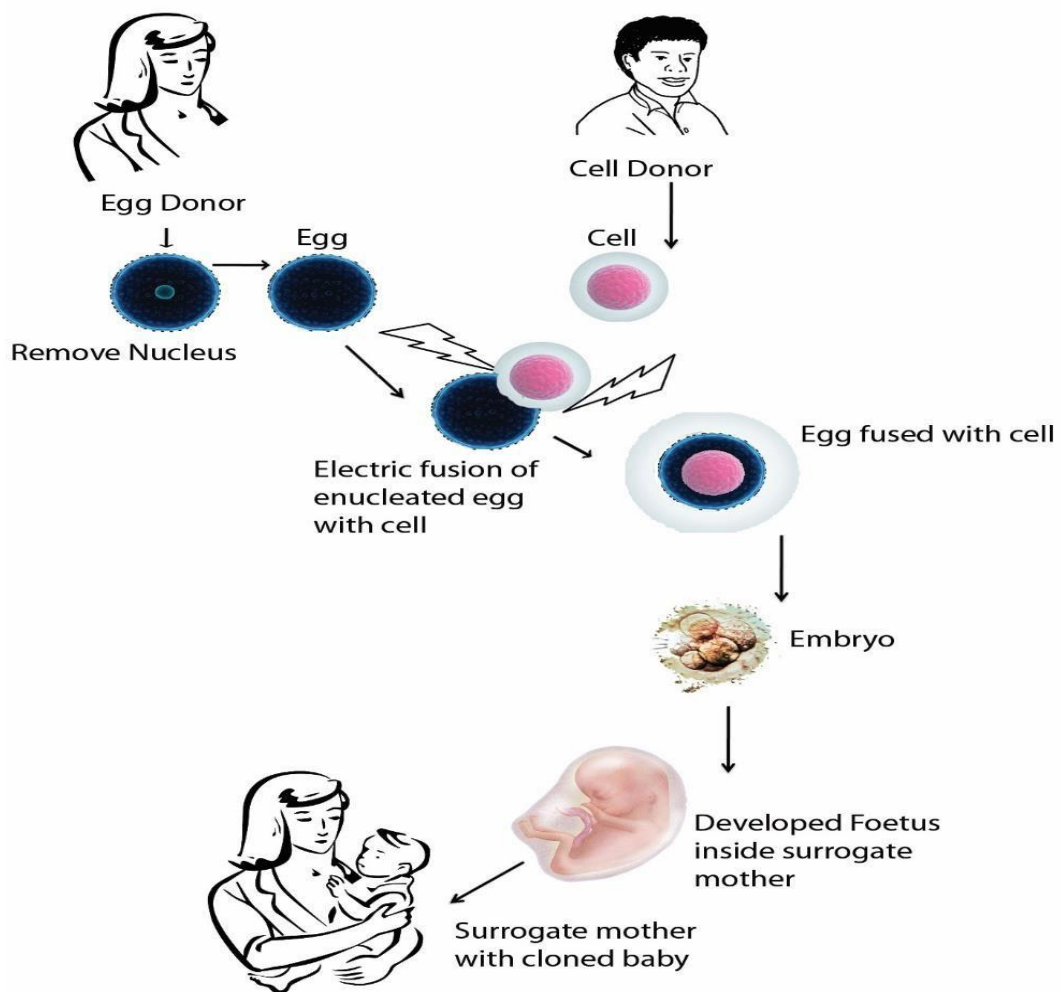
There were many fabricated publications about the successful human cloning. Many scientists reported that they have cloned human embryos but later it was proved to be fabricated work. Till date there are no proven records of successful human cloning.

2. Therapeutic cloning:

The main aim of therapeutic cloning is to develop stem cells from the cloned embryos which would help in treating many diseases/disorders. It also assists in organ replacement therapy. The procedure involved is similar to that of SCNT, but instead of inserting the embryo into surrogate mother, its cells are used to grow stem cells. These stem cells are used for the respective therapies.

Currently in India, gene cloning is in infant stage and hope this technique would excel in India and creates a therapeutic platform for many untreatable diseases and disorders in near future.

Reproductive Cloning Diagram



Reproductive Cloning Process

Now, I state the steps involved in cloning a human in a brief way. The actual process is far more complex than what the steps here depict.

- ✓ **Step One:** Go fetch a human egg! Yes of course, you will need an unfertilized alive human egg. Scientists get them from the egg banks where the eggs are stored safely in an extremely cold environment, perhaps about - 196 degree Celsius.
- ✓ **Step Two:** The next step is to obtain any body cell other than the reproductive cells from the individual to be cloned. These cells are called Somatic cells. They are preferably obtained from soft tissues of the body where the cells are active and young.
- ✓ **Step Three:** After getting the somatic cell, the next step is to extract its nucleus carefully. After the nucleus is extracted, the remaining part of the cell is thrown away and the nucleus is kept safe for the following process.
- ✓ **Step Four:** Now we take the egg again and extract its nucleus. This time, we throw the nucleus away and keep the hollow cell with us. Yes! Throw the nucleus away. Only the enucleated cell is going to be part of the process.
- ✓ **Step Five:** Now we have all the raw material for the cloning process. In this step, the nucleus extracted from the somatic cell is carefully injected into the enucleated egg. This looks like a brand-new cell! But the process will be incomplete without the next step.

✓ **Step Six:** To make the cell actually work, the cell has to be activated by using an electric spark. Then the nucleus fuses with the cell and forms a kind of pseudo zygote. This is the last step of the human cloning. Since we have produced a zygote, the rest of the process follows the regular steps like embryogenesis etc.

Further development of the zygote needs it to be implanted into the uterus of a surrogate mother. After complete growth, the individual will be an exact clone of the person from whom the somatic cell was extracted.

Advantages of Human Cloning

Human cloning is a highly controversial and ethically complex topic, and it raises numerous ethical, moral, and scientific concerns. While some proponents argue that there could be potential advantages to human cloning, it's essential to note that these potential advantages come with significant ethical and practical challenges. Here are some of the arguments put forward in favour of human cloning:

1. **Medical Advancements:** Proponents argue that human cloning could contribute to medical break through by providing a source of genetically identical stem cells for research and therapies. These stem cells could be used to study and treat various diseases, such as Parkinson's disease, Alzheimer's disease, and spinal cord injuries.
2. **Organ Transplants:** Cloning could potentially be used to create genetically matched organs and tissues for transplantation. This could help address the shortage of donor organs and reduce the risk of organ rejection, as the cloned organs would be a perfect genetic match for the recipient.
3. **Reproductive Assistance:** Some argue that human cloning could be used to help

individuals or couples who are unable to have children naturally due to infertility or genetic disorders. Cloning could provide an alternative means of reproduction for such individuals.

4. **Genetic Preservation:** Human cloning might allow individuals to preserve their genetic material for future generations, even if they are unable to have children through conventional means. This could be particularly appealing to people with terminal illnesses or genetic conditions.
5. **Scientific Research:** Cloning could facilitate the study of genetic and developmental processes in humans, helping researchers better understand human biology, development, and genetics.

Major Ethical Concern with Human Cloning

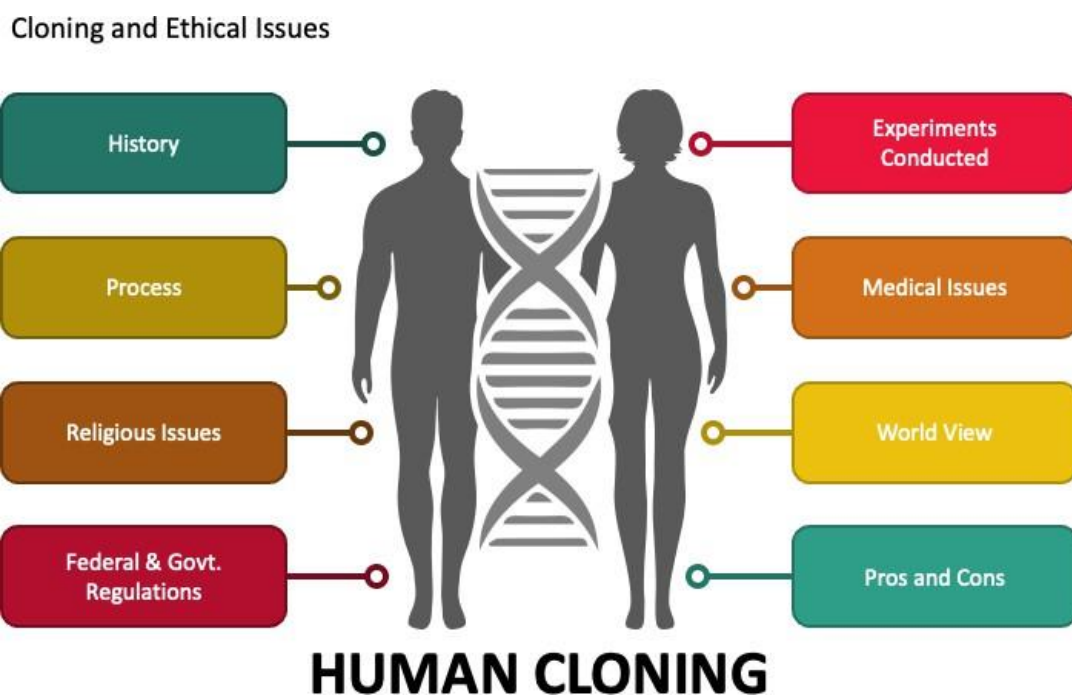
Human cloning raises numerous ethical concerns, and these concerns have been the subject of extensive debate and discussion among ethicists, scientists, policymakers, and the general public. Some of the major ethical concerns with human cloning include:

1. **Violation of Human Dignity:** Critics argue that human cloning can be seen as a violation of the inherent dignity of an individual. Cloning involves creating a human being with a specific purpose or genetic makeup, potentially treating the cloned individual as a means to an end rather than as a unique and autonomous person.
2. **Autonomy and Consent:** There are concerns about the autonomy and consent of the cloned individual. Cloning typically results in the creation of a genetically identical twin, but the clone may not have the same experiences, upbringing, or life choices as the original person. This raises questions about the autonomy and

consent of the cloned individual, especially if they are brought into existence without their consent.

3. **Risk of Abnormalities:** Cloning, especially reproductive cloning, has been associated with a high rate of developmental abnormalities and health issues in cloned animals. There are concerns that attempting human cloning could lead to the creation of individuals with serious health problems or shortened lifespans.
4. **Identity and Individuality:** Human cloning may raise questions about the uniqueness of individuals. Clones would have the same genetic makeup as their genetic donors, potentially leading to questions about their individuality, identity and the potential for discrimination based on genetic similarities or differences.
5. **Parent-Child Relationships:** In cases of reproductive cloning, the cloned child would be genetically identical to one of the parents. This could complicate parent-child relationships and raise questions about the psychological and emotional impact on both the cloned child and the parent.
6. **Potential for Exploitation:** There is concern that human cloning could be exploited for various purposes, such as creating individuals for organ harvesting, research, or other utilitarian ends, which could undermine the value of human life.
7. **Designer Babies:** Cloning techniques could potentially be used to create "designer babies" with specific desired traits, raising concerns about the commodification of human life and the potential for eugenics.
8. **Social and Cultural Implications:** The introduction of human cloning could have significant social and cultural implications, including changes in societal attitudes toward human life, family structures, and the concept of parenthood.

As a result of these ethical concerns, many countries have enacted laws and regulations to ban or restrict human cloning, particularly reproductive cloning. Ethical considerations continue to play a significant role in shaping public policy and scientific research in this area. It's important to note that the ethical landscape surrounding human cloning may evolve over time as technology advances and societal attitudes change.




CONCLUSION

In our opinion Human Cloning is an interesting topic, but not theoretically proved. We are against reproductive cloning but we support the idea of therapeutic cloning. In reproductive cloning the actual cloned human would be abused because he would not have life experiences to know what is right and what is not. That would lead to a world full of crimes. On the other side therapeutic cloning would save the lives of many sick people. For example, the cure of cancer or the replacement of an organ would be a

successful breakthrough in history. Even though there has not been any success until now, they should continue to attend to therapeutic cloning. Many scientists claim that in the future the somatic cell nuclear transfer will not be the technique that is used to produce a human clone. But they say the therapeutic cloning method might be effective and that it could help to prevent diseases and to prevent the risk of extinct species. Even though this problem with the reproductive techniques seems to be small, it will not be easy to figure out a new method. Additionally, some people will not connect with cloning because of ethical aspects, which is comprehensible.

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