

Human Reproductive and Therapeutic Cloning

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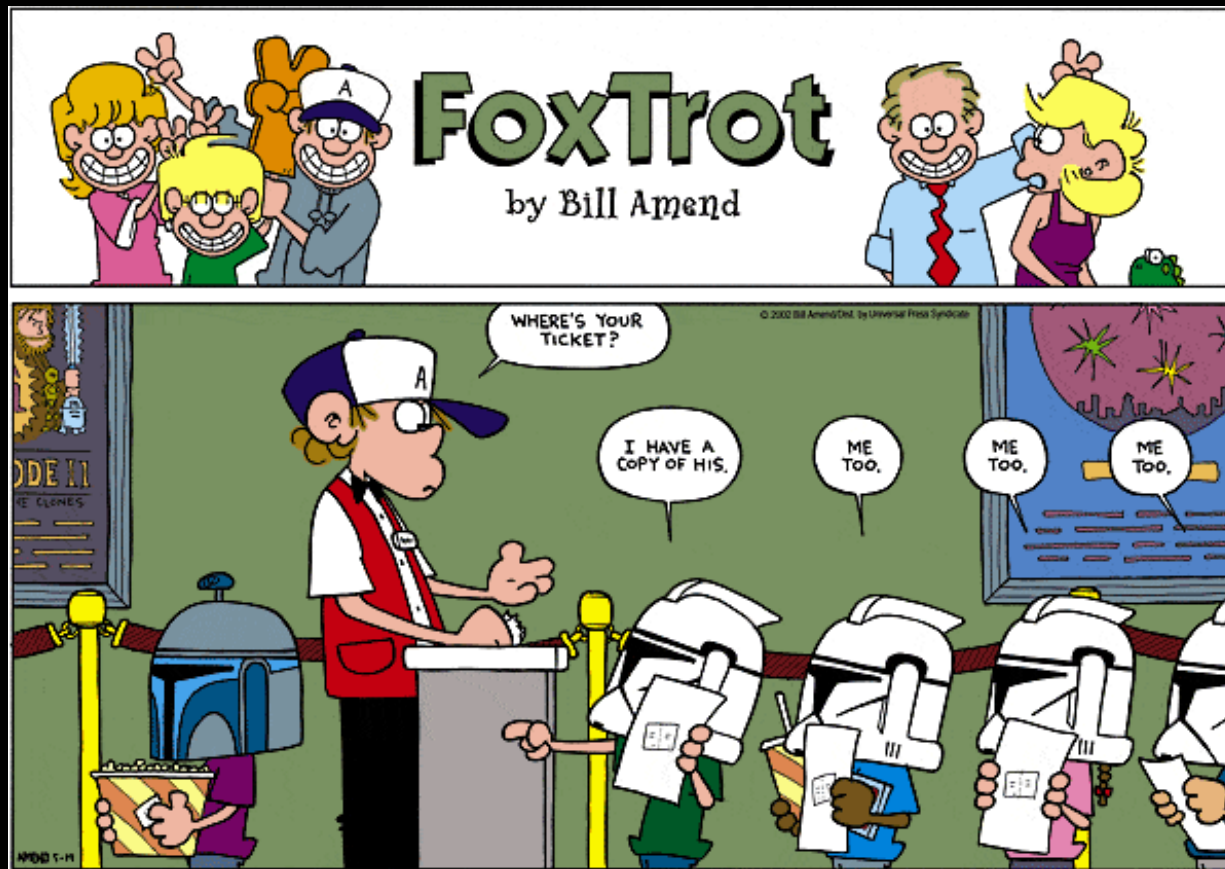


Preview

- Therapeutic Cloning
- Embryo cloning
- Reproductive cloning
- Cloning Ethics
- Cloning Legislation

What is Cloning?

- Cloning is the production of one or more individual plants or animals identical to an original plant or animal.



Therapeutic Cloning

- Therapeutic cloning is about saving and improving lives.
- It produces stem cells, not babies.



Therapeutic cloning:

- Using stem cells to grow new human tissues or organs.
- Removing the DNA from an embryo and replacing it with the DNA from a cell removed from an individual.
- Embryo would be allowed to grow for 14 days.
- Not a human being; it would be a replacement organ.

What are its possible benefits?

- Perfectly matched, replacement organs
- No danger of rejection
- No waiting to obtain a transplant.
- Procedure would save lives.
- Cure diseases:
 - Diabetes
 - Nerve cells
 - Liver cells

Problems of Therapeutic Cloning:

- Is an embryo a human person
- Stem cells have sometimes mutated
- They have produced tumors
- Not enough eggs available
- Until the production of stem cells becomes more efficient, very few cures could be made for economic reasons.
- Therapeutic cloning will probably only become generally useful when a method is found to use non-human eggs as source material.



Embryo Cloning

- Also known as artificial twinning
- Definition = Making a separate embryo by taking one or more cells from the original embryo, therefore “twinning” it. It then has the same genetic code as the original, hence . . . embryo cloning.
- This “scientific” way is the same scenario as the way twins naturally develop. However, this way is done in the laboratory, not by human nature.
- History = Many of the experiments with embryo cloning have been done with mice. It is done by way of in vitro fertilization with a receptive female.
- This process, scientifically, is restricted in the US

- Studies have been done with human embryo cloning, but the scientists have used flawed embryos that would not have survived into a fetus.
 - Do you think this is okay/moral?
 - Is there a difference between this and using healthy embryos?



Reproductive Cloning

a.k.a. cell nuclear replacement

- What is **ADULT REPRODUCTIVE CLONING?** (a.k.a. adult DNA cloning)
- **CLONING** is the production of one or more individual plants or animals that are genetically identical to another plant or animal.
- **ADULT DNA CLONING** involves removing DNA from an embryo and replacing it with the DNA from an adult animal. Then, the embryo is allowed to develop into a new animal with the same DNA as the donor. It has been used for sheep and other animals. Not tried on humans yet.
- **HOW** Reproductive cloning is done: With exception of the sperm and egg, every cell in the body contains all of the genetic material in its DNA to theoretically create an exact clone of the original body. But, cells have been “biochemically programmed to perform limited functions” the other functions are turned off. Most scientists believed that such differentiated cells couldn’t be reprogrammed to be capable of behaving as a fertilized egg.

EXAMPLE: DOLLY the sheep

- A cell was taken from the mammary tissue of a mature 6 yr. old sheep while it's DNA was in a dormant state. It was fused with a sheep ovum which had its nucleus removed. 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 into ewes. Thirteen became pregnant but only 1 lamb, Dolly, was born.



History

- 1996: First successful clone done by Dr. Ian Wilmut in Scotland.
- 1997: Dolly, the sheep was publicly displayed as the first large cloned animal using DNA from another adult. Since then there has been 7 clones of 3 breeds of sheep, which later will be used on humans.
- 1997: Bill Clinton banned the federal funding of human cloning research in the U.S.
- 1998: Cloning of mice is announced.
- 1998: 8 calves cloned in Japan. Four died shortly after birth due to what researchers called “environmental factors”
- 1998: First human cloned in Korea by Kim Seung-bo and Lee Bo-yeon. Be-yeon took an ovum from a woman, removed its DNA and inserted a somatic cell from the same 30 yr. old woman. Their report stated: “We were able to confirm division up to the 4th cell stage, the stage of embryo development when a test tube embryo is usually placed back in the uterus, where it develops into a fetus.” Their goal was not to clone humans but to clone Specific, genetically identical organs for human transplants. They did not implant the morula into a human’s uterus because of ethical considerations. They destroyed it. Protests were held.
- 2000: Eight species cloned: mice, cows, sheep, monkeys, goats, pigs, and rats. Between 3,000 and 5,000 cloned animals have been produced to date.

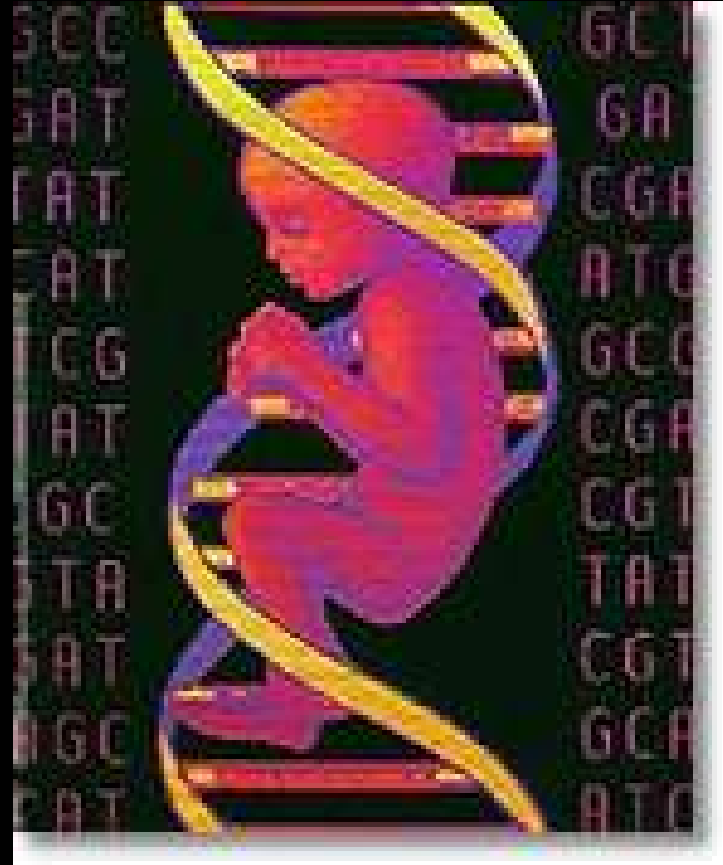
Is it moral?

SOME SAY YES!

- Some talents are genetically influenced. Music ability seems to run in families. Cloning using the DNA from the cell of an adult with the desired traits or talents might produce an infant with similar potential.
- A heterosexual couple in which the husband was completely sterile could use adult DNA cloning to produce a child. An ovum from the woman would be coupled with a cell from the man's body. Both would contribute to the child: the woman would provide the "factory" for creating cells; the man would provide "genetic info." They might find this more satisfactory than using the sperm of another man.
- Two lesbians could elect to have a child by adult DNA cloning rather than by artificial insemination by a man's sperm. Each would then contribute part of her body to the ovum: one woman would donate the ovum, which contains genetic material in its mitochondria; the other woman the nuclear genetic material. Found more satisfactory than in-vitro fertilization with a man's sperm.

SOME SAY NO!!

- There is no guarantee that the first cloned humans will be normal. The fetus might suffer from some disorder that is not detectable with an ultrasound. They may be born disabled.
- Cells seem to have a defined life span built into them. Large scale cloning could deplete genetic diversity, or cause a decreased life expectancy.
- Religious objections – pro life, etc. Some say cloned humans may be born without SOULS.



Therapeutic Cloning presents a few ethical considerations:

Problem: Embryos appear to be the only source of stem cells that would have wide potential in therapeutic cloning.

- Some conservative Christians believe that human personhood starts at conception.
- Some argue that the embryo requires and deserves no particular moral attention whatsoever. It is simply a collection of cells containing DNA.
- Others accept the special status of an embryo as a potential human being, yet argue that the respect due to the embryo increases as it develops and that this respect, in the early stages in particular, may properly be weighed against the potential benefits arising from the proposed research.

Public Opinion on Therapeutic Cloning

The following are the results of a survey conducted by Opinion Research Corporation International on behalf of the Coalition for the Advancement of Medical Research (CAMR).

- 55% want congress to ban reproductive cloning, but allow therapeutic cloning.
- 30% want a ban on therapeutic and reproductive cloning.
- 12% want no ban on either form of cloning.
- 3% were undecided.

Ethics and Cloning

- It appears that there is no hope of society ever reaching an absolute consensus on the ethics surrounding harvesting stem cells from pre-embryos. Even among the religions such as Christianity, Judaism, and Islam, there is still a range of beliefs about what stage of development the fertilized ovum becomes a human being.
- It is likely that therapeutic cloning will never be legalized in all countries because of the push from pro-life groups.
- It is also likely that we will never see it banned in all countries because these same pro-life groups will not be able to stop all legislation.
- Britain already has laws that allow this type of cloning and Canada will have these same laws soon.

Cloning Legislation

- Two Types of Cloning in Legislation:
- Therapeutic Cloning: (also called biomedical or research cloning)
The goal of therapeutic cloning is to acquire stem cells, which could then be developed into organs that could be used in a transplant. These organs would have identical DNA to the organ recipient. It DOES NOT attempt to create a newborn.
- Reproductive Cloning: Basically the same process as therapeutic cloning, only the resulting pre-embryo would be implanted into a women's uterus with the intent of creating a newborn.
- There have been numerous bills introduced in Congress involving cloning but none have proceeded into law. Although they all have different variations the two basic types include:
 - * a ban on reproductive cloning
 - Or
 - * a ban on all cloning.
- 15 states have laws pertaining to cloning

States that ban Therapeutic and Reproductive cloning:

- Arkansas
- Indiana
- Iowa
- Michigan
- North Dakota
- South Dakota
- And possibly Virginia depending on interpretation

States that ban Reproductive cloning:

- California
- Connecticut
- Maryland
- Massachusetts
- Rhode Island
- New Jersey
- Virginia – and possibly Therapeutic depending on interpretation

- Both Missouri and Arizona have laws that address the use of public funding for cloning
- Maryland: the use of state stem cell research funds can not be used for reproductive cloning, also perhaps, depending on interpretation, therapeutic cloning
- Rhode Island: Cloning not prohibited for research
- California and New Jersey: Permit cloning specifically for research purposes.

Questions

- It **IS** possible to hurt or injure an embryo while testing or cloning it. Is that embryo considered a person? And if so, would destroying the embryo be considered murder?
- Are the benefits of therapeutic cloning worth the risk?
- Is there a moral difference between human and animal embryo cloning?
- Should government regulate cloning?

