

Three Types of Cloning and the Necessity to Regulate

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On December 26, 2002, a private organization by the name of Clonaid (headed by Brigitte Boisselier, PhD) reported that they had succeeded in cloning the first human being. The clone was said to be a little girl, named Eve. Because Clonaid never showed any evidence supporting this claim both media and scientific organizations regarded this event as a hoax. While the claim made by Clonaid did not revolutionize science, it did reform the way society thinks about the impending Genetic Revolution.

"This technology [Cloning], will help people have a child and help people with serious diseases and help people to have a better life."

--Brigitte Boisselier and MSNBC: Interview, July 17, 2001

The controversy over the baby Eve stirred up much ethical debate. "The Human Future" website, posts the nationwide reaction in regards to news of the cloned child, Eve. As a result a variety of legislation was adopted in favor of prohibiting cloning: Ten states have laws concerning human cloning. Nine states prohibit cloning to bring about the birth of a child, and seven of those states also ban research cloning. Two of the states ban cloning to bring about the birth of a child but allow research cloning. The tenth state, Missouri, prohibits the use of state funds to clone a human embryo where the embryo survives through gestation and is born, but does not prohibit such cloning if conducted with private or federal funds.¹

The claims made by Clonaid forced society to begin to fully evaluate the issue at hand. The United States had to decide quickly, *how* we are to go about using clone technology. The major fault of media coverage regarding the issue of cloning is that they fail to address different types. The efforts made by Clonaid to produce a human clone is by far the most controversial and for that reason I feel it has given cloning its negative reputation. In this paper I will clearly define three types of cloning and discuss the benefits and repercussions of each type of cloning. I wish to bring to light the inherent benefits of certain types of cloning as well as further the notion that human reproductive cloning is inherently bad. The first type of cloning I will address is DNA cloning, I will

demonstrate how this type of cloning will benefit our society as long as we are capable of regulating its uses. The second type of cloning I wish to address is reproductive cloning, I will offer empirical evidence regarding the dangers of reproductive cloning to fuel my notion that society is better off without it. The third type of cloning I wish to address is known as therapeutic cloning, I will offer potential benefits as well as discuss the controversy laden behind the use of human embryos for disease reaserch. I also wish to commend the California Advisory Committee on Human Cloning for devoting their time to find a scientific ethic before cloning got out of hand.

The State of California's Response to Cloning

As a result of the claims made by Clonaid the state of California reacted by adopting a seven year ban on cloning and formed the California Advisory Committee of Human Cloning which consisted for twelve individuals from a variety of backgrounds. All twelve panelists researched cloning for two years and participated in five public meetings state-wide as well as listened to international experts' and ordinary citizens' remarks on cloning (San Francisco Chronicle, January 12, 2002). The committee was able to distinguish between two types of cloning: reproductive cloning and non-reproductive cloning. This distinction was helpful because it allowed society to distinguish between types of cloning that are beneficial and types that are not. The California Advisory Committee on Human Cloning's first regulation was in regards to reproductive cloning which stated:

The Committee unanimously agrees that California should ban human reproductive cloning. Many arguments support this position, some dealing with physical and psychological safety, some with ethical or social concerns and some with regulatory and political issues. We

¹ <http://www.thehumanfuture.com>: This website is up to date on all laws regarding the Genetic Revolution and Cloning. The information above is found under the "Cloning: Policy" tab. At the site they present a Table of State Cloning Laws and the codes that follow.

all believe, based on current knowledge of physical safety, that California should prohibit human reproductive cloning.²

The committee banned Reproductive cloning for many reasons. While all members did not agree on the same reason, most were able to agree that, as of now, the technology used to clone humans (as well as other animals) is not safe. They were shown overwhelming evidence that attempts to clone complex animals resulted in many fatalities and birth defects. Their next attempt was to address the issue of human non-reproductive cloning, the result was this:

The Committee unanimously agrees that California should not prohibit but reasonably regulate human non-reproductive cloning. We believe that the use of this technology offers potential medical and scientific benefit while not raising many of the same concerns as human reproductive cloning. The regulation should do at least three things: a) prohibit the use of pre-embryos after development of the primitive streak, b) ensure that the persons providing cells for this purpose gave informed consent, and c) require that the research be permitted by an approved Institutional Review Board.³

The committee found that certain types of cloning *could* be potentially helpful. They were shown evidence that DNA cloning was a great help in researching gene therapy. It was found that gene therapy could be potentially helpful when finding preventative treatments for genetic maladies. The committee also found benefits regarding the uses of stem cell research. For these reasons, it was decided that not *all* types of cloning ought to be banned and instead “reasonably regulated.”

DNA Cloning and Its Benefits

DNA cloning has a variety of names: molecular cloning, gene cloning, recombinant DNA technology. For the majority of this paper I will refer to it as DNA cloning. This type of cloning is mainly used to produce replicas of the same gene, in turn, allowing scientists to thoroughly study the genome. The process goes as follows:

The gene of interest is isolated from the chromosomal DNA using restriction enzymes and then united with a plasmid that has been cut with the same restriction enzymes. When the fragmented chromosomal DNA is joined with it cloning vector in the lab, its called a “recombinant DNA molecule.” Following introduction into suitable host cells, the recombinant DNA can then be reproduced along with the host cell DNA.⁴

²⁻³Regulations 1 and 2 adapted from the January 12 issue of the *San Francisco Chronicle*. This is actual text that the California Advisory Committee on Cloning came up with at the end of their five year term.

⁴ Notation adapted from the January 12 issue of the

By reproducing DNA replicas scientists are able to study the human genome and figure out *which* genes contribute to *what* diseases. DNA cloning has been used mostly by scientists researching genetic modification and gene therapy. This process allows scientists to identify the bad gene and replace it with a good one. It does not seem to be the case that human beings are harmed by the process of DNA cloning. Quite opposite, DNA cloning suggests a future in which society can take pre-emptive measures to ward off future maladies. However, the California Advisory Committee on Human Cloning raises the concern regarding *how* this developmental technology will be used, I too share this concern.

I believe we must make it the case that all forms of genetic modification resulting from DNA cloning undergo a thorough review in regards to its use. Therefore, the state of California is obligated to regulate the uses of this technology. The California Advisory Committee on Human Cloning suggests an IRB (International Review Board). I believe it is necessary that we come to a international consensus on *how* DNA cloning will be used. One may question, how it is possible that gene therapy could be harmful to our society? I believe that gene therapy can take on two forms: Preventative and enhancement gene therapy. I believe the latter form of gene therapy could be harmful to our society. I believe that the idea behind preventative gene therapy: taking pre-emptive measures to ward off future maladies by replacing a bad gene with a good one, will benefit our society. While utilizing gene therapy for enhancement purposes—making an already functional person aesthetically better—could be potentially harmful. I believe this to be the case because enhancement gene therapy is a luxury, while preventative gene therapy aims to save lives. For all these reasons I believe that we ought to observe carefully *how* gene therapy will be used.

Reproductive Cloning: A Dismal Future

Reproductive cloning is the basis of most controversial debates regarding the Genetic Revolution. Reproductive cloning goes as follows: a) a cell is removed from an organism that'll be replicated which is extracted by an incision in the skin, b) a female reproductive organ [cell?] is taken from the female organism, c) an entire deoxyribonucleic acid (DNA) is also removed from the donor cell, d) donor DNA is then forced into the second cell nucleus and a process known as fusion combines the two cells, e) finally a woman must be found to carry the cloned child. It all sounds so simple, yet, lurking are many unforeseen consequences. In 1996, the first mammal ever to be cloned from adult DNA was a sheep, named Dolly. This was made possible by a Scottish Scientist named Professor Ian Wilmut. Dolly

San Francisco Chronicle. This is actual text that the California Advisory Committee on Cloning came up with at the end of their five year term.

was a Dorset sheep, the life-span of that breed ranges from 11 to 12 years. Sadly, Dolly suffered from lung cancer and arthritis which lead to her early death at age 6.

Studies have shown overwhelming evidence of failure, when cloning complex organisms. The California Advising Committee on Human Cloning found that:

Attempts at cloning certain species such as monkeys, chickens, horses and dogs have been unsuccessful. Some species may be more resistant to somatic cell nuclear transfer than others.⁵

The fact that so few complex organisms survive the gestation of the cloning procedure was one of the California Advising Committee on Human Cloning's main deterrents for allowing human cloning. Studies have shown that:

More than 90% of cloning attempts fail to produce viable offspring... In addition to low success rates, cloned animals tend to have more compromised immune function and higher rates of infection, tumor growth and other disorders.⁶

At this point in time, cloning, is a process that seems highly underdeveloped. Evidence shows that scientists' efforts to clone complex organisms have failed. If we cannot clone a primate which has DNA that differs [from that of a human] by 0.07%, it doesn't seem like the cloning of a human being ought to be any different. I believe that if we could find a way to successfully clone a primate it *could* be the case that the successful cloning of a human *may* follow, but this is only speculation. As of now, if we were to clone a human being the result would be tragic, in that, the probability of producing a viable offspring is slim. I believe it would be logical to attempt to clone a human only after cloning procedures have been perfected with all other complex animals (i.e., horses, primates, etc.) I feel like we must cross smaller bridges (i.e., cloning primates) before we take the final leap (i.e., cloning human beings). However, the science isn't the only problem regarding reproductive cloning. Reproductive cloning also gives rise to many ethical and social issues.

Therapeutic Cloning

Therapeutic cloning (also known as embryonic cloning) is the idea of using human stem cells in order to study human development and treat disease. The problem with therapeutic cloning is that in order to

perform a study on development or disease a human embryo is used and more often than not destroyed. While we may be able to benefit from research developed by therapeutic cloning, many people are willing to argue that we are destroying a human life for the sake of science and that is inherently wrong.

Embryonic cloning is where the philosophical line is really fuzzy. The controversy here is regarding *how* we define life. Some believe that embryos constitute life and therefore we should not use them to further scientific development. While others believe that the embryos subject to these tests are but a potential for life and therefore it is okay to use them for scientific development. On August 9th 2001, President George W. Bush addressed the issue of Stem Cell research and announced that:

"As a result of private research, more than 60 genetically diverse stem cell lines already exist. I have concluded that we should allow federal funds to be used for research on these existing stem cell lines where the life and death decision has already been made. This allows us to explore the promise and potential of stem cell research without crossing a fundamental moral line by providing taxpayer funding that would sanction or encourage further destruction of human embryos that have at least the potential for life."⁷

Although embryos may be destroyed I feel that this science could benefit society. Embryonic cloning parallels to DNA cloning in that it will allow us to find new ways of producing skin for possible burn victims and organs for those in need. If we could find a way to develop this technology it may be the case that we will never need to have an organ donor list. Stem cells are cells that are used to produce the vast array of cells that our bodies are made up of. If scientists were able to manipulate these cells, it could be the case that these cells would be used to produce viable organs. It is a commonly known fact that the demand for organs far exceeds the supply. If we were able to grow organs there may never be a need for an organ donor waiting list.

In Conclusion

While the media tends to only cover the most extreme cases of cloning, it is very important to realize and be able to distinguish between the three different kinds. I believe it is obvious that this science could be beneficial to humanity if used properly. However in order to find ways to utilize this technology properly we must completely understand what each type of cloning entails.

I believe DNA cloning, that can be used to discover new ways of warding off diseases and ailments is good and by no means harmful. Yet, I am also in agreement with the California Committee on Human

⁵ Notation adapted from the January 12 issue of the *San Francisco Chronicle*. This is actual text that the California Advisory Committee on Cloning came up with at the end of their five year term.

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⁷ <http://www.whitehouse.gov/news/releases/2001/08/print/20010809-1.html>: Excerpt was taken from the White House Press Release web page. This statement was given by President George W. Bush on August 9, 2001 during a press release.

Cloning that this technology must be restricted and its uses must be under inspection all the time.

Regarding reproductive cloning, I believe it is far too early in the development of cloning organisms to even fathom cloning a human being. Because we are currently incapable of cloning complex organisms such as dogs, cats and primates, the ability to successfully clone a human seems to be even less likely. If we had the ability to clone a primate which has DNA that differs from humans' by a mere 0.07%, it may be the case that cloning could work. As of now, the 90% failure rate is too unpromising and shows no potential for good.

Therapeutic cloning (i.e., stem cell research) has been supported by our government. While it may leave some people in discontent, I believe that one day people will be able to recognize the benefits of this type of research. I feel that having the

Presidential support of this science is very important, for the reason that federal monetary support is being donated and with this aid the realization of growing organs and tissues looks to be promising.

Overall, I believe that the California Advisory Committee on Human Cloning did a fine job in researching the issue behind cloning. I would like to express my enthusiastic support of DNA cloning and therapeutic cloning. I believe that these types of cloning could be very beneficial to our society. While many people may disagree due to ethical concerns, I feel it is a chance we must take when tackling new ground of science. Furthermore, it is our moral duty to keep suffering at a minimum therefore we must shy away from reproductive cloning because results are too unpromising.