

STANDARDS 4LIFE

Human Cloning

1. What is Human Cloning?

- How Does It Work?
- Why Clone a Human?
- Ethical & Moral Issues
- Cloning History
- Scientific Issues
- Cloning Numbers: How Successful Is It?
- Societal Issues

2. What You Should Know

- Why Should Therapeutic Cloning Be Banned?
- The Women's Health Issue
- Quotes From the Experts

3. What You Can Do

- Know What the Bible Says
- Answers to the Arguments
- Christian Medical Association Position Statement

4. Resources

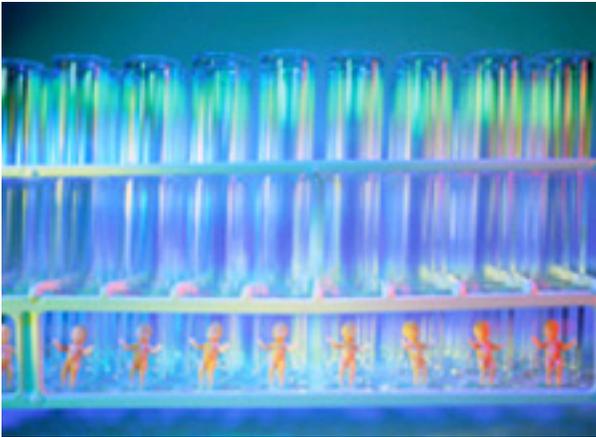
- Pro-Life Organizations
- Endnotes



P.O. Box 7500
Bristol, TN 37621
888-230-2637
www.cmda.org

Christian Medical & Dental Associations serves as a voice and ministry for Christian healthcare professionals. Its vision is to “transform doctors to transform the world.” Founded in 1931, CMDA currently serves more than 16,000 members and coordinates a network of Christian healthcare professionals for personal and professional growth; sponsors student ministries in medical and dental schools; conducts overseas healthcare projects for underserved populations; addresses policies on healthcare, medical ethics and bioethical and human rights issues; distributes educational and inspirational resources; provides missionary doctors with continuing education resources; and conducts international academic exchange programs.

1. What is Human Cloning?



Alzheimer's, Parkinson's, diabetes, spinal cord injuries, Lou Gehrig's disease. These are a few of the incurable illnesses being researched by scientists who believe the answer to a cure lies in the stem cells of tiny, human embryos frozen in time and space. These stem cells, precious for their ability to become any tissue in the body, are accessible only by destroying the human embryo. However, studies are published frequently documenting the real potential in adult stem cells, a potential unknown just a few years ago. Therefore, America is faced with a decision: human cloning versus adult stem cell research. Below you'll find information based on science, research and biblical guidance to help you decide for yourself which avenue is best.

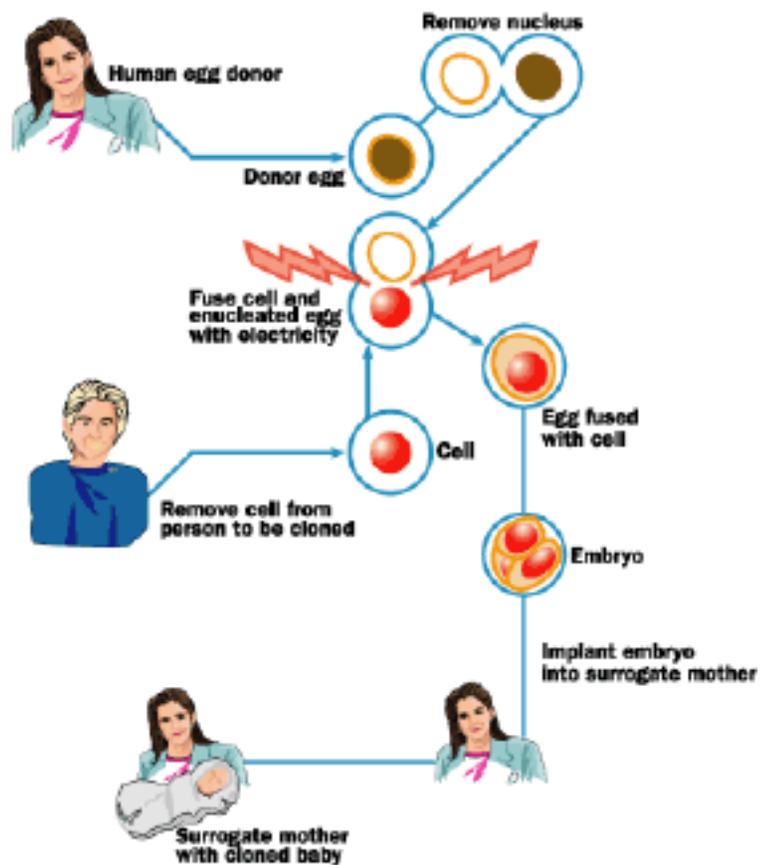
Definition of Human Cloning

Cloning is asexual reproduction in which an exact genetic copy of another plant, animal or human is made by fusing the DNA from an adult cell into a human egg from which the genetic material has been removed, causing it to divide and grow.

By definition of the National Academy of Sciences, a clone is an exact genetic replica of another organism. ¹

How does it work?

The same procedure used to create Dolly the sheep, technically called **somatic cell nuclear transfer**, is the procedure used with human cloning as well. Researchers first take an egg from a female donor and empty its genetic contents by removing the nucleus. They call this enucleating the egg. Adult cells, which contain DNA, are then taken from the person who is being cloned. They can be taken from almost any place on the body, including the skin, the mouth, or even from a strand of hair. These cells are cultured and then starved of nutrients to cause them to go into a dormant stage. The enucleated egg and one of these adult cells are fused together with a jolt of electricity. This creates the cloned embryo, a human being with the same genetic makeup as the person who donated the adult cells. If the embryo is implanted into a "surrogate" woman's uterus through in vitro fertilization, we refer to it as "**reproductive cloning**." If successful, the surrogate mother will give birth to a clone of the cell donor. Many scientists do not favor reproductive cloning at this time, but most want to be able to make human clones to "harvest" their valuable embryonic stem cells. This destroys the embryo. It is called "**research**" or "**therapeutic**"



cloning, and is done with the hope that these stem cells can be used to cure various diseases.² It is important to remember that there is no technical difference between "therapeutic", or "research" cloning and reproductive cloning. In "research" cloning, the embryo is destroyed before it has the chance to grow. In reproductive cloning, the embryo is implanted with the hopes of growing into a cloned human being.

Why clone a human?



Replace a child

A genetically identical child (an identical twin) could be reproduced from the DNA of a dead child.

Homosexual/Lesbian Reproduction

A genetic copy of one of the couple could be created without involving the opposite sex. "It's a gay issue," explained Randolph Wicker, Director, Human Cloning Foundation, in an article in *Gay Today*, "because heterosexuality as a route to reproduction is now historically obsolete."³

Infertile Couples

Infertile couples could create a child that matches one of them identically. They wouldn't have to use donated sperm or eggs.

Desired Traits

Someone with great intellect, beauty or ability could be copied for the "good of mankind." People have already purchased eggs or sperm from models and Nobel laureates.

Spare Organs

A group in England proposed, through genetic modifications, to create clones with only enough of a brain to sustain body functions. They believe that these "non-persons," genetic copies of individuals that need transplants, could have their organs harvested, without moral qualms.

Prevent Genetic Defects

A couple could clone the partner who does not carry the genetic defect causing a disease. They would still have their own child instead of adopting.

Ethical and Moral Issues

Destruction of Human Life	To get Dolly, 277 embryos were created. Only 29 embryos began to divide after they were fused. These were all implanted in ewes. Thirteen ewes became pregnant but only one lamb, Dolly, was born. ⁴ Thousands of human beings would be killed in attempts to create human embryos.
Means to an End	It is immoral to turn human beings into commodities and treat them like property. There is a unique value to human life.
Unique Individual Identity	A cloned person is genetically identical to another person who is older than they are. There will be unrealistic expectations that they should be like the person they were cloned from. Environmental and societal factors play a major role in development; therefore, a clone would not develop to be just like his or her twin. This is much different than being a twin of someone your own age.

Cloning History

Late 1800s	First “cloned” animals were created by Hans Dreisch in an attempt to prove that cell division does not prevent a loss of genetic material. Dreisch cloned sea urchins by separating a 2-cell embryo; each grew independently into adult sea urchins. This was not true cloning but artificial twinning.
1902	Embryologist Hans Spemman separated a 2-cell salamander embryo with a strand of his son’s hair, then separated a single cell from a 16-cell embryo. Both embryos then developed into identical adult salamanders. Although this was not true cloning, identical twins were created.
1952	Using nuclear transfer, Philadelphia scientists attempted to clone frogs with the nuclei of early tadpole embryos. The cells began to divide and grow.
1957	J.B Gurdon attempted to clone a frog with an adult cell. It never developed to the tadpole stage.
1962	J.B. Gurdon produced an adult frog from the intestinal cells of a tadpole.
1978	David Rorvik’s book <i>In His Image: The Cloning of a Man</i> was published. The book claimed the true story of first cloned man but was later determined to be a hoax. Also released was <i>Boys from Brazil</i> , a fictional tale of Dr. Joseph Mingele cloning Adolph Hitler.
1986	Steen Willadsen, an English scientist, announced he’d cloned a sheep’s embryo. At the same time, an American researcher, Neal First, claimed to have cloned a cow’s embryo. Although they were able to keep tissue alive in lab conditions, neither team attempted to clone from adult cells. It was still thought impossible to enable adult genetic material to convert to an embryonic state.
1993	The blockbuster movie <i>Jurassic Park</i> showed the risks and wonders of dinosaur cloning. Michael Crichton, author of the book on which the movie was based, said he wanted to show that science can’t really control nature and it is too powerful to leave just to scientists. Robert Stillman and Jerry Hall accomplished the first artificial human twinning through embryo splitting. It was labeled by the media as cloning, but it was not.
1997	After three years of paperwork, six years of experimentation and 277 failed attempts, the first true mammal, a sheep named Dolly was cloned by Ian Wilmut at the Roslin Institute and PPL Therapeutics in Scotland. In October of the same year, researchers at the Honolulu Technique cloned a mouse named Cumulina from cumulus cells (cells that surround a developing egg cell) using nuclear transfer.

Source: Think Quest - <http://www.thinkquest.org/library>

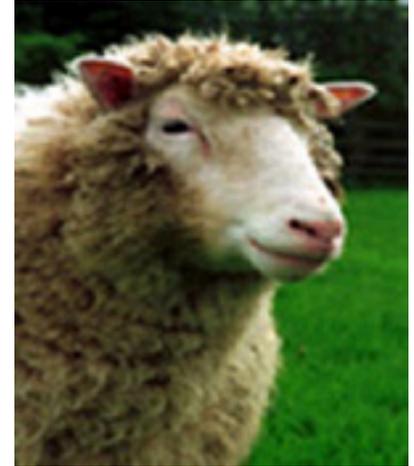
Scientific Issues

- **Mutation:** Genes mutate, or change, throughout life as a result of environmental factors and errors in replication. Cloning begins with a flawed cell, which passes on these mutations and increases the number of genetic disabilities in cloned children. For example, a skin cell may have many mutations (like scratches on a CD) that are not seen (heard) because only a small portion of its genetic material is being expressed (like playing only one track of a CD). When the cell is used to clone, all of the genes are once again expressed (playing the whole CD).
- **Malformation:** Large offspring syndrome (LOS) appears in perhaps 30 percent to 40 percent of cloned animals. LOS results in lung, brain, liver, tongue, heart and other defects that often leads to early death. Cloned animals typically have malformed placentas.⁵
- **Agng Genetic Material:** Recent studies have shown that the clone’s physiological age may be older than their chronological age; this is why Dolly has arthritis at a young age.⁶
- **Genetic Diversity:** In a world where human cloning was common, genetic diversity of humans would decrease. This would lead to a greater chance of inheritable genetic diseases.

Cloning Numbers: How Successful Is It?

Based on the most successful cloning experiments in animals to date, here are the success rates of cloning:⁷

- Dolly the sheep, first cloned mammal: 1 live birth out of 277 cloned embryos (0.4%)
- Cloned mice: 5 live births out of 613 cloned embryos (0.8%)
- 5 live births out of 314 cloned embryos implanted (1.6%) (0.8%; 1 survived)
- 26 live births out of 312 cloned embryos implanted (8.3%) (4.2%; 13 survived)
- Cloned pigs: 5 live births out of 72 cloned embryos implanted (7%)
- Cloned goats: 3 live births out of 85 cloned embryos implanted (3.5%)
- Cloned cattle: 30 live births out of 496 cloned embryos implanted (6%) (4.8%; 24 survived)
- Cloned cat: 1 live birth out of 188 cloned embryos (0.5%); of 87 embryos implanted (1.1%)
- Cloned rabbits: 6 live births out of “hundreds” of cloned embryos (4 survived)



In animal cloning “...the success rate for the standard technique, in which the nucleus of an egg is replaced with one from a donor cell, is dismal: typically, 1% to 3% of nuclear transfer oocytes survive uterine implantation, gestation, birth, and early life.”⁸ —Brian Vastag, Journal of the American Medical Association

Societal Issues

People Oppose	A June 7, 2001 poll by the U.S. Conference of Catholic Bishops showed that 84 percent of people believe scientists should not be allowed to clone to create children for infertile couples. Most scientists and doctors also oppose reproductive cloning. When asked in a poll would they “like to be a clone,” 86 percent of people said no. ⁹
Parentage	Who will be the parents of a cloned child? Is it the person they are cloned from? That person is not the clone’s mother or father but his or her twin. Is it the woman who donated the egg? The child has none of her nuclear DNA. Is it the person(s) who raises them? Does a clone then need to be formally adopted by whoever provides care for the child?
Lineage	What will be the legal status of the child? A whole new set of laws will need to be developed to deal with inheritance. The child will be dislocated from a family tree without real grandparents, uncles or cousins. This will differ from adoption where the child is not genetically related to the family they are part of at all but has been legally adopted into it.
Family Structure	Homosexuals, lesbians and singles will be able to have their “own” children that are actually their genetic twins, yet they will raise them as their children. The traditional family structure will be increasingly challenged by the mindset that a family is whatever people want to make it.
Protecting Your DNA	Famous and admired people would be forced to protect their DNA to avoid it being used to create a genetic duplicate of themselves without their permission.

2. What You Should Know

Why should “therapeutic” cloning be banned?



- If therapeutic cloning was allowed but reproductive cloning was banned, the result would be a legal requirement to destroy young embryonic human beings.
- If there are medical breakthroughs for presently incurable diseases like diabetes, people who value human life will have the terrible choice of respecting their convictions and forgoing life-prolonging treatment or abolishing their beliefs and taking the new therapy.
- Therapeutic cloning treats embryonic human beings as valuable biological material. A person is treated like property. Its genetic twin is its “owner” who decides how their genetic product will be used.

Why should “therapeutic” cloning be banned? cont’d

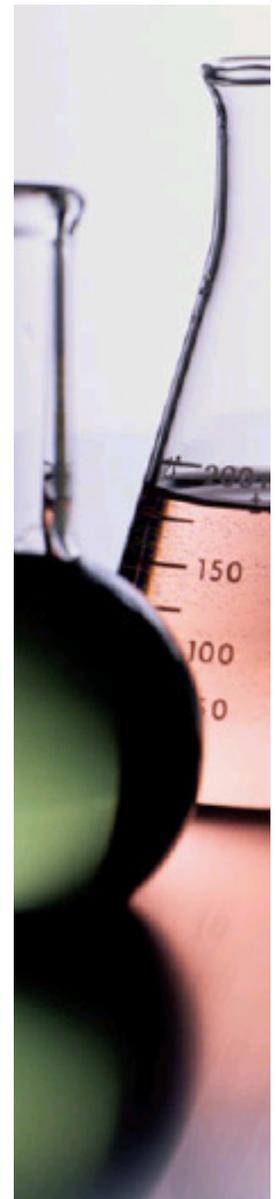
- It will be impossible to know if an implanted pregnancy has been done with a cloned embryo or a traditional embryo. How will the IVF specialist say no to parents dealing with infertility, have lost a child or a dozen other scenarios who desire to implant their clone? The IVF industry is non-regulated at present and human cloning can be done with the equipment already located in every IVF lab.

The Women’s Health Issue



To get enough eggs to seek cures for just four diseases through human cloning, every woman in the U.S. aged 18-44 (approximately 55 million) would have to endure two cycles of ovarian hormone hyper-stimulation and then undergo surgery to have their eggs harvested. The numbers below are based on 50 eggs required per patient treatment. Estimates range between 50 to 100 eggs per patient. Since no one has reported successfully harvesting stem cells from cloned human embryos, no one really knows what the true success rate will be, but it would likely be worse than in animal models. In vitro fertilization donors average 10 to 15 eggs per hyper-stimulation cycle. This chart assumes 10 as the average number of eggs that could be cloned due to the abnormalities found in some eggs harvested that would make them unsuitable for use. The total number of women of reproductive age (18 to 44 y.o.) in November 2000 (US Census) was estimated at 55 million.¹⁰

DISEASE	AFFECTED PATIENTS	EGGS REQUIRED	DONATING WOMEN NEEDED
ALS	20,000	1,000,000	100,000
Parkinson’s	1,000,000	50,000,000	5,000,000
Diabetes	17,000,000	850,000,000	85,000,000
Totals ->	18,020,000	901,000,000	90,100,000



Quotes from the Experts...

David A. Prentice, Ph.D., Professor, Life Sciences, Indiana State University; Ad Hoc Science Adviser to Senator Sam Brownback:

“All human cloning is reproductive, in that it creates reproduces a new developing human intended to be virtually identical to the cloned subject. Both “reproductive cloning” and “therapeutic cloning” use exactly the same techniques to create the clone, and the cloned embryos are indistinguishable. The process, as well as the product, is identical. The only distinction between the embryos is their subsequent use—either implantation in hopes of a live birth, or destruction in hopes of a medical miracle.”

State laws recognize the embryo as a human being. Following is a summary by Sam Casey, a lawyer and the Executive Director of the Christian Legal Society:

“Currently at least 29 states recognize... that ‘fertilization’ or ‘conception’ initiates the life of a human being. At least 25 states protect pre-natal human beings...during some part of their gestational development. Moreover, state courts continue to expand the reach of personal injury laws to include compensation for...human beings at the embryonic and fetal stages. As yet unchallenged, a longstanding law in Massachusetts prohibits the use of ‘any live human fetus before or after the expulsion from its mother’s womb, for scientific, laboratory, research or other kind of experimentation.’”

Los Angeles Times, May 10, 2002: “Thomas Okarma, too, has met with senators to advocate cloning, but not because he sees any business potential in it. As chief executive of Geron Corp., a cell therapy company, he has no interest in using cloned embryos to produce customized treatments for disease. The odds favoring success ‘are vanishingly small,’ he said, and the costs are daunting. Okarma said it would take ‘thousands of [human] eggs on an assembly line’ to produce a custom therapy for a single person. ‘The process is a nonstarter, commercially,’ he said.”

There are other ways to prevent rejection of transplanted cells besides using the therapeutic cloning technique. The **March 18, 2002 San Francisco Chronicle** reported that researchers from biomedical plant Geron Corp., and with Advanced Cell Technologies, admitted that there are other ways, but that “that message has not gotten out,” and that “the need for cloning to overcome immune system rejection has been overstated.” The report also notes that “the scientific community has put out the message that a ban on therapeutic cloning will prevent researchers from solving the immune-system problem - an argument that seems at best a stretch, and at worst, a deception.”¹¹

President George W. Bush, April 10, 2002:

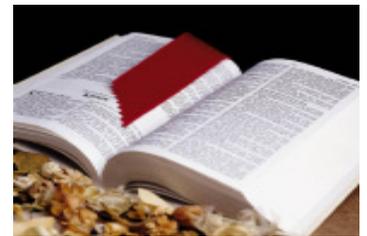
“Human cloning is deeply troubling to me, and to most Americans. Life is a creation, not a commodity. Our children are gifts to be loved and protected, not products to be designed and manufactured. Allowing cloning would be taking a significant step toward a society in which human beings are grown for spare body parts, and children are engineered to custom specifications; and that’s not acceptable. I believe all human cloning is wrong, and both forms of cloning ought to be banned, for the following reasons. First, anything other than a total ban on human cloning would be unethical. Research cloning would contradict the most fundamental principle of medical ethics, that no human life should be exploited or extinguished for the benefit of another.”

3. What You Can Do

Know What the Bible Says

1. Unlike animals, man and woman are made in God’s image. This gives human life special value.

- Genesis 1:26 “And God said, Let us make man in our image, after our likeness...”
- Genesis 9:6 “Whoever sheds the blood of man, by man shall his blood be shed; for in the image of God has God made man.”
- Job 33:4 “The Spirit of God has made me; the breath of the Almighty gives me life.”



2. God’s design is that each individual is formed by the union of genetic material from a husband and wife. God creates and men and women procreate.

- Genesis 4:1 “And Adam knew Eve his wife; and she conceived, and bare Cain, and said, I have gotten a man from the LORD.”
- Isaiah 45:11-12 “This is what the LORD says—the Holy One of Israel, and its Maker: Concerning things to come, do you question me about my children, or give me orders about the work of my hands? It is I who made the earth and created mankind upon it. My own hands stretched out the heavens; I marshaled their starry hosts.”

3. Man cannot comprehend God’s wisdom and His divine will. Man may fight illness and the consequences of a disease brought by sin into the world but is not to create new forms of life or to take it unjustly.

- Ecclesiastes 3:11 “He has made everything beautiful in its time. He has also set eternity in the hearts of men; yet they cannot fathom what God has done from beginning to end.”
- Ecclesiastes 8:17 “...then I saw all that God has done. No one can comprehend what goes on under the sun. Despite all his efforts to search it out, man cannot discover its meaning. Even if a wise man claims he knows, he cannot really comprehend it.”
- Ecclesiastes 11:5 “As you do not know the path of the wind, or how the body is formed in a mother’s womb, so you cannot understand the work of God, the Maker of all things.”
- Isaiah 55:8-9 “As the heavens are higher than the earth, so are My ways higher than your ways and my thoughts than your thoughts.”

- Romans 1:20-21 “For since the creation of the world God’s invisible qualities—his eternal power and divine nature—have been clearly seen, being understood from what has been made, so that men are without excuse. For although they knew God, they neither glorified him as God nor gave thanks to him, but their thinking became futile and their foolish hearts were darkened.”
- Isaiah 5:20-21 “Woe to those who call evil good and good evil, who put darkness for light and light for darkness, who put bitter for sweet and sweet for bitter. Woe to those who are wise in their own eyes and clever in their own sight.”
- Luke 6:9 “Then Jesus said to them, ‘I ask you, which is lawful on the Sabbath: to do good or to do evil, to save life or to destroy it?’”

4. We are not to do evil even if some good may result.

- Romans 3:8 “Why not say—as we are being slanderously reported as saying and as some claim that we say—‘Let us do evil that good may result’? Their condemnation is deserved.”

5. God pities the orphan, blesses the family and gives special responsibilities to each member of it. Children are a blessing that God gives to parents. Man should not create “orphans” through cloning.

- Psalm 68:5 “A father to the fatherless, a defender of widows, is God in his holy dwelling.”
- 1 Timothy 3:4 “He must manage his own family well and see that his children obey him with proper respect.”
- Psalms 127:3 “Sons are a heritage from the LORD, children a reward from him.”



Log onto cmdahome.org
to read this article in Today's Christian Doctor.

Answers to the Arguments

1. This is not a human being. It is only a mass of cells.

- Authoritative scientific texts, congressional testimony and scientific consensus state that human life begins at the zygote (one-cell embryo) stage
- “A zygote is the beginning of a new human being.”¹²
- “We begin our description of the developing human with the formation and differentiation of the male and female sex cells or gametes, which will unite at fertilization to initiate embryonic development of a new human individual.”¹³ —William Larsen, “Human Embryology”

2. Pregnancy begins at implantation.

- “Human pregnancy begins with the fusion of an egg and a sperm,…”¹⁴ —Bruce Carlson, “Human Embryology and Developmental Biology”
- “...Union of these gametes during fertilization produces a zygote or fertilized ovum which is the primordium or beginning of a new human being (emphasis in original text). Human development begins at fertilization... This highly specialized, totipotent cell marked the beginning of each of us as a unique individual.” —Keith L. Moore & T.V.N. Persaud. *The Developing Human: Clinically Oriented Embryology*, 6th Edition, 1998
- “Although life is a continuous process, fertilization is a critical landmark because, under ordinary circumstances, a new, genetically distinct human organism is formed when the chromosomes of the male and female pronuclei blend in the oocyte.” —Ronan O’Rahilly & Fabiola Muller, 2001 *Human Embryology & Teratology*, 3rd Ed.
- State laws recognize the embryo as a human being.

3. If “therapeutic” cloning is banned, we cannot develop cures for chronic diseases like Alzheimer’s or Parkinson’s disease.

- The greatest scientific breakthroughs are much more likely to occur using adult stem cells. That is why three out of four investment dollars are going into biotech companies doing adult stem cell research. Already adult stem cells are being used to treat thousands of people in the lab while embryonic stem cells have not been successfully used to treat even one patient. Embryonic stem cells turn into cancers when transplanted, it is difficult to control their differentiation and almost impossible to get a pure culture of differentiated cells.
- Embryonic stem cell therapy requires human cloning. Such therapy would be morally troublesome to many patients since they themselves would have to be cloned and their twin cannibalized for its cells. Most Americans would have ethical qualms about participating in human sacrifice.
- The public is overwhelmingly opposed to human cloning — 80-90 percent of people oppose it categorically. The American Heart Association experienced donor backlash when they said they would fund destructive embryo research.

4. The potential for curing disease outweighs the problem of destroying embryos.

- “Peter Mountford, chief scientific officer of Stem Cell Sciences, believes these problems [with cloning] can be overcome, and argues that it is too early to give up on therapeutic cloning - but his has become a minority view.”¹⁵
- “...The idea of ‘therapeutic cloning’ seems to be on the wane. By creating cloned human blastocysts, some experts have argued that it should be possible to derive embryonic stem cells perfectly matched to individual patients. But most now believe this will be too expensive and cumbersome for regular clinical use.”¹⁶
- “[John] Gearhart [of Johns Hopkins University] also says that many scientists ‘feel there are ways of getting around [the rejection problem of proposed embryonic stem cell therapies] without the nuclear transfer paradigm.’”¹⁷
- “[T]he poor availability of human oocytes, the low efficiency of the nuclear transfer procedure, and the long population - doubling time of human embryonic stem cells make it difficult to envision this [therapeutic cloning] becoming a routine clinical procedure...”¹⁸



Testimony by Dr. Chris Hook, Ethicist at Mayo Clinic before the House of Representatives: “What is a chimpanzee embryo? It is a little immature chimpanzee. What is an embryo of the species homo sapiens? It is an immature member of the species homo sapiens. It is human all the way in its developmental pathway and it is a being all the way as well. It is not just tissue. Tissue cannot grow into an adult being. Only a small immature being can do that. It is a unique member of the species homo sapiens, a human being, from the moment conception is completed at syngeny. It is not some other species, it is human. It is not a non-being. Any attempt to define some point along the developmental pathway beyond that moment when a new, unique genetic human being is conceived is purely arbitrary. It is only in the context of other utilitarian goals that somehow our arbitrary thresholds get defined, a process in and of itself that should lead us to be skeptical of such designations.”

Christian Medical Association Human Cloning Ethics Statement

As Christian physicians and dentists, we believe that human life is sacred because each individual is made by God in His own image. God’s design is that each individual is formed by the union of genetic material from a husband and wife. We further believe that the family is the basic social unit designed by God to receive and nurture new human life.

There are moral reasons to refrain from proceeding with human cloning. First and foremost, the development of this technology will require the deliberate sacrifice of human embryos. We believe this to be immoral. The use of human life merely as a means to an end is likewise morally unacceptable. Another moral concern is the question of the timing and significance of ensoulment. Furthermore, cloning may deviate from the wisdom of God’s design for human genetic diversity and therefore may be unwise.

There are scientific reasons to oppose human cloning such as the potential for mutation, transmission of mitochondrial diseases, and the negative effects from the aging genetic material. There are also societal reasons to be hesitant about human cloning such as questions about parentage, lineage, family structure and the uniqueness of the individual.

Therefore, we believe that human cloning should not be pursued given our current understanding and knowledge. We affirm the need for continued moral scrutiny as research on animal cloning proceeds and proposals for the application of this technology to humans are advanced.

4. Resources

Christian Legal Society

4208 Evergreen Lane,
Suite 222
Annandale, VA 22003
703.642.1070
www.clsnet.org
clshq@clsnet.org

Focus on the Family

8605 Explorer Drive
Colorado Springs, CO 80902
719.531.3328
800.A-FAMILY
www.family.org

Life Issues Institute

1821 W. Galbraith Rd.
Cincinnati, OH 45239
513.729.3600
513.729.3636
www.lifeissues.org
info@lifeissues.org

Family Research Council

801 G. Street NW
Washington, DC 20001
202.393.2100
800.225.4008
www.frc.org

Concerned Women for America

1015 Fifteenth St. NW Suite 1100
Washington, DC 20005
202.488.7000
www.cwfa.org
mail@cwfa.org

The Center for Bioethics & Human Dignity

2065 Half Day Road
Bannockburn, IL 60015
847.317.8180
www.cbhd.org
info@cbhd.org

Endnotes

1. NAS, Scientific and Medical Aspects of Human Reproductive Cloning (National Academy Press 2002), page E-4)
2. How Stuff Works. 8 Nov. 2002. <http://library.thinkquest.org/20830/Frameless/Manipulating/Experimentation/Cloning/longdoc.htm>
3. <http://gaytoday.badpuppy.com/garchive/viewpoint/052797vi.htm>
4. Benoit, B. "Human Cloning and Rengineering,"
5. Vastag, Brian. "Epigenetics seen as possible key to cloning." JAMA. 286:12. 26 Sept. 2001.
6. Allen JF, Allen CA. "A mitochondrial model for premature ageing of somatically cloned mammals." IUBMB. Life. 1999 Oct. 48(4):369-72.
7. http://cloninginformation.org/info/latest_cloning_numbers.htm
8. Vastag, Brian. "At the Cloning Circus Sideshows Abound, While Scientist Seek a Wider Audience." JAMA. 286:12. 26 Sept. 2001.
9. Elmer-Dewitt, Phillip. "Cloning: Where do we draw the line?" Time. November 8, 1993. 65-70.
10. <http://eire.census.gov/popest/archives/national/nation2/intfile2-1.txt>.
11. Abate, Tom. "Drugs posited as stand-in for stem cell cloning." San Francisco Chronicle. 18 March 2002.
12. Keith Moore and T.V.N. Persaud, The Developing Human (Philadelphia: W.B. Saunders Company, 1998. 2.)
13. William Larsen, Human Embryology (New York:Churchhill Livingstone, 1997), p. 20
14. Bruce Carlson, Human Embryology and Developmental Biology (St. Louis, MO: Mosby, 1994) p. 3.
15. Peter Aldhous, "Can they rebuild us?", Nature 410, 622-625; April 5, 2001.
16. Peter Aldhous, "A world of difference", Nature 414, 838; Dec 20/27, 2001
17. Constance Holden, "Would cloning ban affect stem cells?" Science 293, 1025; Aug 10, 2001
18. Odorico JS, Kaufman DS, Thomson JA, "Multilineage differentiation from human embryonic stem cell lines," Stem Cells 19, 193-204; 2001