



Stem Cell Research

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1. What are stem cells?

divide for an indefinite period of time. Other cells cannot do this. All 210 different types of tissue in the human body grow from the stem cells of an embryo, which is a human being from the age of conception through the eighth week of development.



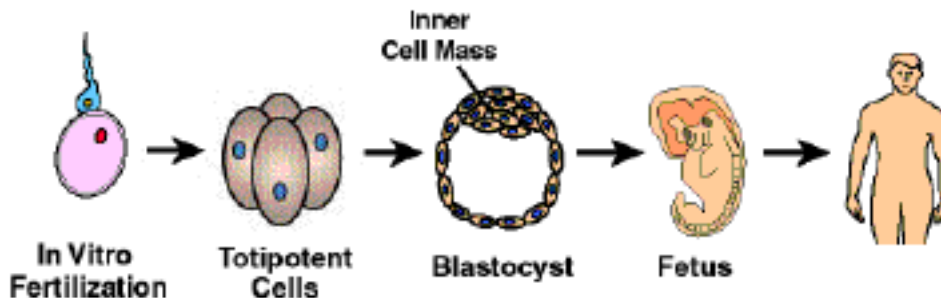
Embryos that are created for infertility treatment are often created in excess of the number that is usually needed to achieve a pregnancy. There is a heavy burden and expense in collecting ova from the donor and there is no satisfactory technology for storing eggs. Three to four eggs are implanted during each IVF attempt because three out of four embryos do not survive to grow into a child in utero. Scientists are not sure why. Most fertility specialists consider it unwise to insert more than four eggs during a cycle for fear that in some instances, multiple gestations will result. If too many embryos implant, the mother may have difficulty sustaining her pregnancy. If pregnancy is achieved, many parents abandon their “excess” embryos (their children). Over 400,000 embryos are in storage in the U.S.¹

These “excess embryos” have developed in culture to the blastocyst stage and can be thawed so their inner cell mass can be harvested for stem cells. Harvesting the inner cell mass destroys the embryo.

There are three types of stem cells:²

Type of Cell	Definition	Traditional Examples
Totipotent	Stem cells that can become an entire human being.	A fertilized human egg
Pluripotent	Stem cells that can develop into any body cell type by can't become an entire human being.	A seven-day-old embryo, or blastocyst
Multipotent	Stem cells that can only differentiate into the same tissue type.	A bone marrow stem cell can differentiate into another type of bone marrow cell, but not into kidney, heart muscle or brain.

Recent research has shown that stem cells from seven day embryos are totipotent, meaning they can become an entire human being. Scientists have also found that bone marrow and other “adult” stem cells can turn into other types of tissue such as heart muscle.



Life Threatening Sources of Stem Cells

Embryonic Stem Cells (Totipotent)

Harvested from the inner cell mass of the hollow blastocyst, or early embryonic human being, seven to ten days after fertilization. The embryo at this stage may be up to 200 cells in size.³

Fetal Stem Cells (Totipotent)

Often taken from the germline tissues that will make up the ovaries or testes of aborted fetuses.⁴

Life Honoring Sources of Stem Cells

Umbilical Cord Stem Cells (Pluripotent)

Taken from umbilical cord blood, which contains stem cells similar to those found in the bone marrow of newborns.⁵ Many doctors are now recommending these valuable cells be preserved after delivery.⁵

Placenta Derived Stem Cells (Pluripotent)

The placenta contains many blood vessels and connects the umbilical cord of an unborn child with the uterine wall, allowing nutrients to pass from mother to baby. Normally it is discarded after birth. Anthrogenesis Corporation recently announced the development of a commercial process that can extract ten times as many stem cells from a placenta as from cord blood.⁶

Adult Stem Cells (Pluripotent)

Tissues, like bone marrow, lung, pancreas, brain, breast, fat, skin and even tooth pulp contain stem cells that have been isolated. Bone marrow stem cells have been recognized and used in treatment for over 20 years. Only recently were stem cells found in many other tissues. There may be stem cells in each of the 210 different types of tissue in the human body.

2. What You Should Know

Adult Stem Cell Research Today

Today, bone marrow-derived stem cells are used in cancer and auto-immune disease treatment protocols. Stem cells replace the patient's bone marrow after high dose chemotherapy or radiation. This is done over 15,000 times a year in the U.S. alone and has resulted in formerly unattainable cures and regressions. The following conditions or diseases have been positively affected by the use of adult stem cells.

1. Brain Tumor⁷
2. Retinoblastoma⁸
3. Ovarian Cancer⁹
4. Solid Tumors¹⁰
5. Testicular Cancer¹¹
6. Multiple Myeloma¹²
7. Leukemia¹³
8. Breast Cancer¹⁴
9. Neuroblastoma¹⁵
10. Non-Hodgkins Lymphoma¹⁶
11. Renal Cell Carcinoma¹⁷
12. Autoimmune Diseases¹⁸

Adult Stem Cell Research Tomorrow¹⁹

Functional Genomics

The area of functional genomics may enable scientists to identify the factors involved in the cellular decision-making process that results in cell specialization. What turns the expression of genes off and on so a cell develops into muscle instead of nervous tissue? Some of our most serious medical conditions, such as cancer, are due to abnormal cell specialization and cell division.



Drug Testing

Stem cells could allow scientists to test new drugs using human cell lines which could hasten new drug development. Only drugs that were safe and had beneficial effects in cell line testing would graduate to whole animal or human testing. It would allow quicker and safer development of new drugs.

Genetic Disorders

Their ability to integrate and generate new cells within an organ makes stem cells prime candidates to deliver gene therapy to replace genetically defective cells.

Cell Therapy

A number of diseases are characterized by the death of specific cell populations that do not regenerate themselves - neurodegenerative disorders, paralysis caused by trauma and Type 1 diabetes, for example. Stem cell transplants could repair tissue damaged by disease and injuries. This is the primary benefit stem cells could provide.

Transplantation

Skin could be grown in the lab for grafting onto serious burn victims; new livers, kidneys or hearts could be grown on "frameworks" in the lab and then transplanted. This complicated technology will take decades to develop.

Diabetes

There are 16 million diagnosed diabetic patients in the United States. There are 798,000 more diagnosed annually--costing \$5 billion a year. Five to 10 percent of diabetics have Type 1 diabetes and need new islet cells to produce insulin. Reserachers have isolated and induced pancreatic duct stem cells in mice and have cured their diabetes.²⁰

Multiple Sclerosis

Multiple Sclerosis is an inflammatory disease of the central nervous system. Nerve stem cells can be harvested, multiplied in the lab and reimplanted into the MS patient for therapy. This process was successful in restoring myelin (the nerve insulating substance) in mice using Schwann cells grown in culture.²¹

Paralysis

Stem cells were transplanted into the spinal cords of rats after 9 days of paralysis. They were able to stand and walk, though not perfectly, within two weeks.²²

Stroke

Umbilical cord blood stem cells were cultured into immature neuronal stem cells, and injected intravenously into rats that had been given artificial strokes. The cells

migrated to the damaged areas and remarkably improved the recovery of animals. The stem cells replaced dead cells and boosted the rodents' own brain repair mechanism.²³

Heart Attacks

The creators of Dolly took a cow udder cell, turned it into a stem cell and then differentiated that cell into beating heart muscle.²⁴

AIDS

Autologous stem cells transplanted after they were made resistant to the HIV virus through gene therapy. The stem cells survived and produced CD4+ cells for a minimum of six months.²⁵

Kidney Transplant

Stem cell biology holds enormous potential for artificial organ development and transplantation, which may enable scientists to grow a new, tailor-made kidney for transplant purposes.²⁶

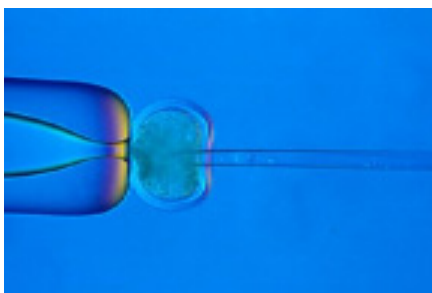
Muscular Dystrophy

Stem cells transformed neuronal cells not only in culture but after injection into mice. "With adult stem cells there would also be the possibility of auto-transplantation, eliminating all the problems of immunological compatibility and rejection."²⁷ Transplant rejection would be a significant problem if using embryonic stem cells.

Understanding Personhood

- **Personhood begins at conception.** Adult human beings are the result of continuous growth that begins at conception. They are human at conception because of their unique genetic code that makes them part of the human species. They are also "beings" at conception - they have life and undergo development in the appropriate environment. There is no morally relevant break in their development. Personhood does not depend on having abilities such as the power to reason, self-awareness, a level of intellect or consciousness.
- **Implantation:** Personhood does not depend on the survival rate of an embryo once it has been implanted. There is a 50 percent miscarriage rate around implantation: we have no moral obligation to save an embryo from natural death. Twinning occurs around implantation: this doesn't mean the original embryo was not a full person.
- **Viability:** Point when a baby is able to live outside the womb. Viability cannot be measured precisely, it continues to change and become earlier. It is dependent on man's technology, not the essence of the fetus.
- **Personhood does not depend on location or dependency.** There is no difference the day before birth and the day after birth - just a difference in location and degree of the baby's dependence on the efforts of others.

Understanding the Debate



It is immoral.

At its core, this debate is not about science but about human rights. Proponents of stem cell research know it is impossible to take away the inalienable right to life from human beings, so they are taking away the embryos' humanity by referring to them as "clumps of cells" or "primordial masses of tissue." In interview after interview, prominent scientists have testified that embryos are not human beings at all.²⁹ Yet a dictionary reveals that a human being is: "A member of the genus Homo and especially of the species H. sapiens." If human embryos are not human beings, then what are they?²⁹

It is illegal.

The “Dickey Amendment,” which has been attached yearly to National Institutes of Health budgets, states: “None of the funds made available in this Act may be used for research in which a human embryo or embryos are destroyed, discarded or knowingly subjected to risk of injury....” Unfortunately, the Clinton administration presented a loophole stating that the NIH could fund embryonic stem cell research as long as federal funds weren’t used to actually destroy the embryos. These guidelines circumvented the intent of the Dickey Amendment and created a powerful incentive for destroying human embryos. ³⁰

It is unethical.

History reveals the tragedy of unchecked scientific inquiry and unethical human experimentation. Scientists often seek to push the limits of knowledge, which can result in productive perseverance or horrific ethical compromise. Following is Senate testimony from Dr. Chris Hook, MD, Christian Medical & Dental Associations member and Director of Ethics Education for the Mayo Graduate School of Medicine and as Chair of Mayo’s Clinical Ethics Council, explaining why good ends do not justify unethical means:

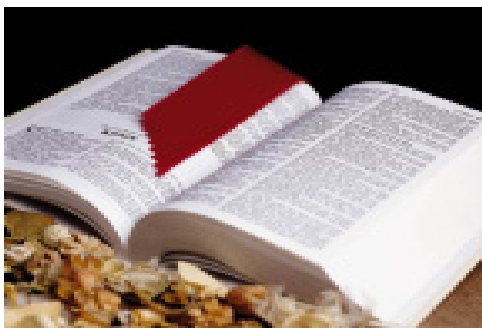


Human subject research has provided many wonderful treatments to patients over the past 200 years. However, the history of human research is checkered with horrible abuses, including the Tuskegee syphilis trial and the Willowbrook hepatitis experiments here in the United States, and the experiments performed at Dachau during the Second World War. During the Nuremberg war crime trials, conducted at the conclusion of World War II, German researchers on trial defended themselves on the following grounds: (1) a great need allegedly existed for the research to save the lives of soldiers and sailors; (2) the subjects of the experiments were purportedly already targeted to die (i.e., German researchers alleged that someone else made the decision to kill them); therefore, (3) we should not let this valuable commodity, this chance to learn in ways we otherwise could not, be wasted. This argument, resoundingly rejected by the tribunal, is precisely the same argument put forward today to justify using government funds to conduct research on human embryos. The only difference is that we have substituted human embryos as the group

of devalued, commodified human beings who are to be sacrificed on the altar of research and supposed progress.

One of the products of the Nuremberg trials was the Nuremberg Code of Research Ethics. The Code was created with the hope that the research community would not repeat the mistakes in Germany. Indeed, it is interesting that Germany, the country with the most horrific experience with fatal human subject experimentation, today bars not only the destruction of living human embryos for research purposes, but also the freezing of human embryos because of the high associated death rate (11% death rate at thawing). The Nuremberg Code of Research Ethics has served as the foundation of all subsequent statements governing human subject research. Section 5 of the Code states, “No experiment should be conducted where there is an a priori reason [i.e., prospective reason] to believe that death or disabling injury will occur; except perhaps, in those experiments where the experimental physicians also serve as subjects.”

3. What You Can Do



Know What the Bible Says

1. Most importantly, the Bible says man is made in God’s image. God’s image is not based on human capacity such as the ability to reason or have relationships. The image of God is something humans possess as part of their nature or essence.

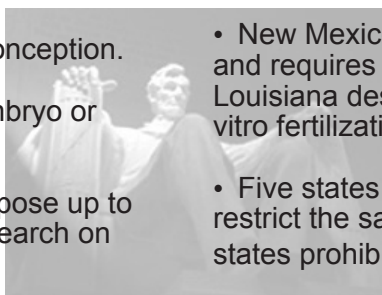
- “Then God said, ‘Let us make man in our image, in our likeness, and let them rule over the fish of the sea and the birds of the air, over the livestock, over all the earth, and over all the creatures that move along the ground.’ So God created man in his own image, in the image of God he created him; male and female he created them.” Genesis 1:26-27
- “And for your lifeblood I will surely demand an accounting. I will demand an accounting from every animal. And from each man, too, I will demand an accounting for the life of his fellow man. Whoever sheds the blood of man, by man shall his blood be shed; for in the image of God has God made man. As for you, be fruitful and increase in number; multiply on the earth and increase upon it.” Genesis 9:5-7

Know What the Bible Says, continued

2. The Scriptures describe a continuity of human personhood from before birth. Man is not seen as just another animal. God gave man dominion over animals. This dominion must be responsible. We are merely stewards of God's creation since he still owns it.
 - "Surely I was sinful at birth, sinful from the time my mother conceived me." Psalm 51:5
 - "Look away from me, that I may rejoice again before I depart and am no more." Psalm 39:13-16
 - "The land must not be sold permanently, because the land is mine and you are but aliens and my tenants." Lev. 25:23
3. The Bible teaches that man is not to unjustly take human life.
 - "You shall not murder." Deuteronomy 5:17
4. God gave us the tools to learn how to cure disease through his "general revelation" to mankind. This means God reveals himself and his wisdom to all men outside the pages of the Bible. God set the physical world in motion and made it function logically so man could understand it. By observing the physical world man can learn how things work and how to limit the effects of disease that sin brought into the world. This is all part of God's "common grace" to mankind.
 - "The law of the Lord is perfect, reviving the soul. The statutes of the Lord are trustworthy, making wise the simple." Psalm 19:7
 - "This is what the Lord says: 'If you can break my covenant with the day and my covenant with the night, so that day and night no longer come at their appointed time, then my covenant with David my servant-and my covenant with the Levites who are priests ministering before me-can be broken and David will no longer have a descendant to reign on his throne.'" Jer. 33:20-21
5. Because of sin coming into the world, mankind can also misuse technology. (Analgesics can relieve pain or be abused to escape reality). Efforts made to cure diseases and manipulate human life should have boundaries.
 - "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." Romans 3:8
 - "All Scripture is God-breathed and is useful for teaching, rebuilding, correcting and training in righteousness, so that the man of God may be thoroughly equipped for every good work." 2 Tim. 3:16-17
 - "His divine power has given us everything we need for life and godliness through our knowledge of him who called us by his own glory and goodness." 2 Pet. 1:3
 - "(God's grace) teaches us to say 'No' to ungodliness and worldly passions, and to live self-controlled, upright and godly lives in this present age." Titus 2:12
 - "I know, O Lord, that a man's life is not his own; it is not for man to direct his steps." Jer. 10:23
7. Christ's incarnation began with a miraculous fertilization. Our Savior was once a one-cell embryo.
 - "But why am I so favored, that the mother of my Lord should come to me?" Luke 1:43
 - "You will be with child and give birth to a son, and you are to give him the name Jesus." Luke 1:31

It's the Law...

- 38 states recognize that life begins at conception.
- 25 states regulate and 10 states ban embryo or fetal research.
- Maine, Michigan and Massachusetts impose up to five years of imprisonment for harmful research on live embryos or fetuses.
- New Mexico prohibits all human embryo research and requires that all embryos created be implanted. Louisiana designates embryos created through in vitro fertilization as "judicial persons."
- Five states restrict the sale of embryos. Five more restrict the sale of embryos for research. Eight states prohibit the sale of embryos for any reason.



Answers to the Arguments

Argument	Answer
“It’s just like abortion. Fetuses/embryos don’t have rights. We must pursue embryonic stem cell research to find cures.”	Human embryos are not without legal rights. “The legal basis for permitting abortion was not a lack of fetal rights, but rather the purported competing Constitutional rights of women... The Supreme Court’s abortion jurisprudence does not prohibit the government from granting rights to fetuses or embryos.... It does not limit legislatures power to define the scope and permissibility of investigational embryo research in years to come.” ³¹
“We can sacrifice a few embryos to save millions of lives. They’re going to be destroyed anyway.”	This espouses a utilitarian ethic - the end justifies the means. Destroying human life in the name of science will ultimately corrode and destroy science. An “ends justifies the means” ethic puts all of humankind in jeopardy because those that have the power decide the ends and justify the means.
“Let’s allow both since we don’t know which one will be successful.”	Why sacrifice our moral, ethical and legal principles when an ethical path is open before us. Would a scientist explore two paths of research when he knew one path would cause the death of human beings and the other wouldn’t?
“These embryos don’t have a brain or brain waves. Therefore they can’t be considered human life.”	Brain wave activity is not a marker of life like it is a marker for death. Death of the brain means there is no future. It is irreversible. An embryo has capacities to develop full brain activity if allowed to.
“If an embryo can’t feel pain, then it should not be considered a person.”	The ability to experience sensation or pain does not determine when life begins. This confuses sensation of harm with the reality of harm. A person is harmed whether they feel their leg being cut off or not. Science shows that pain is felt by a fetus much earlier than we have thought and it is more intense. Quickening - mother feels baby move around 18 weeks. Personhood is not dependent on someone’s ability to feel a sensation.

The basic tenet of medicine is to “do no harm.”

Taking another person’s life is the ultimate harm. Redefining embryos to be “less than human” to conduct destructive research on them is the height of arrogance. To state that human embryos deserve respect but it is okay to destroy them is irrational.


It is unethical under international ethics codes.

The Nuremburg Code states: “No experiment should be conducted where there is a priori reason to believe that death or disabling injury will occur.”³² Any research that destroys human life is also unethical under the World Health Organization Code of Ethics,³³ the Council of Europe’s Convention on Human Rights and Biomedicine,³⁴ and AMA’s Policy on Clinical Investigation.³⁵

Adult stem cells hold as much if not more promise than embryonic stem cells.

Underreported by the media, adult stem cell research has come a long way in the past decade.

- Researchers at the University of Minnesota discovered the ‘ultimate adult stem cell’ when cells taken from adult bone marrow were found to have the ability to turn into every type of tissue in the body (meaning they are pluripotent) and they were able to easily to extract them from 75 percent of donors. New techniques will increase this percentage.³⁶
- Umbilical cord blood and adult bone marrow can also provide therapeutically promising stem cells without sacrificing human beings. The



“At its core, this issue forces us to confront fundamental questions about the beginnings of life and the ends of science. It lives at a difficult moral intersection, juxtaposing the need to protect life in all its phases with the prospect of saving and improving life in all its stages....While we must devote enormous energy to conquering disease, it is equally important that we pay attention to the moral concerns raised by the new frontier of human embryo stem cell research. Even the most noble ends do not justify any means.”

—President George W. Bush,
August 9, 2001

scientific journal Nature Immunology recently reported that Canadian scientists have identified a way to make adult stem cells grow in the laboratory—a finding that could have immediate application for cancer treatments.³⁷

- Research with mice has shown their versatility in the ability to grow into heart, lung, intestine, kidney, liver, nervous tissue, and muscle.³⁸
- Bone marrow cells can become heart, brain, bone and kidney. Neural stem cells can become blood or retina. Research at the University of Florida revealed that pancreatic stem cells completely reversed diabetes in mice, while embryonic stem cells produced far less insulin than needed, consequently killing all the mice.³⁹
- A patient with Parkinson’s disease had a few hundred of his neural stem cell harvested and grown to millions in the lab. He had a 90 percent decrease in his symptoms after they were transplanted back in.
- Doctors in Germany recently infused eight patients who had heart attacks with their own stem cells. Follow-up revealed the size of their infarcts had been reduced and their cardiac function had improved.
- Embryonic stem cell research has major obstacles to overcome. Embryonic stem cells are difficult to culture and to control. A pure culture of cells that have differentiated into the tissue needed must be obtained. If embryonic stem cells remain, they can multiply uncontrollably when transplanted and turn into teratomas, a malignant cancer. Embryonic stem cell research has not moved outside the lab to work with patients because of these difficulties. The quickest road to real treatments for real people is with adult stem cells.
- Adult stem cells seem to take on the characteristic of the tissue they are placed in without extensive laboratory manipulation. Since they are taken from the patient that they are given back to, there is no transplant rejection and no risk of transferring viruses or genetic defects.



In order for embryonic stem cell research to work, it will require cloning.

Even if embryonic stem cell research results in beneficial therapies, a patient’s immune system will reject them. Therapy would be required with all its side effects, expense and risks. The only way to avoid this problem is to clone the patient using a donated egg. The clone would be grown using in-vitro fertilization techniques and the inner cell mass would be harvested for its stem cells. Those stem cells would be “engineered” in the lab into the tissue cells needed by the patient and then introduced into the patient. Therefore, instead of facing one ethical problem, embryonic stem cell therapy recipients would face two. Cloning is unethical and immoral in its own right. Will patients be willing to sacrifice their own embryonic identical twin to cure their own illness? Should we put public funding into research that a significant portion of the population will not access on moral grounds?

Embryo Adoption

It is estimated that 400,000 human embryos are currently in cryopreservation in the United States. When the genetic parents decide that their family is complete and embryos are still available, they are faced with a dilemma: donating their embryos to research, thawing them and letting them die, or donating them to a couple who is unable to conceive. Many believe that embryo donation and adoption is the most life-honoring solution to this difficult choice.

To that end, CMDA in 2003 worked with the Southeastern Fertility Center and Baptist Women’s Hospital in Knoxville, Tenn. to establish an embryo adoption program, the [National Embryo Adoption Center](#) (NEDC) ([read press release](#)). And in 2004, CMDA and the NEDC received \$304,000 from the U.S. Department

of Health and Human Services (HHS) for an embryo adoption awareness grant project. The project will help provide a life-honoring solution to destroying human embryos created through in-vitro fertilization ([read press release](#)).

[Nightlight Christian Adoption](#) is also a non-profit, licensed adoption agency located in California. Through its Snowflakes Program, Nightlight enables adoptive parents to adopt live human embryos that are being stored in fertilization clinics. These adoptions are performed with the consent of the genetic parents. Through its embryo adoption program, Nightlight has assisted many adoptive parents in successfully adopting and implanting these embryos, resulting in numerous births.

Ethical Alternatives to Stem Cell Research

Cord Blood Storage & Donation

Studies show that children who received cord blood transplants from siblings are less likely to reject the transplant than children receiving bone marrow.⁴⁰ You can protect your children now by storing cord blood or placenta from your newborn baby. You can also donate your baby's cord blood for other children who might need it and to ethical research on its stem cells. For a more complete analysis of cord blood storage and donation, go to www.parentsguidecordblood.com.

Cord blood banks:

Cord Blood Family Trust: www.cordbloodfamilytrust.com

Cord Blood Registry: www.cordblood.com

Viacord: www.viacord.com

CryoCell International: www.cryo-cell.com

CorCell: www.corcell.com

Life Bank USA: www.lifebankusa.com

California Cryobank Stem Cell Services: www.mycordblood.com
banc: www.stembanc.com

Cord Blood Donor Centers:

Carolinas Cord Blood Bank: www.cancer.duke.edu/CCBB/cordblood.asp

St. Louis Cord Blood Bank: www.slccb.org/

Stemcyte: www.stemcyte.com

New Jersey Cord Blood Bank: www.coriell.org/njccb/njcbbsumm.html

Listing of Cord Blood Banks in the National Marrow Donor Program:

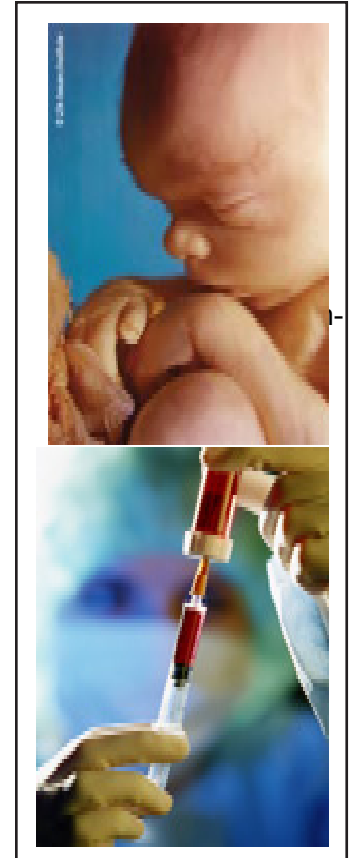
www.marlow.org/cgi-bin/NETWORK/nmdp_cord_blood_banks.pl

Cord blood donation FAQs from the National Marrow Donor Program:

www.marlow.org/FAQS/cord_blood_faqs.html

Cord Blood Donor.com

Cord Blood Donor.org



4. Resources

Christian Legal Society

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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

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