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CLONING AND STEM CELL RESEARCH

INTRODUCTION

"The primary question raised by the practice of embryonic stem cell research is whether it is morally defensible to disaggregate (and thus destroy) living human embryos in order to derive pluripotent cells for purposes of basic research that may someday yield regenerative therapies." O. Carter Snead, *Public Bioethics and the Bush Presidency*, 32 HARV. J.L. & PUB. POL'Y 867, 875 (2009). The American Center for Law and Justice (ACLJ) is committed to the sanctity of all human life and is opposed to cloning and *embryonic* stem cell research because of their fatal effects on human life. Though the scientific community has attempted to create a distinction between reproductive cloning and therapeutic cloning, in actuality all cloning is reproductive because all cloning results in the creation of a human embryo. The only difference is that in reproductive cloning, the embryo is implanted for the purpose of achieving a live birth and in therapeutic cloning, the embryo is killed for research. The destruction of human embryos required for embryonic stem cell research is morally wrong.

By contrast, adult, umbilical cord, and amniotic fluid stem cell research present promising opportunities for achieving the same medical goals, and do not result in the destruction of human life.

I. An Overview of Stem Cell Research and Cloning

A. Stem cell research

Many scientists believe that stem cell research can lead to significant medical breakthroughs, including cures for conditions such as heart disease, diabetes, and cancer. Stem cells have enormous potential because they are *pluripotent*;[1] they are able to grow into any cell found in the

[1] Embryonic stem cells are totipotent within the first four to five days after fertilization, at the zygote stage of embryonic development. Totipotency ("all") is the ability of a cell to give rise to any type of adult cell. A single totipotent cell, such as a zygote, has the ability to grow into any type of cell, including a full organism. Pluripotent

human body. There are two types of human stem cells: embryonic stem cells ("hESC") and adult stem cells (ASC).

Embryonic stem cells are derived from a five to six day old human embryo by removing pluripotent inner mass cells from an embryo at the blastocyst stage of development, a process which destroys the embryo. Adult stem cells, on the other hand, can be taken directly from a patient through sources such as skin, bone marrow, blood, the cornea and retina of the eye, the brain, skeletal muscle, the lining of the gastrointestinal tract, and the pancreas. Though a few clinical trials are pending, no human disease has been successfully treated with hESC since the successful isolation of hESCs in the 1990's. *Stem Cell Information, Frequently Asked Questions*, NAT'L INSTS. OF HEALTH, http://stemcells.nih.gov/ (Under "Frequently Asked Questions" follow "Can they cure diseases?" hyperlink) (last visited May 15, 2013).

Research on ASC, however, has yielded a number of successful treatments. *See, e.g.*, David A. Prentice, *Treatment with Adult Stem Cells*, LIFE ISSUES INST., http://www.lifeissues.org/cloningstemcell/adultstemsuccess.htm (last visited May 15, 2013) (compiling a list of articles from peer-reviewed scientific and medical journals detailing the successful treatment of diseases using ASC). By 2008, adult stem cells had been used to successfully treat antiphospholipid syndrome, scleroderma, multiple sclerosis, heart disease, cancers such as leukemia, multiple myeloma and neuroblastoma, and cerebral palsy. Adult stem cells have also been successfully used in regenerative procedures such as breast reconstruction and bone healing. *See* WILLIAM L. SAUNDERS ET AL., ADULT STEM CELL SUCCESS STORIES IN 2008 UPDATE: JANUARY–JUNE (2008), *available at http://www.frc.org/get.cfm?i=IS08G01#_ftnref1*.

Developments in treatment with ASC only continue to grow. In November, 2011, Swedish doctors successfully replaced the cancerous trachea of a Maryland man with a new, healthy trachea formed in a matter of days from ASC taken from the patient's own skin. Henry Fountain, *Synthetic Windpipe is Used to Replace Cancerous One*, N.Y. TIMES (Jan. 12, 2012), http://www.nytimes.com/2012/01/13/health/research/surgeons-transplant-synthetic-trachea-in-baltimore-man.html?_r=2. Dr. Yong Zhao from the University of Chicago released a study in January, 2012, that ASC therapy, utilizing stem cells from umbilical cord blood, can help to reverse Type I diabetes. *Stem Cell Therapy Reverses Diabetes*, BIOMED CENT. (Jan. 10, 2012), http://www.biomedcentral.com/presscenter/pressreleases/20120110.

B. Cloning

Human cloning is a subset of stem cell research and is also known as "somatic cell nuclear transfer." The scientific and political communities distinguish between two types of cloning: reproductive and therapeutic. Reproductive cloning attempts to result in a live birth, whereas therapeutic cloning is the creation of embryos that are permitted to live only for a brief period of time, usually to harvest hESC for research. The reality is, however, that all cloning is reproductive; it is merely the purpose of the cloned embryo that changes.

("many") cells, on the other hand, have the ability to grow into any type of adult cell but cannot alone develop into a whole organism. Embryonic stem cells removed from the blastocyst are pluripotent. *See generally* PRINCIPLES OF CLONING 110–13 (Jose Cibelli et al. eds.,).

> [T]here is absolutely no difference in the scientific techniques used to accomplish—or the embryonic human beings produced—via therapeutic cloning or the cloning of a human being for other purposes. The idea that an organism created by cloning is a new type of biological entity never before seen in nature is an attempt by scientists to hide the truth of this new technology behind scientific jargon. Instead of calling this cloned organism an embryo, which is precisely what it is, scientists have labeled it an activated egg. This is again manipulation of terminology with the hope of deceiving the public. In fact, the term "therapeutic cloning" itself is used to deceive the general public into believing that human cloning is acceptable and beneficial in certain medical circumstances.

Amy Coxon, *Therapeutic Cloning: An Oxymoron*, CTR. FOR BIOETHICS AND HUMAN DIGNITY (Mar. 13, 2001) (citations omitted), http://cbhd.org/content/therapeutic-cloning-oxymoron.

To create a clone, scientists take an egg from a female donor, remove the nucleus (containing half the chromosomes needed), and replace it with a nucleus from a mature human cell (containing all the chromosomes). A chemical or electrical impulse is then used to stimulate the egg to begin the growth process. Cloning result in a human embryo equipped with all the genetic information needed to direct its development through the various stages of human life.

Even scientists who are in favor of therapeutic cloning acknowledge that a cloned embryo is as much a human life as an embryo produced through the uniting of sperm and egg. In his testimony before the President's Council on Bioethics, Dr. John Gearhart, one of the scientists who discovered stem cells at Johns Hopkins, stated:

> [S]cientists are beginning to argue about what is an embryo and what isn't an embryo. . . . [M]y own personal feeling is that anything that you construct at this point in time that has the properties of those structures to me is an embryo, and we should not be changing vocabulary at this point in time. It doesn't change some of the ethical issues involved.

Session 1: Stem Cells 1: Medical Promise of Embryonic Stem Cell Research (Present and Projected), President's Council on Bioethics (Apr. 25, 2002), *available at* http://bioethics.georgetown.edu/pcbe/transcripts/apr02/apr25session1.html (testimony of Dr. John Gearhart). Additionally, the General Assembly of the United Nations has urged member states to "prohibit all forms of human cloning inasmuch as they are incompatible with human dignity and the protection of human life." Declaration on Human Cloning, G.A. Res. 59/280, U.N. Doc. A/RES/59/PV.82 (Mar. 8, 2005). Unsurprisingly, this Declaration received almost no media attention.

Cloning technology has also resulted in the attempt to create human-animal hybrids, or c*himeras*. Chimeras are created by mixing human genetic material with animal genetic material. In July, 2011, it was discovered that over 150 human-animal hybrid embryos had been secretly created in the United Kingdom. Daniel Martin and Simon Caldwell, *150 Human Animal Hybrids Grown in UK Labs: Embryos have been produced secretively for the past three years*, DAILY

MAIL (Jul. 22, 2011, 9:18 PM), http://www.dailymail.co.uk/sciencetech/article-2017818/Embryos-involving-genes-animals-mixed-humans-produced-secretively-past-years.html. In the United Kingdom, this research is permissible under the 2008 Human Fertilization Embryology Act. The discovery of the chimera research caused a firestorm of debate over the moral and ethical implications of mixing human and animal genes.

Though the federal government has not banned human-animal hybrids, several states have done so. In 2009, Louisiana was the first state to ban human-animal hybrids. The Louisiana statute makes it a crime to create or attempt to create a human-animal hybrid or to transfer or attempt to transfer a human embryo into a nonhuman womb or a nonhuman embryo into a human womb. LA. REV. STAT. ANN. § 14:89.6 (2012). Arizona has also banned human-animal hybrids. ARIZ. REV. STAT. ANN. § 36-2312 (2011).

In May of 2013, Dr. Shoukhrat Mitalipov and his team of researchers at Oregon Health and Science University successfully cloned human embryonic stem cells using a human egg and human skin cells. *See*, http://www.cell.com/fulltext/S0092-8674(13)00571-0 (last visited May 28, 2013). This method avoids the ethical issue of destroying human embryos to harvest stem cells. Because the embryonic stem cells are cloned from a specific person's skin cells, the scientists can create stem cells that are tailored to that specific person, eliminating the risk of rejection by the body.

II. A History Of Executive And Federal Legislative Action

Bioethical concerns with stem cell research and cloning first gained wide public attention in the 1990's. As a result, many legislators began advocating for laws that would regulate research and the use of public funds for that research. A national debate was launched as individuals and groups began to voice concerns about the ethical implications of scientific research on human embryos.

A. The Clinton Administration (1992–2000)

In 1993, Congress passed the National Institutes of Health (NIH) Revitalization Act, which "effectively ended [a] *de facto* moratorium on support of [in vitro fertilization] and other types of research involving human embryos." National Research Council, GUIDELINES FOR HUMAN EMBRYONIC STEM CELL RESEARCH 23 (2005). Through the creation of a Human Embryo Research Panel, the NIH attempted to develop standards for determining what research was ethical, and thus deserving of federal funding, and what research was unethical. *Id.* In response to the NIH's actions, President Clinton created a National Bioethics Advisory Commission to investigate and advise him "on complex bioethical issues that affect our society."[2] *Statement of the President*, THE WHITE HOUSE (Dec. 2, 1994), http://clinton6.nara.gov/1994/12/1994-12-02-president-on-nih-and-human-embryo-research.html. In announcing the creation of the

[2] For nearly forty years, Congress and United States Presidents have used various types of commissions for advisement on ethical issues presented by science, medicine and technology. Beginning with President Clinton, every United States president has formed a bioethics commission upon taking office. *See History of Bioethics Commissions*, PRESIDENTIAL COMMISSION FOR THE STUDY OF BIOETHICAL ISSUES, http://bioethics.gov/history (last visited May 29, 2013).

Commission, President Clinton stated, "I do not believe that federal funds should be used to support the creation of human embryos for research proposes, and I have directed that NIH not allocate any resources for such research." *Id.*

In 1996, Congress passed the Dickey-Wicker Amendment as part of the Health and Human Services Appropriations Legislation. The rider prohibited the use of public funds for research that would create embryos solely for the purpose of research and has been included in every Labor, Health and Human Services, and Education appropriations act since 1996. The original rider stated:

> None of the funds made available by Public Law 104-91 may be used for—
> (1) the creation of a human embryo or embryos for research purposes; or
> (2) research in which a human embryo or embryos are destroyed, discarded, or knowingly subjected to risk of injury or death greater than that allowed for research on fetuses in utero under 45 CFR 46.208(a)(2) and 42 U.S.C. 289g(b).
>
> For the purposes of this section, the phrase "human embryo or embryos" shall include any organism, not protected as a human subject under 45 CFR 46 as of the date of enactment of this Act, that is derived by fertilization, parthenogenesis, cloning, or any other means from one or more human gametes.

Balanced Budget Downpayment Act, I, Pub. L. No. 104-99, § 128, 119 Stat. 26 (1996).

B. The Bush Administration (2001–2008)

The debate over cloning and embryonic stem cell research was at its zenith during the Bush administration. Before September 11, 2001, the debate was receiving more news coverage than almost any other political or popular science issue. President Bush made a concerted effort to restrict embryonic stem cell research and focus on alternative ethical methods of stem cell research that were as, if not more, promising.

In July of 2001, two bills seeking to restrict human cloning were introduced in the House of Representatives. The first was the Weldon Bill, which banned all human cloning. Human Cloning Prohibition Act of 2001, H.R. 2505, 107th Cong. (2001). The Senate, however, did not vote on the bill. The second bill, the Greenwood Bill, sought to ban all reproductive cloning and allow therapeutic cloning, but it was defeated in the House. Cloning Prohibition Act of 2001, H.R. 2172, 107th Cong. (2001). The Weldon Bill was reintroduced in 2003 and passed the House by a vote of 241 to 155, but once again failed to pass the Senate. Human Cloning Prohibition Act of 2003, H.R. 534, 108th Cong. (2003).[3]

[3] Over the course of President Bush's term in office, many other bills were introduced in the House of Representatives and the Senate attempting to ban cloning in part or in whole. Most of these bills, however, never made it to a vote. *See, e.g.*, Human Cloning Research Prohibition Act, H.R. 222, 109th Cong. (2005); Human Cloning Prohibition Act of 2005, H.R. 1357, 109th Cong. (2005); Human Cloning Ban and Stem Cell Research Protection Act of 2005, S. 876, 109th Cong. (2005); Human Cloning Ban Act of 2005, S. 1520, 109th Cong. (2005).

In November of 2001, President Bush created the President's Council on Bioethics (Council). Exec. Order No. 13,237, 66 Fed. Reg. 59,851 (Nov. 28, 2001). The Council was created to "advise the President on bioethical issues that may emerge as a consequence of advances in biomedical science and technology." *Id.* The Council, made up of seventeen members, met regularly over the eight years of President Bush's time in office and focused much of its attention on "the issues of embryonic stem cell research and related topics," including cloning. O. Carter Snead, *Public Bioethics and the Bush Presidency*, 32 HARV. J.L. & PUB. POL'Y 867, 884 (2009).

As legislative battles continued in Congress, the President's Council evaluated the ethical perils of embryonic stem cell research and the viability of alternatives that would advance biomedical science as effectively. In 2005, the Council released a white paper entitled "Alternative Sources of Pluripotent Stem Cells," which explored the ethical, scientific, and practical aspects of the four main methods of deriving stem cells:

> (1) by extracting cells from embryos already dead; or (2) by nonharmful biopsy of living embryos; or (3) by extracting cells from artificially created non-embryonic but embryo-like cellular systems (engineered to lack the essential elements of embryogenesis but still capable of some cell division and growth); or (4) by dedifferentiation of somatic cells back to pluripotency.

THE PRESIDENT'S COUNCIL ON BIOETHICS, ALTERNATIVE SOURCES OF HUMAN PLURIPOTENT STEM CELLS 3 (2005). The Council provisionally concluded that the first method, research on embryonic cells already dead, is acceptable, though it raises some serious ethical questions. *Id.* at 58. The second and third methods are unacceptable because of the experimentation on live members of the human species. *Id.* at 58–59. The final method is acceptable so long as a line can be maintained between pluripotency and totipotency.[4] *Id.* at 59.

On July 18, 2006, Congress passed a bill that allowed for research with federal funding on human embryonic stem cells provided that they were created in the course of fertility treatment and were then donated by couples after completing their IVF treatment. Stem Cell Research Enhancement Act of 2005, H.R. 810, 108th Cong. (2006). President Bush, however, vetoed the bill the very next day, and Congress was unable to garner the requisite two-thirds vote to override the veto. In his response to Congress, President Bush stated:

> Like all Americans, I believe our Nation must vigorously pursue the tremendous possibilities that science offers to cure disease and improve the lives of millions. Yet, as science brings us ever closer to unlocking the secrets of human biology, it also offers temptations to manipulate human life and violate human dignity. Our conscience and history as a Nation demand that we resist this temptation. With the right scientific techniques and the right policies, we can achieve scientific progress while living up to our ethical responsibilities.

Message to the House of Representatives Returning Without Approval the "Stem Cell Research Enhancement Act of 2005," 42 WEEKLY COMP. PRES. DOC. 1365 (July 19, 2006). He concluded, "If we are to find the right ways to advance ethical medical research, we must also be willing

[4] See *supra* note 1 for an explanation of the difference between totipotency and pluripotency.

when necessary to reject the wrong ways." *Id.* Two years later, Congress passed a similar bill that President Bush again vetoed. Stem Cell Research Enhancement Act of 2007, S. 5, 110th Cong. (2007).

In 2007, President Bush took another step to encourage the development of non-embryonic stem cell research by directing the Secretary of Health and Human Services to create and implement a plan to explore alternative and ethically responsible techniques "so that the potential of pluripotent stem cells can be explored without violating human dignity or demeaning human life." Exec. Order No. 13,435, 72 Fed. Reg. 34,591 (June 20, 2007). The Order required the Secretary to:

> [C]onduct and support research on the isolation, derivation, production, and testing of stem cells that are capable of producing all or almost all of the cell types of the developing body and may result in improved understanding of or treatments for diseases and other adverse health conditions, but are derived without creating a human embryo for research purposes or destroying, discarding, or subjecting to harm a human embryo or fetus.

Id. at § 1(a).

Just a few months later, James Thomson published a groundbreaking article, *Induced Pluripotent Stem Cell Lines Derived from Human Somatic Cells*, detailing a method for creating stem cells from human skin cells. 318 SCI. MAG. 1917 (Dec. 21, 2007). The method was so successful that it was named "Scientific Breakthrough of the Year." Gretchen Vogel, *Breakthrough of the Year: Reprogramming Cells*, 332 SCI. MAG. 1766 (Dec. 19 2008). After Dr. Thomson's discovery, the public debate about stem cell research quieted down significantly. Though research on embryonic stem cells unfortunately continued, researchers could no longer argue that embryonic stem cells were the only viable avenue of research, and the political value of endorsing embryonic stem cell research faded. *See generally* Joseph Bottum and Ryan T. Anderson, *Stem Cells: A Political History*, FIRST THINGS, Nov. 2008, at 15.

C. The Obama Administration (2009–present)

One of President Obama's first acts was to repeal President Bush's 2001 and 2007 Executive Orders. Exec. Order No. 13,505, 74 Fed. Reg. 10,667, § 5 (Mar. 9, 2009). President Obama's order permitted the NIH to "support and conduct responsible, scientifically worthy human stem cell research, including human embryonic stem cell research, to the extent permitted by law." *Id.* at § 2.

To implement President Obama's Executive Order, the NIH issued new guidelines to regulate the flow of federal funds for stem cell research through the NIH. National Institutes of Health Guidelines for Human Stem Cell Research, 74 Fed. Reg. 32,170 (effective July 7, 2009). The Guidelines created a registry listing all human embryonic stem cells that are eligible for use in NIH funded research. *Id.* at 32,175. While the use of federal funds for cloning and animal-human hybrids is still prohibited, the Guidelines open the door to federal funding for research on embryos originally created for fertility treatments that are no longer wanted by the parents and

are donated for research. *Id.* The Guidelines recognize that the Dickey-Wicker Amendment still prohibits the creation of embryos solely for the purpose of research. Applications may be made to NIH for approval of new embryonic stem cell lines for research. *See First Human Embryonic Stem Cells Approved for use under the NIH Guidelines for Human Stem Cell Research*, NAT'L INSTS. OF HEALTH (Dec. 2, 2009), http://grants.nih.gov/grants/guide/notice-files/NOT-OD-10-020.html; *Clarification of Terms and Conditions of Awards using Human Embryonic Stem Cells*, NAT'L INSTS. OF HEALTH (Dec. 14, 2009), http://grants.nih.gov/grants/guide/notice-files/not-od-10-029.html. Since President Obama's order, research on over 200 lines of embryonic stem cells have been approved to receive federal funding, with many more in line awaiting approval. *NIH Human Embryonic Stem Cell Registry*, U.S. DEP'T OF HEALTH AND HUMAN SERVS., http://grants.nih.gov/stem_cells/registry/current.htm (last visited May 16, 2013)

After the promulgation of the 2009 Guidelines, two scientists, Dr. James Sherley and Dr. Theresa Deisher, brought suit to enjoin the NIH from implementing the Guidelines on the grounds that they violated the Dickey-Wicker Amendment's prohibition on the use of federal funding in research that results in the destruction of embryos. Although the case was tied up in litigation for two years, the Court of Appeals for the District of Columbia ultimately held that NIH had reasonably interpreted the Dickey-Wicker Amendment, and dismissed the Plaintiffs' Complaint. *Sherley v. Sebelius*, 689 F.3d 776 (D.C. Cir. 2012). The Supreme Court of the United States denied review of the case. *Sherley v. Sibelius*, 133 S. Ct. 847 (2013).

III. State Legislative Action

Though Congress has failed to ban cloning or embryonic stem cell research on the federal level, many state legislatures have taken action to restrict unethical scientific research and to promote promising alternatives.

A. Cloning

Currently, eight states had legislation banning any kind of human cloning (Arkansas, Illinois, Indiana, Michigan, North Dakota, Oklahoma, South Dakota, and Virginia).[5] Nine states permit therapeutic cloning but ban reproductive cloning (California, Connecticut, Iowa, Maryland, Massachusetts, Missouri, Montana, New Jersey, and Rhode Island).[6] Missouri prohibits public funding of cloning, MO. REV. STAT. § 1.217, and has amended its constitution to prohibit reproductive cloning and protect therapeutic cloning. MO. CONST. art. III, § 38(d) (2011). New Jersey prohibits reproductive cloning, N.J. STAT. ANN. § 2C:11A-1 (2012), but specifically

[5] ARK. CODE Ann. § 20-16-1002 (2012); 410 ILL. COMP. STAT. 110/1–50 (2012); IND. CODE § 16-34.5-1-2 (2012) (prohibiting use of public funds), IND. CODE § 35-46-5-2 (2012) (prohibiting cloning); MICH. COMP. LAWS SERV. § 333.16274 (2012); N.D. CENT. CODE § 12.1-39-02 (2011); OKLA. STAT. tit. 63, § 1-270.2(B)(3) (2012) (permitting stem cell research but prohibiting the use of cloned embryos), OKLA. STAT. tit. 63, § 1-727 (2012) (prohibiting cloning); S.D. CODIFIED LAWS § 34-14-27 (2011); VA. CODE ANN. § 32.1-162.22 (2012).

[6] CAL. HEALTH & SAFETY CODE § 24185 (Deering 2012); CONN. GEN. STAT. § 19a-32d (2011); IOWA CODE § 707C.3 (2011); MD. CODE ANN. ECON. DEV. § 10-429(f) (LexisNexis 2011); MASS. ANN. LAWS ch. 111L, § 8 (LexisNexis 2011); MO. REV. STAT. § 1.217 (2011) (prohibiting the use of public funds), MO. CONST. art. III, § 38(d) (2011) (constitutionally prohibiting reproductive cloning and protecting therapeutic cloning); MONT. CODE ANN. § 50-11-102 (2011); N.J. STAT. ANN. § 2C:11A-1 (2012); R.I. GEN. LAWS § 23-16.4-1 to 2 (2012).

permits cultivation, experimentation, and destruction of cloned embryos for research, subject to review by an institutional review board, N.J. STAT. ANN. § 26:2Z-2 (2012).

Two states prohibit the public funding of human cloning but allow human cloning to take place when privately funded (Arizona and Louisiana).[7] Though Louisiana does not specifically prohibit cloning, it does provide strict protections for in vitro viable fertilized humans by prohibiting the use of in vitro fertilized ova for anything but achieving pregnancy and recognizing an in vitro fertilized ovum as a juridical person. LA. REV. STAT. ANN. § 9:122 to 23 (2012).

In addition to cloning, some states have begun initiatives to ban human-animal hybrids. States such as Arizona, ARIZ. REV. STAT. ANN. § 36-2312 (2011), and Louisiana, LA. REV. STAT. ANN. § 14:89.6 (2012), have made the creation of human-animal hybrids a crime.

B. Stem cell research

Most states have not passed legislation regarding stem cell research. In Arizona, it is a felony to conduct research that results in the destruction of human embryos. ARIZ. REV. STAT. ANN. § 36-2313 (2011). Nebraska prohibits state funding of research which results in the destruction of embryos. NEB. REV. STAT. ANN. § 71-8806 (2012). In a fashion similar to federal law during the time of President Bush's administration, Oklahoma restricts legal embryonic stem cell research to lines derived before August 1, 2001. OKLA. STAT. tit. 63 § 1-270.2(B)(2) (2012). Finally, Virginia has a state-established research fund to support stem cell research, but funding may not be provided to research using embryonic stem cells. VA. CODE ANN § 23-286.1 (2012).

C. Alternative methods

Cord blood and tissue, taken from the umbilical cord and placenta after the birth of a baby, are excellent sources of stem cells. *FAQs: Research and Innovation*, Cord Blood Registry, http://www.cordblood.com/en/stem-cell-research/cord-blood-research-questions#question8 (last visited May 28, 2013). The blood can also be used in place of bone marrow for stem cell transplantation and it provides greater probability of a match between donor and patient. *Comparison Between Bone Marrow or Peripheral Blood Stem Cells and Cord Blood Donated for Transplantation*, NAT'L CORD BLOOD PROGRAM, http://www.nationalcordbloodprogram.org/qa/comparison.html (last visited May 28, 2013). Cord blood has been used to treat dozens of diseases, including various types of lymphoma, leukemia, and bone marrow failure syndromes. *Diagnosis for Transplantation with NYBC CB Units*, NAT'L CORD BLOOD PROGRAM, http://www.nationalcordbloodprogram.org/downloads/list_of_diseases.pdf (last visited May 28, 2013).

In 2005, Congress passed the Stem Cell Therapeutic and Research Act, a national initiative to encourage and support cord blood banking for future treatments and research through a national network. Stem Cell Therapeutic and Research Act of 2005, Pub. L. No. 109-129, 119 Stat. 2550. In addition to the national initiative, many states have provided for umbilical cord blood banks

[7] ARIZ. REV. STAT. ANN. § 35-196.04 (2011); LA. REV. STAT. ANN. § 40:1299.36 (2012).

and are encouraging use of these banks as a matter of public policy, in some cases specifically to discourage embryonic stem cell research. *See, e.g.*, ARK. CODE ANN. § 20-8-502 (2012). As many as twenty-six states have encouraged or required health care providers to provide patients with information about banking or have provided in some way for a public initiative promoting cord blood banking.[8]

[8] ARIZ. REV. STAT. ANN. § 32-3212 (2011); ARK. CODE ANN. §§ 20-8-501 to 506 (2012); CAL. HEALTH & SAFETY CODE § 1627 (Deering 2012); COLO. REV. STAT. §§ 25-40-101 to 104 (2011); CONN. GEN. STAT. §§ 19a-32o to 19a-32v (2012); FLA. STAT. § 381.06015–16 (2012); GA. CODE ANN. § 31-46-3(b) (2011); 20 ILL. COMP. STAT. §§ 2310/2310-342, 577 (2012); IND. CODE § 12-31-1-3 (2012); KAN. STAT. ANN. § 65-1,249 (2011); LA. REV. STAT. ANN. § 46:2881–82 (2012); MD. CODE ANN. HEALTH–GEN. § 19-308.7 (2012); MASS. GEN. LAWS ch. 111L § 5 (2011); MICH. COMP. LAWS § 333.2682 (2012); MO. CODE REGS. ANN. tit. 12, § 191.755 (2012); N.J. REV. STAT. § 26:2H-12.46 (2012); N.M. STAT. ANN. § 24-27-4 (LexisNexis 2012); N.C. GEN. STAT. § 130A-128.1 (2012); N.D. CENT. CODE § 130A-128.1 (2011); OHIO REV. CODE ANN. § 2108.62 (2012); OKLA. STAT. tit. 62 § 2175 (2012); R.I. GEN. LAWS § 23-83-3 (2012); TENN. CODE ANN. § 68-32-105 (2012); TEX. HEALTH & SAFETY CODE ANN. § 162.018 (2012); VA. CODE ANN. § 32.1-69.3 (2012); WASH. REV. CODE § 70.54.220 (2012).