
ARTICLE

THE FEAR OF DRAWING THE LINE AT CLONING

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I. INTRODUCTION

In 1997, Ian Wilmut announced the successful asexual reproduction of a sheep (named Dolly) using a method known as cloning.¹ The announcement spawned scientific, popular, legal, and political interest and debate. The scientific community reviewed Wilmut's work and strove to reproduce it and

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¹ I. Wilmut et al., *Viable offspring derived from fetal and adult mammalian cells*, 385 NATURE 810 (1997).

extend it to other species.² Politicians took notice and debated appropriate responses to cloning. The Food and Drug Administration (FDA) claimed that it had regulatory power over the development of cloning techniques when applied to human DNA.³ President Clinton tasked the National Bioethics Advisory Counsel (NBAC) to study human cloning and to recommend a course of governmental action.⁴ One conclusion of the report was that the issues cloning raises were not yet understood well enough to justify either federal support for or permanent proscription of human cloning research.⁵ President Bush's position, on the other hand, is clear: He supports a complete ban on cloning because he believes "all human cloning is wrong."⁶

Full appreciation of the issues surrounding the regulation of cloning requires an understanding of the science of cloning. That understanding can moderate the emotional response to cloning by describing how cloning and human development occur.⁷ Once one understands the science of cloning and its possibilities, then legal⁸ and ethical⁹ issues can be addressed in the rational framework required for adequate analysis of an issue as complicated as human cloning. A holistic analysis that recognizes the importance of the emotional response to cloning and the scientific implications of both cloning and human development can lead to a regulatory structure that protects and respects the potential for human life once that potential has sufficiently manifested.¹⁰

² *E.g.*, X. Cindy Tian et al., *Normal telomere lengths found in cloned cattle*, 26 NATURE GENETICS 272, 272-73 (2000).

³ See Richard A. Merrill & Bryan J. Rose, *FDA Regulation of Human Cloning: Usurpation or Statesmanship?*, 15 HARV. J. L. & TECH. 85, 87 (2001).

⁴ *Cloning Human Beings Report and Recommendations of the Nat'l Bioethics Advisory Comm'n* (1997), at <http://www.georgetown.edu/research/nrcb/nbac/pubs/cloning1/cloning.pdf>.

⁵ *Cloning Human Beings Report and Recommendations of the Nat'l Bioethics Advisory Comm'n, Executive Summary*, 1 (1997), at <http://bioethics.georgetown.edu/nbac/pubs/cloning1/executive.htm>. See also Clarke D. Forsythe, *Human Cloning and the Constitution*, 32 VAL. U. L. REV. 469, 470 (1998).

⁶ George W. Bush, *President Bush Calls on Senate to Back Human Cloning Ban, Remarks by the President on Human Cloning Legislation* (Apr. 10, 2002), at <http://www.whitehouse.gov/news/releases/2002/04/20020410-4.html>; see also Ari Fleischer, *Press Briefing by Ari Fleischer* (Nov. 6, 2002) (responding to the election results that gave the Republicans control of Congress by including a ban on cloning in the list of issues still of interest to the President), at <http://www.whitehouse.gov/news/releases/2002/11/20021106-1.html>.

⁷ See, *e.g.*, *infra* text accompanying notes 11-40 (synthesizing basics of cloning and developmental biology to draw a line after which a cloned embryo should be protected).

⁸ See *infra* text accompanying notes 41-134.

⁹ See *infra* text accompanying notes 135-200.

¹⁰ See *infra* text accompanying notes 174-76.

II. THE SCIENCE OF CLONING

One function of live cells is to reproduce.¹¹ Understanding cellular reproduction and the role DNA plays in it is central to understanding cloning. Focusing on the DNA is important because it is the “instruction set” that directs a cell’s functions and most organisms originating from sexual reproduction have unique DNA.¹² Most cells have their DNA organized into structures called chromosomes.¹³ These cells reproduce by duplicating their chromosomes, then assigning one copy to each of two resulting cells.¹⁴ The resulting cells are virtually identical because they have the same DNA within their chromosomes.¹⁵ Cellular reproduction begins with the very first cell that starts the life of an organism. So, every cell of an organism has virtually the same DNA. Because the organism itself resulted from this process, in principle, one can reproduce an entire second organism genetically identical to the first by isolating almost any of the cells from an existing organism and inducing it to repeat the process. This type of reproduction is a form of cloning. It is fundamentally different from sexual reproduction, which creates offspring genetically different from their progenitors.

One hurdle in cloning a second organism from a mature original organism is that the function of most cells in most organisms is determined very shortly after the single-cell start of that organism’s life.¹⁶ Once a cell’s function is determined, it can be changed only with great difficulty, if at all. Thus, a muscle cell (and its DNA) generally can produce only more muscle cells, not for example, skin cells. Although the DNA contained in a cell describes how to create all the different kinds of cells in the organism, that cell generally cannot create any of those other types of cells. Only if this limitation is overcome can cloning succeed.

Early in the life of an organism, some cells, called embryonic stem cells, do not have this limitation. From shortly after a human egg is fertilized until about the time the resulting embryo implants at day five,¹⁷ embryonic stem cells have the potential to become almost any kind of cell found in an

¹¹ PETER H. RAVEN & GEORGE B. JOHNSON, *BIOLOGY* 203 fig. 10-1 (3d ed. 1995) (“All reproduction of organisms depends on the reproduction of cells.”).

¹² See National Center For Biotechnology Information, *Gene Expression*, available at <http://www.ncbi.nlm.nih.gov/Class/NAWBIS/Modules/GeneExpressionVariation/varexp48.html> (last revised July 29, 2002).

¹³ See RAVEN & JOHNSON, *supra* note 11, at 205.

¹⁴ See *id.* at 214.

¹⁵ *Id.* at 213.

¹⁶ See *id.* at 1167.

¹⁷ See Forsythe, *supra* note 5, at 473.

independent human being.¹⁸ The process whereby these embryonic stem cells develop into specific kinds of cells is called differentiation.¹⁹

Generating an independent organism from a differentiated cell requires both reversing the differentiation of that cell and then inducing it to produce the new, differentiated cells of a complete organism. In creating Dolly through cloning, Wilmut reversed differentiation by reducing the nutrients he supplied to differentiated cells that he had extracted from an adult sheep.²⁰ These cells were still alive, but because they were starved of nutrients, they were quiescent, no longer in the growth cycle, no longer reproducing into differentiated cells.²¹ Wilmut then used the egg of another sheep to induce differentiation: He extracted the DNA from these starved cells and fused it within an enucleated egg²² from another sheep.²³ The egg provided the machinery that the DNA needed to replicate and differentiate so that it could become a viable organism. Since Dolly's birth, other scientists have used this method, called somatic²⁴ cell nuclear transplantation,²⁵ to successfully clone pigs, cattle, goats, cats, mice, and monkeys.²⁶

These experiments have highlighted some of the problems with the science of cloning. For example, the success rate for producing viable cloned offspring in many experiments is small: In Wilmut's initial work, Dolly was the only successfully cloned organism out of 277 implanted eggs.²⁷ Another problem involves the "genetic age" of an organism. Chromosomes degrade over an organism's life. So, an organism cloned from a mature individual may start life with degraded chromosomes, and if aging is related to chromosome degradation, these clones may have shortened lives or health problems associated with old age.²⁸ A further troublesome result from cloning research

¹⁸ Shirley J. Wright, *Human Embryonic Stem-cell Research: Science and Ethics*, 87 AM. SCIENTIST 352 (1999).

¹⁹ RAVEN & JOHNSON, *supra* note 12, at G-7.

²⁰ Wilmut, *supra* note 1, at 812-13.

²¹ *Id.* at 812.

²² An egg cell with its DNA removed.

²³ Wilmut, *supra* note 1, at 813.

²⁴ All non-germ cells from an adult organism are somatic cells and are already differentiated.

²⁵ Other terms used interchangeably with "transplantation" include "transfer" and "replacement."

²⁶ *E.g.*, Taeyoung Shin, et al., *A cat cloned by nuclear transplantation*, 415 NATURE 859 (2002); Merrill & Rose, *supra* note 3, at 96.

²⁷ Wilmut, *supra* note 1, at 811. *But see* Robert P. Lanza et al., *Cloned Cattle Can Be Healthy and Normal*, 294 SCI. 1893 (2001) (claiming a much higher success rate in a later cloning experiment).

²⁸ *See* Lori Andrews, *Is There a Right to Clone: Constitutional Challenges to Bans on Human Cloning*, 11 HARV. J.L. & TECH. 643, 650 (1998). *But see* Tian et al., *supra* note 2, at 272 (describing their results showing that chromosomes elongate back to appropriate

is the observation of negative characteristics found in some cloned offspring. One study found that cloned mice tend to be obese, although their own sexually reproduced offspring do not.²⁹ Other studies have found that some cloned offspring have organ deformities and shorter life spans.³⁰ Dolly may exemplify some of these concerns as she was put to sleep at the relative young calendar age of six because of health problems often associated with advanced aging.³¹

Against these and other concerns, stand the benefits that somatic cell nuclear transplantation could provide.³² Potential applications for it in humans include not only reproduction (procreative cloning) but also disease treatment (therapeutic cloning). Many diseases result from the destruction of healthy cells, tissues, or organs: for example, Parkinson's (neurons), Alzheimer's (neurons), heart disease (cardiac muscles), and emphysema (lungs).³³ Somatic cell nuclear transplantation has the potential to combat these diseases by creating embryonic stem cells from the patient's own DNA. The patient's doctor could induce these cells to differentiate into the cells, tissues, or organs needed to effectively treat the patient. Treatment of this sort would be especially valuable because it would consist of material cloned from the patient's own DNA, which might reduce or eliminate immune response problems.³⁴

Debate about the application of cloning technology to humans is no longer entirely academic. Advanced Cell Technology, a privately held company in Worcester, Massachusetts, has announced that in their development of therapeutic cloning, they have created a cloned human embryo that progressed to the six-cell stage.³⁵ Italian gynecologist Severino Antinori claims he is caring for a woman pregnant with a cloned embryo.³⁶ A group called Clonaid

lengths during cloning in contrast to other results that showed cloned animals with shortened chromosomes).

²⁹ See Narumi Ogonuki et al., *Early death of mice cloned from somatic cells*, 30 NATURE GENETICS 253, 254 (2002).

³⁰ See Andrews, *supra* note 28, at 652; but see generally Lanza, *supra* note 27, at 1893.

³¹ See Jane Wardell, *Goodbye Dolly: The World's First Cloned Mammal is Put Down*, abcnews.com (Feb. 14, 2002), at <http://abcnews.go.com/sections/scitech/DailyNews/dolly030214.html> (last visited Feb. 19, 2002).

³² See *infra* notes 120-182 and accompanying text.

³³ See Wright, *supra* note 13 at 359.

³⁴ See Carol Ezzell, *Stem Cell Showstopper?*, SCI. AM., Dec. 16, 2001, at 27 (describing how cloning may be the only feasible method for using stem cells therapeutically).

³⁵ Jose B. Cibelli et al., *The First Human Cloned Embryo*, SCI. AM., Nov. 24, 2001, at 45.

³⁶ See Paul Lesko & Kevin Buckley, *Attack of the Clones . . . and the Issues of Clones*, 3 COLUM. SCIENCE AND TECHNOLOGY L. REV. 1 (May 10, 2002) (citing Abu Dhabi & Kavitha S. Daniel, *Human cloning project claims progress*, GULF NEWS, ONLINE EDITION, at <http://www.gulf-news.com/Articles/print.asp?ArticleID=46275>) (April 3, 2002). But cf. Alison Abbott, *Disbelief greets claim for creation of first human clone*, 416 NATURE 570 (2002) (documenting skepticism about the claim).

claims that a woman in their care has given birth to a human clone.³⁷ Authors,³⁸ government agencies, scholars, legislators,³⁹ theologians,⁴⁰ and the media have analyzed issues stemming from cloning technology for years. The time to address and act on the legal, ethical, and moral questions inherent in these (and other) applications of cloning is upon us.

III. CONSTITUTIONAL ISSUES FACING THE REGULATION OF HUMAN CLONING

The Constitution grants and sets boundaries for legislative power. Under the Commerce Clause, Congress probably has the power to regulate cloning.⁴¹ Courts limit congressional power under the Commerce Clause by balancing the importance of the governmental interest a regulation would promote against the extent the regulation would infringe on an individual's constitutionally protected rights.⁴² Because the governmental interest in protecting potentially viable human embryos is probably stronger than the rights associated with cloning (such as the right to scientific experimentation and the right to procreate), regulation and perhaps even prohibition of reproductive cloning would likely pass judicial scrutiny.⁴³ Legislative regulation or ban of therapeutic cloning presents a more difficult constitutional question because the government's interest in protecting non-viable embryos may not outweigh the rights associated with cloning.⁴⁴

A. Congressional Regulation of Cloning under the Commerce Clause

The Commerce Clause likely gives Congress the power to regulate cloning. Congress has authority under the Commerce Clause to regulate three broad categories of activity: (1) instrumentalities of interstate commerce, (2) use of the channels of interstate commerce, and (3) activities that substantially affect interstate commerce.⁴⁵ The second and third categories can justify congressional regulation of cloning. Cloning technology uses resources from

³⁷ *Where's the Proof: Experts Wait for Scientific Evidence of Cloned Baby Claim*, abcnews.com, available at <http://abcnews.go.com/sections/scitech/DailyNews/clonedbabyreax021227.html> (Dec. 27, 2002) (stating many experts believe that without proof Clonaid's claim is nothing more than hype).

³⁸ *E.g.*, ALDOUS HUXLEY, *BRAVE NEW WORLD* (1932) (envisioning a society where people are grown in laboratory incubators and cloned to fit predetermined specifications).

³⁹ *See e.g.*, Forsythe, *supra* note 5, at 470.

⁴⁰ *E.g.*, Duncan J. Dormor, *Reflections on Prospero: Questions in Theology with Respect to Cloning*, 6 HUMAN REPRODUCTION AND GENETIC ETHICS, 4 (2000).

⁴¹ *See infra* text accompanying notes 42-45.

⁴² *See* *Red Lion Broadcasting v. FCC*, 395 U.S. 367, 367-68 (1969) (balancing television and radio stations' First Amendment rights to decide what to broadcast against Congress's interest in enhancing the public's access to information).

⁴³ *See infra* text accompanying notes 41-134.

⁴⁴ *See infra* text accompanying notes 41-134.

⁴⁵ *E.g.*, *United States v. Lopez*, 514 U.S. 549, 558-59 (1995).

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across the country and across the world: Reagents, instrumentation, and medicines required for cloning experiments are not all likely to come from the state in which a laboratory is located.⁴⁶ In addition, because at least initially, only very few facilities will achieve successful results with cloning (procreative or therapeutic), many people will have to cross state borders to receive the benefits of either reproductive or therapeutic cloning.⁴⁷ Cloning experimentation will therefore have a substantial impact on interstate travel. Under two of the three prongs of Commerce Clause jurisprudence, Congress has the power to regulate cloning. Whether that regulation will withstand constitutional attack as an infringement of protected individual rights depends on the strength of the governmental interest promoted by the regulation.

B. Governmental Interests Relevant to Regulation of Cloning

Development of both therapeutic and procreative cloning using human DNA will likely entail experimentation on human embryos. The Supreme Court has recognized that legislatures have an “important and legitimate interest in protecting the potentiality of human life.”⁴⁸ The Court has also recognized protection and preservation of human life⁴⁹ and maintenance of medical standards as legitimate governmental interests.⁵⁰ Commentators have suggested other potential interests relevant to cloning regulation such as maintaining the ethical integrity of the medical profession⁵¹ and protecting the evolutionary process.⁵²

These interests all have bearing on the regulation of human cloning. Because development of human cloning will involve experimentation on human embryos, which have at least the potential for human life, Congress has an important and legitimate interest in it. Because both therapeutic and procreative human cloning will entail medical procedures on humans, a governmental interest in them may exist for maintenance of both medical standards and the profession’s ethical integrity. Because cloning ultimately represents the end to the evolutionary process, Congress may decide to restrict its scope.

Of all these interests, protection of the human embryo may be the most important to regulation of human cloning. The Supreme Court has already indicated the importance of protecting embryos by holding that interest to be compelling when the fetus reaches viability, in many instances overriding a

⁴⁶ See Andrews, *supra* note 28, at 673-74.

⁴⁷ See *id.* at 674.

⁴⁸ Roe v. Wade, 410 U.S. 113, 162 (1973).

⁴⁹ E.g., Cruzan v. Mo. Dep’t of Health, 497 U.S. 261, 280 (1989)

⁵⁰ Carey v. Population Serv. Int’l, 431 U.S. 678, 690 (1977).

⁵¹ E.g., June Coleman, Comment, *Playing God or Playing Scientist: A Constitutional Analysis of State Laws Banning Embryological Procedures*, 27 PAC. L.J. 1331, 1373 (1996).

⁵² E.g., *id.* at 1381.

woman's choice to have an abortion.⁵³ A regulation controlling and even prohibiting human cloning for the protection of human embryos is likely to withstand a constitutional challenge from all but the most highly protected constitutional rights, but as in abortion jurisprudence, the result of the balancing of these issues likely depends on the state of the embryo's development.

C. Cloning and the Constitutional Protection of Scientific Inquiry

A right to scientific inquiry could protect the development of both therapeutic and procreative cloning against government regulation. Either the First Amendment or the Due Process Clauses might protect scientific inquiry.⁵⁴ The knowledge generated by scientific inquiry and its contribution to the marketplace of ideas might justify its protection under the First Amendment.⁵⁵ The Due Process Clauses might protect scientific inquiry as a fundamental liberty.⁵⁶ These arguments for protecting scientific inquiry, however, have appeared in Supreme Court decisions only in dicta. The Court has never directly addressed a statute regulating scientific inquiry. Lower federal courts have confronted the issue in fetal research cases.⁵⁷ In these cases, the courts weighed the concrete state interest of protecting embryos and fetuses against the constitutional protection afforded to scientific inquiry.⁵⁸ The analysis in these cases provides some guidance for drafting regulation of cloning that does not offend the constitutional protection of either speech or due process.

1. First Amendment Free Speech Protection of Scientific Inquiry

Protection of cloning research under the First Amendment could stem from the Amendment's protection of the marketplace of ideas. In *Roth v. United States*, a case involving a challenge to state obscenity laws, the Supreme Court declared that the First Amendment "was fashioned to assure unfettered interchange of ideas for the bringing about of political and social changes desired by the people."⁵⁹ The Court supported this interpretation by quoting a 1774 letter from the Continental Congress stating that the purposes of freedom of the press include advancement of truth, science, morality, and arts;

⁵³ See *Roe v. Wade*, 410 U.S. 113, 162-63 (1973).

⁵⁴ E.g., *Andrews*, *supra* note 28, at 661-62.

⁵⁵ See *Coleman*, *supra* note 51, at 1386-95.

⁵⁶ Cf. Comment, *Considerations in the Regulation of Biological Research*, 126 U. PA. L. REV. 1420, 1427 n.41 (1978) (making an Equal Protection argument when the government restricts only some research and citing Comment, *Government Control of Research in Positive Eugenics*, 7 U. MICH. J.L. REFORM 615, 628-29 (1974)).

⁵⁷ E.g., *Margaret S. v. Treen*, 597 F. Supp. 636 (E.D. La. 1984); *Wynn v. Scott*, 449 F. Supp. 1302 (N.D. Ill. 1978).

⁵⁸ See, e.g., *Margaret S.*, 597 F. Supp. at 671-72; *Wynn*, 449 F. Supp. at 1322.

⁵⁹ *Roth v. United States*, 354 U.S. 476, 484 (1957).

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communication between citizens; and promotion of unity between them.⁶⁰ Under these principles, the First Amendment protects an idea having any social value unless it encroaches on interests that are more important.⁶¹

The Court amplified this position in *Miller v. California*,⁶² another obscenity case, when it provided guidelines for speech protected by the First Amendment. One of the guidelines the Court required a trier of fact to analyze was “whether the work, taken as a whole, lacks serious literary, artistic, political, or scientific value.”⁶³ In *Griswold v. Connecticut*, the Court stated, “the State may not, consistent with the spirit of the First Amendment, contract the spectrum of available knowledge.”⁶⁴ In another obscenity case, the U.S. District Court for the Northern District of Indiana interpreted this position of *Griswold* as including “the right of scholars to do research and advance the state of man’s knowledge.”⁶⁵ These decisions suggest that the First Amendment protection of the marketplace of ideas includes scientific inquiry and discourse. Its application to scientific experimentation, in particular on human fetuses and embryos, however, is not straightforward.

The Supreme Court has not addressed whether experimentation on fetuses is speech protected by the First Amendment, but the Court would probably treat it as conduct containing both speech and non-speech elements. Experimentation includes speech elements in the recording and dissemination of results. The experiment itself, however, is not speech—it is, for example, the reaction of an embryo or fetus to a specific environment. It is not a symbolic act intended to convey a particularized message.⁶⁶ Indeed, if the experimenter already knew the message, the experiment would be a waste of time. Because experimentation includes both speech and non-speech elements, “a sufficiently important governmental interest in regulating the nonspeech [sic] element can justify incidental limitations on First Amendment freedoms.”⁶⁷ The Court, in *United States v. O’Brien*, defined the constitutional test for a regulation on conduct containing speech and non-speech:

[A] government regulation is sufficiently justified if it is within the constitutional power of the Government; if it furthers an important or substantial governmental interest; if the governmental interest is unrelated to the suppression of free expression; and if the incidental restriction on alleged First Amendment freedoms is no greater than is essential to the furtherance of that interest.⁶⁸

⁶⁰ *Id.* (citing 1 Journals of the Continental Congress 108 (1774)).

⁶¹ *See id.*

⁶² *Miller v. California*, 413 U.S. 15 (1973).

⁶³ *Id.* at 24.

⁶⁴ *Griswold v. Connecticut*, 381 U.S. 479, 482 (1965).

⁶⁵ *Henley v. Wise*, 303 F. Supp. 62, 66 (N.D. Ind. 1969).

⁶⁶ *Cf. Spence v. Washington*, 418 U.S. 405, 410-11 (1974).

⁶⁷ *United States v. O’Brien*, 391 U.S. 367, 376 (1968).

⁶⁸ *Id.* at 377.

Analysis of a statute banning procreative cloning until it has been proved to be as successful as *in vitro* fertilization⁶⁹ (IVF) provides an instructive application of the *O'Brien* framework.⁷⁰ The success rate of IVF is a good metric for procreative cloning because both IVF and procreative cloning involve creating a viable human embryo *in vitro* and then implanting it in a woman with the goal of the birth of a live baby. The governmental interest in protecting the potential for human life is the same in each.

Regulation of cloning fashioned in this manner satisfies the first element of the *O'Brien* test because the Commerce Clause gives Congress the power to regulate cloning.⁷¹ The statute satisfies the second element because the Supreme Court has held that protecting human embryos is an important, at times compelling, governmental interest, on par with the government's (and the mother's) interest in the health of the mother.⁷² As for the third element, the interest in protecting embryos is grounded in protecting potential life and has nothing to do with free expression. Finally, because IVF provides an already accepted standard for protection of the embryo, courts may hold that similar regulation of reproductive cloning is no greater than necessary.

Such a statute would amount to a ban on human procreative cloning until it is adequately reliable. Because the statute would prohibit attempts at human procreative cloning in the United States until that reliability were proved, no data demonstrating that reliability could be generated legally.⁷³ By requiring proof of the reliability of cloning, the statute would achieve another recognized state interest: maintenance of medical standards.⁷⁴ Thus, legislatures will likely be able to craft statutes that will pass the *O'Brien* test and still prohibit procreative human cloning, at least until research elsewhere demonstrates reliable cloning.

Defining a ban on therapeutic cloning narrowly enough to pass the *O'Brien* test is more difficult because the governmental interest in protecting human embryos may be less important when the embryo has no real potential for human life. Embryos cloned for therapeutic purposes represent potential life in only a symbolic sense: Therapeutic research with cloned embryos does not even contemplate placing them in an environment in which they could develop into a human being.⁷⁵ Nonetheless, because an embryo still represents the potentiality of human life and the Supreme Court has declared protection of

⁶⁹ *In vitro* fertilization is the fertilization of an egg outside of a woman's body.

⁷⁰ See generally *Considerations in the Regulation of Biological Research*, *supra* note 56, at 1432-34 (analyzing First Amendment protection for research on recombinant DNA using the *O'Brien* test).

⁷¹ See *supra* text accompanying notes 42-44.

⁷² See *supra* text accompanying notes 49-50.

⁷³ Experimentation outside the United States, however, could eventually produce enough data to prove the reliability of procreative cloning.

⁷⁴ See *supra* text accompanying note 51.

⁷⁵ See, e.g., Cibelli, *supra* note 35, at 46.

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human embryos to be an important governmental interest, regulation and perhaps even a ban of therapeutic cloning might pass the *O'Brien* test. This declaration, however, has arisen in abortion cases dealing with embryos already in environments conducive to their achieving viability, and the Court grounded its position on the embryo's potential for life. The Court has not addressed therapeutic use of an embryo that has never existed in an environment in which it could develop into a human being. Considering the environment is important because the possibility of reproductive cloning means that virtually every human cell represents the potential for human life, and if the nuclei of human cells after fusion into an egg must be protected because they might develop into a human, then the cells before fusion must also be protected.⁷⁶ Under that reasoning, virtually every human cell would be unavailable for experimentation.

A more reasonable position is that the government has an interest in cloned cells only after they are in an environment designed to allow their development into a human. Thus, because embryos cloned for therapeutics have so miniscule, perhaps only theoretical or symbolic, potential for life, the importance of the state interest in these human embryos may be insufficient for a ban of therapeutic cloning to pass the *O'Brien* test.⁷⁷ Reasonable regulation that does not amount to a ban of therapeutic cloning, however, will likely pass the *O'Brien* test as it would promote the governmental interest of maintaining medical standards and ethics.

2. Due Process Clause Protection of Scientific Inquiry

Protection of human cloning under the Due Process Clauses of the Fifth and Fourteenth Amendments would stem from their protection of liberties. The Supreme Court has given the Fifth Amendment Due Process Clause broad scope in dicta. For example, in *Meyer v. Nebraska*, the Court stated, "[w]ithout doubt, it denotes not merely freedom from bodily restraint but also the right of the individual to contract, to engage in any of the common occupations of life, to acquire useful knowledge, to marry, establish a home and bring up children."⁷⁸ In *Meyer*, the Court faced a constitutional challenge to a law prohibiting teaching foreign languages to students before they had passed the eighth grade.⁷⁹ The Court struck down the law because it promoted no "end within the competency of the state."⁸⁰ Unattached to a legitimate governmental interest, the law arbitrarily infringed on the right to teach and

⁷⁶ See generally *infra* text accompanying notes 153-66 (elaborating on and expanding the scope of this environment argument and relating it to a developmental argument).

⁷⁷ See generally *infra* text accompanying notes 160-66 (analyzing the significance of different stages in the development of a cloned embryo from a somatic cell in more detail).

⁷⁸ *Meyer v. Nebraska*, 262 U.S. 390, 399 (1923).

⁷⁹ *Id.* at 397.

⁸⁰ *Id.* at 403.

therefore violated the Due Process Clause.⁸¹ Similarly, because cloning research involves liberties protected under the Due Process clause (scientific inquiry, a common occupation of life, and generation of useful knowledge), Congress cannot restrict it unless the restriction promotes a legitimate governmental interest.

The Court also defined a broad scope for the Due Process Clause in dicta in *Sweezy v. New Hampshire*, when it protected the right to lecture at a university: “To impose any straight jacket upon the intellectual leaders in our colleges and universities would imperil the future of our Nation.”⁸² The Court went on to state, “[t]eachers and students must always remain free to inquire, to study and to evaluate, to gain new maturity and understanding; otherwise our civilization will stagnate and die.”⁸³ The Court went so far as to declare that it saw no “circumstance wherein state interest would justify infringement of” the right to intellectual inquiry but noted that such a broad statement was unnecessary for deciding the case at hand.⁸⁴

Sweezy involved a defendant who had been cited for contempt for refusing to answer questions about, inter alia, a lecture he gave to his University of New Hampshire class.⁸⁵ The aim of the questioning was to determine the defendant’s affiliation with the Progressive Party.⁸⁶ Despite the Court’s broad dicta, this fact pattern does not provide strong support for finding due process protection of scientific experimentation, especially experimentation on human embryos and fetuses—entities that the Court has recognized that states have a more than arbitrary interest in protecting. A few district courts have weighed the state’s interest against the right to scientific inquiry. Their analyses provide insight into how to resolve this balance.

3. Due Process Clause Protection of Experimentation on Fetal Tissue

In *Wynn v. Scott*, the U.S. District Court for the Northern District of Illinois analyzed the constitutionality of the Illinois Abortion Act of 1975, which included a prohibition of experimentation on “any fetus or premature infant aborted alive” or on any fetal tissue.⁸⁷ Although noting that none of the plaintiffs were medical researchers, the court summarily stated that the Constitution does not recognize the right to research as a fundamental right.⁸⁸ The court also held that the regulation did not violate the Constitution because the plaintiffs produced no evidence that the state’s interest in regulating the

⁸¹ *See id.*

⁸² *Sweezy v. New Hampshire*, 354 U.S. 234, 250 (1957).

⁸³ *Id.*

⁸⁴ *Id.* at 251.

⁸⁵ *Id.* at 243-44.

⁸⁶ *Id.*

⁸⁷ *Wynn v. Scott*, 449 F. Supp. 1302, 1322 (N.D. Ill. 1978).

⁸⁸ *Id.*

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practice of medicine was not rationally related to the regulation.⁸⁹ With no researchers arguing for their Due Process right to research, however, the foundation of the court's summary rejection of research as a fundamental right is questionable.

In *Margaret S. v. Treen*,⁹⁰ the U.S. District Court for the Eastern District of Louisiana more thoughtfully applied the Due Process Clause of the Fourteenth Amendment to a fetal research statute. In the aftermath of the Supreme Court holding in *Roe*, the Louisiana legislature declared in the statute that unborn fetuses are human beings from the moment of conception.⁹¹ The statute prohibited, inter alia, experimentation ““on a child born as a result of an abortion,” whether the unborn child (fetus) or child is aborted alive or dead.”⁹² Using a Due Process Clause argument, the court held this part of the statute unconstitutional. Citing *Meyer*, the court held that the Due Process Clause protects scientific research because it is a common occupation.⁹³ As such, a state may not arbitrarily infringe upon the right to scientific research. As a result, because the Louisiana statute prohibited experimentation on dead fetuses, whose lives the state has no interest in protecting, the statute was unconstitutional.⁹⁴

The *Margaret S.* analysis provides a more complete framework than does that in *Wynn* for a Due Process Clause analysis of human cloning experiments. The statute prohibiting experimentation on dead fetuses analyzed in *Margaret S.*, however, was supported by a weak state interest. A prohibition of experimentation on only live embryos poses a more difficult question because the state interest in protecting the potential for life can approach the strength of a woman's right to preserve her health.⁹⁵

Under Due Process Clause analysis, whether a statute infringes on a basic liberty requires balancing that liberty against the relevant state interests.⁹⁶ For example, a statute prohibiting torture is likely to pass Due Process Clause scrutiny, even if torture is “justified” as medical experimentation, because an individual's right to inflict pain and to acquire knowledge resulting from the torture “experiment” is not stronger than the state's interest in protecting its citizens.

A statute prohibiting human cloning would serve the important state interest of protecting the potential life of embryos. That interest, however, may not be sufficient to permit governmental infringement on the right to scientific inquiry into therapeutic cloning. Cloned human embryos do not now have greater

⁸⁹ *Id.*

⁹⁰ *Margaret S. v. Treen*, 597 F. Supp. 636 (E.D. La. 1984).

⁹¹ *See id.* at 644.

⁹² *Id.* at 671-72.

⁹³ *Id.* at 674.

⁹⁴ *Id.* at 675.

⁹⁵ *See Roe v. Wade*, 410 U.S. 113, 162-63 (1973).

⁹⁶ *E.g., Cruzan v. Mo. Dep't of Health*, 497 U.S. 261, 279 (1990).

potential for life than any somatic cell. But even if reproductive cloning becomes reliable, therapeutic cloning could be practiced such that an embryo can never become viable. Both these scenarios differ from the abortion jurisprudence that defined the governmental interest in the potential life of the embryo—the cloned embryo used for therapeutics is never in an environment where it can reach viability. It therefore would not have the potential for life, and other governmental interests would be required for justification of regulation or prohibition of therapeutic cloning. Of those mentioned above that relate to therapeutic cloning, (protection and preservation of human life, maintenance of medical standards, and maintenance the ethical integrity of the medical profession),⁹⁷ none justify a complete ban on therapeutic cloning, though they could justify regulation of it.

Even if the potential for life a cloned embryo represents is important enough to justify a ban on therapeutic cloning, therapeutic cloning research could progress in a manner bypassing this governmental interest. The low success rate of cloning experiments shows that not all embryos created by cloning have potential for life even when cared for in an appropriate environment. The low success rate might result from scientists' inability to control parameters critical for creating a potentially viable embryo. Those embryos that do not achieve independent life might be "defective" from their creation, never having that potential. Scientists may even discover how to clone only these defective embryos for therapeutics. The governmental interest in protecting defective human embryos that could never achieve independent life is probably not strong enough to support banning therapeutic cloning.⁹⁸

The analysis changes when applied to procreative cloning because procreative cloning deals directly with the potential for human life. If statutes did not prohibit other assisted procreation technologies, such as IVF, the relevant governmental interest would appear to be simply the banning of cloning. Then, like the prohibition of experimentation on dead fetuses in *Margaret S.*, the statute would appear to be arbitrary and therefore an impermissible infringement on reproductive scientists' liberty interest. On the other hand, the initial success rate of human cloning is likely to be considerably lower than the success rate of IVF, even considering the "spare" embryos⁹⁹ created in the current practice of IVF. This discrepancy may adequately justify prohibition of procreative cloning—to further the governmental interest in protecting human embryos—without prohibiting IVF.

⁹⁷ See *supra* text accompanying notes 40-45.

⁹⁸ Cf. *Margaret S.*, 597 F. Supp. at 675 (holding that the state has at most, a weak interest in protecting dead fetuses).

⁹⁹ IVF techniques typically involve fertilizing more eggs than are implanted in the woman.

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D. Cloning and the Constitutional Right to Procreate

Whether or not a right to scientific inquiry protects procreative cloning research, a constitutional right to procreate might protect research to this end.¹⁰⁰ The Supreme Court decisions relevant to reproductive rights have often dealt with protecting persons from governmental intrusion into their decisions about reproduction: the freedom from statutory sterilization,¹⁰¹ the right to be informed about and to use contraception,¹⁰² and the right not to carry a fetus to term.¹⁰³ In these cases, the Court discussed a right to procreate but not the limits of a positive assertion of it, that is the lengths one could go to ensure reproduction happens. Even if the Constitution protects affirmative reproductive rights, it may not protect a right to clone because of the fundamental differences between cloning and sexual reproduction.

In *Skinner v. Oklahoma*, the Supreme Court addressed the right to procreate, declaring that procreation is “one of the basic civil rights of man. Marriage and procreation are fundamental to the very existence and survival of the race.”¹⁰⁴ The Court faced a constitutional challenge to a law requiring the sterilization of habitual felons.¹⁰⁵ Using the Equal Protection Clause, the Court found the law unconstitutional because it called for sterilization of some felons but not others convicted of effectively the same crime.¹⁰⁶ This underbreadth was fatal to the law because sterilization infringes on “a basic liberty.”¹⁰⁷ In his concurring opinion, Chief Justice Stone preferred to use a due process argument. His focus, however, was not on procreation as a protected liberty; rather, he reasoned that because the statute failed to provide for a defendant to have a hearing to determine if his or her criminal tendencies were inheritable, it violated due process.¹⁰⁸ Neither opinion squarely addressed the strength of the right to procreate.

The series of Supreme Court cases on contraception and abortion continued the development of a right to procreation protected by the Due Process Clause. In *Griswold v. Connecticut*, the Court addressed whether the State could ban distribution of contraceptives.¹⁰⁹ The appellant had been convicted of prescribing contraceptives to married women.¹¹⁰ After describing how the Due

¹⁰⁰ See, e.g., Andrews, *supra* note 28, at 664-69, Coleman, *supra* note 51, at 1362-67.

¹⁰¹ *Skinner v. Oklahoma*, 316 U.S. 535, 541 (1942).

¹⁰² See *Eisenstadt v. Baird*, 405 U.S. 438 (1992); see also *Griswold v. Connecticut*, 381 U.S. 479 (1965).

¹⁰³ See *Planned Parenthood v. Casey*, 505 U.S. 833 (1992); see also *Roe v. Wade*, 410 U.S. 113 (1973).

¹⁰⁴ *Skinner v. Oklahoma*, 316 U.S. 535, 541 (1942).

¹⁰⁵ *Id.* at 536.

¹⁰⁶ *Id.* at 541-42.

¹⁰⁷ *Id.* at 541.

¹⁰⁸ *Id.* at 544 (Stone, C. J. concurring).

¹⁰⁹ *Griswold v. Connecticut*, 381 U.S. 479, 480 (1965).

¹¹⁰ *Id.*

Process Clause protects the right to privacy, the Court used it to strike down the statute.¹¹¹ The Court applied the right to privacy in the context of marriage, declaring the law unconstitutional because it had “a maximum destructive impact upon that relationship.”¹¹² The Court supported its decision with the right to privacy in the home, including “the sacred precincts of the marital bedroom.”¹¹³

In *Eisenstadt v. Baird*,¹¹⁴ the Court extended the right to privacy to unmarried persons. It reasoned that if anti-contraception laws infringe on the right to privacy of married couples, then they infringe on the right to privacy of single persons, too: “If the right of privacy means anything, it is the right of the *individual*, married or single, to be free from unwarranted governmental intrusion into matters so fundamentally affecting a person as the decision whether to bear or beget a child.”¹¹⁵ The right to privacy became attached to persons, independent of their relationships to others, and the Court declared an affirmative right to reproduce.

The Court clarified its holdings in the contraception (and abortion) cases in *Carey v. Population Services*, when it held that although the right to privacy protects personal decisions about procreation, that right does not include a right to contraception.¹¹⁶ Summarizing *Griswold*, *Eisenstadt*, and *Roe*, the Court declared, “the Constitution protects individual decisions in matters of childbearing from unjustified intrusion by the State.”¹¹⁷ Later, in *Planned Parenthood v. Casey*, the Court, in upholding a women’s right to an abortion, reaffirmed this position: “[T]he Constitution places limits on a State’s right to interfere with a person’s most basic decisions about family and parenthood.”¹¹⁸

In *Lifchez v. Hartigan* the U.S. District Court for the Northern District of Illinois applied the Court’s *Casey* reasoning in a challenge to the state’s abortion law prohibiting experimentation on fetuses.¹¹⁹ The court struck down the law because, inter alia, its prohibition of some procedures that increase reproductive options violated a woman’s right to make private reproductive choices.¹²⁰ The court reasoned that because no state interest is sufficiently compelling to prevent a woman from terminating her pregnancy during the first trimester, no state interest is sufficient to intrude upon other protected activities during the first trimester.¹²¹

¹¹¹ *Id.* at 485.

¹¹² *Id.*

¹¹³ *Id.* at 485.

¹¹⁴ *Eisenstadt v. Baird*, 405 U.S. 438 (1972).

¹¹⁵ *Id.* at 453.

¹¹⁶ *Carey v. Population Services*, 431 U.S. 678, 687-89 (1977).

¹¹⁷ *Id.* at 687.

¹¹⁸ *Planned Parenthood v. Casey*, 505 U.S. 833, 849 (1992).

¹¹⁹ *Lifchez v. Hartigan*, 735 F.Supp. 1361, 1363 (N.D. Ill. 1990).

¹²⁰ *Id.* at 1376-77.

¹²¹ *Id.* at 1377.

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The *Lifchez* court's argument is flawed, however, because a woman's right to terminate her pregnancy is grounded on her own welfare, not her right to procreate. Few, if any, state interests are sufficient to outweigh her right to her own welfare. Although the right to procreate is also a protected liberty, the Supreme Court has not balanced it against any state interests, so its constitutional weight remains unknown. The Court has acknowledged, however, that this right may have limits: The Court has prohibited only unwarranted¹²² or unjustified¹²³ government restrictions on it.

The *Lifchez* court further reasoned that the right to privacy, which includes the right of access to contraceptives, must also include "the right to submit to a medical procedure that may bring about, rather than prevent, pregnancy."¹²⁴ If this right exists, it might include procreative cloning. Some Supreme Court decisions provide measures for the weight of this right. In holding that a state need not fund abortions, the Court has allowed states to enact laws that promote normal childbirth over abortion.¹²⁵ In another abortion funding case, the Court declared that "a State is not required to show a compelling interest for its policy choice to favor normal childbirth any more than a State must so justify its election to fund public but not private education."¹²⁶ These cases indicate that a state does not infringe on a woman's right to make private procreative decisions when it promotes or funds one procreative choice more than another.

The Court has also addressed arguments on the right to medical treatment. In *United States v. Rutherford*, the Court ruled on a challenge to FDA regulation of Laetrile use by terminally ill cancer patients.¹²⁷ The district court had held that terminally ill cancer patients have a right to use Laetrile, basing its result on the Federal Food, Drug, and Cosmetics Act and on constitutional privacy interests.¹²⁸ The Supreme Court overturned the district court decision without addressing the privacy interests, relying entirely on statutory interpretation. Its failure to address the privacy issue has led some commentators to argue that there is no constitutional right to medical treatment.¹²⁹ If true, then the right to privacy does not prevent a legislature from prohibiting procreative cloning.

Combining these threads suggests that regulations and even prohibitions on procreative cloning would not infringe on the right that the Court has recognized to make procreative choices. The contraception and abortion cases, when they addressed procreative rights, neither analyzed a medically assisted

¹²² *Eisenstadt v. Baird*, 405 U.S. 438, 453 (1972).

¹²³ *Carey v. Population Services*, 431 U.S. 678, 687 (1977).

¹²⁴ *Lifchez*, 735 F. Supp. at 1377.

¹²⁵ *Poelker v. Doe*, 432 U.S. 519, 521 (1977).

¹²⁶ *Maher v. Roe*, 432 U.S. 464, 477 (1977).

¹²⁷ *United States v. Rutherford*, 442 U.S. 544 (1979).

¹²⁸ *Id.* at 550.

¹²⁹ *E.g.*, Forsythe, *supra* note 5, at 515, 524.

right to procreation nor balanced the right to procreate against any State interests. Coupled with the lack of precedent for a right to medical treatment and the recognition of a preference for normal childbirth as a State interest, the contraception and abortion jurisprudence indicates that the Court is unlikely to hold that restrictions on procreative cloning offend a constitutional right to procreate.

Indeed, some state courts and legislatures have placed bounds on the right to procreate. The New Jersey Supreme Court has held both that contracts terminating a surrogate mother's¹³⁰ parental rights are void and that contracts hiring a woman to be a surrogate are illegal.¹³¹ As of 2002, the District of Columbia and nine other state legislatures have taken similar positions.¹³² States with statutes allowing surrogacy contracts nonetheless regulate the contracts.¹³³

Even if a constitutional right to procreate exists, it might not include procreative cloning. Procreative cloning differs from all other human reproduction—it is asexual, and it does not create a new DNA sequence. These differences may be so fundamental that they prevent procreative cloning from being included in a right to procreate.¹³⁴

The preceding analysis indicates that the Constitution affords little protection for procreative cloning. On the other hand, constitutional protection of therapeutic cloning may exist, but reasonable regulation of it is not likely to offend the Constitution. States and Congress might therefore choose to regulate human cloning. In their debates on the regulation of either of these types of cloning, legislators will face important ethical issues such as the amount of protection cloned embryos should receive and the risks cloned humans face.

IV. ETHICAL ISSUES IMPORTANT TO THE REGULATION OF HUMAN CLONING

Cloning offers hope to many. Therapeutic cloning may provide cures to many diseases that continue to bedevil medical science.¹³⁵ Procreative cloning may provide better opportunities for creating families, for example, by eliminating the need of a third party for some procreative options.¹³⁶ Balanced

¹³⁰ “Surrogacy describes the situation in which a woman gestates a child for another and turns over the baby to the intended parent or parents at the time of birth.” Kimberly R. Willoughby & Alisa A. Campbell, *Having My Baby: Surrogacy in Colorado*, COLO. LAW., Jan. 2002, at 103.

¹³¹ See *In re. Baby M.*, 109 N.J. 396, 422 (1988).

¹³² See, e.g., Willoughby & Campbell, *supra* note 130, at 104.

¹³³ See, e.g., *id.*

¹³⁴ See *Scientific Discoveries and Cloning: Challenges for Pub. Policy: Hearing Before the Subcomm. on Pub. Health and Safety of the S. Comm. on Labor and Human Resources*, 105th Cong. 44 (1997) (statement of George Annas).

¹³⁵ See, e.g., Wright, *supra* note 18, at 359.

¹³⁶ See David Orentlicher, *Cloning and the Preservation of Family Integrity*, 59 LA. L.

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against this hope is the fate of the embryo created by cloning. Further weighing against the hope cloning offers is the fear cloning produces: the fear of the different and the unknown.

A. Ethical Issues of Therapeutic Cloning

Cloning of human cells to produce embryonic stem cells has the promise of tremendous therapeutic value.¹³⁷ The power of this technology is a result of the versatility of embryonic stem cells. They can differentiate into virtually any type of cell in the body.¹³⁸ If doctors can harness this versatility, then they can clone a patient's healthy cells to produce embryonic stem cells.¹³⁹ Doctors could then induce those cells to differentiate into healthy replacements for the patient's damaged or infected cells: nerve cells to treat Alzheimer's disease, pancreatic cells to treat diabetes, cardiac muscle cells to treat heart disease.¹⁴⁰ Doctors could even create entire organs, which the patient's immune system would be less likely to reject than an organ from a donor.¹⁴¹ Advances in genetic engineering could enable the creation of a universal tissue bank containing skin, bone, blood, and every other kind of tissue from embryonic stem cells.¹⁴² Embryonic stem cells could aid pharmaceutical research. Scientists could test new drugs on them for toxicity and efficacy, producing results more quickly with better accuracy than existing testing protocols and requiring fewer animal trials.¹⁴³ Embryonic stem cells could also provide the means to study both human development and the progression of disease.¹⁴⁴ Understanding both of these processes could lead to substantially improved health care.¹⁴⁵

The concern facing all this progress is that the human embryos, which have the potential for life and from which embryonic stem cells originate, will never have even the chance to reach viability.

One perspective on this concern suggests that embryos have moral value but not moral status.¹⁴⁶ Embryos deserve respect for their potential to create human life, but because that potential is unrealized, they do not have the rights of a human infant.¹⁴⁷ This perspective may undervalue the embryo by

REV. 1019, 1019 (1999).

¹³⁷ See, e.g., Wright, *supra* note 18, at 359.

¹³⁸ See, e.g., *id.* at 352.

¹³⁹ See, e.g., *id.* at 358.

¹⁴⁰ See, e.g., *id.* at 359.

¹⁴¹ See, e.g., *id.* at 359-60.

¹⁴² See, e.g., Wright, *supra* note 18, at 359.

¹⁴³ See, e.g., *id.* at 360.

¹⁴⁴ See *id.*

¹⁴⁵ See, e.g., *id.*

¹⁴⁶ Kevin P. Quinn, *Embryonic Stem Cell Research as an Ethical Issue: On the Emptiness of Symbolic Value*, 13 ST. THOMAS L. REV. 851, 854 (2001).

¹⁴⁷ *Id.* at 855.

allowing experimentation on it even when the experimentation provides only a possible benefit to people.¹⁴⁸ Without care, this perspective could result in no protection for human embryos.¹⁴⁹

Appropriate care could take a number of forms. Researchers could experiment on embryos only if the results are likely to provide substantial benefit to people.¹⁵⁰ Or researchers' reverence rather than mere respect for embryos could guide their experimentation.¹⁵¹ The reverence standard would permit experimentation on embryos only when other methods, for example adult stem cell experiments, are not available.¹⁵² Combining these two forms might produce the most workable option, which would allow experimentation on embryos only if it were likely to provide substantial benefit and if no other method were available.

Therapeutic cloning faces another ethical concern: Creation of an embryo with no intention of allowing it to mature may treat human life as a mere means to an end.¹⁵³ Although, this concern also applies to embryos created for research by IVF, the NBAC report¹⁵⁴ recommends allowing funding for research using spare IVF embryos but not for research using embryos created only for research, whether by cloning or IVF.¹⁵⁵ Differences between cloned embryos and IVF embryos, however, do not support providing more protection for embryos cloned for therapeutics than for embryos left over from IVF attempts. The purpose of IVF embryos is to create a new human being; the purpose of an embryo cloned for therapeutics is to improve an existing human's life, not to create a new human. Furthermore, unlike the DNA of an IVF embryo, the DNA of a cloned embryo is not unique, so; the potential life of the IVF embryo represents an increase in genetic diversity that the cloned embryo does not.¹⁵⁶ And the cloned embryo would provide the best tissue match for the donor of the cell that generated that embryo. These differences

¹⁴⁸ See *id.* at 858.

¹⁴⁹ See *id.* at 859.

¹⁵⁰ See, e.g., *id.* at 858 n.49 (quoting Bonnie Steinbock, *Respect for Human Embryos*, in CLONING AND THE FUTURE OF HUMAN EMBRYO RESEARCH 21, 23 (Paul Lauritzen ed., 2001)).

¹⁵¹ See Quinn, *supra* note 146, at 859-60.

¹⁵² *Id.* at 860.

¹⁵³ E.g., Cibelli et al., *supra* note 35, at 48; Sharon M. Parker, Comment, *Bringing the "Gospel of Life" to American Jurisprudence: A Religious, Ethical and Philosophical Critique of Federal Funding for Embryonic Stem Cell Research*, 17 J. CONTEMP. HEALTH L. & POL'Y 771, 802 (2001); *Human Cloning and the Constitution: Hearing Before the Subcomm. on Sci. Tech. & Space of the S. Commerce Comm.*, 109th Cong. (2001).

¹⁵⁴ *Cloning Human Beings Report and Recommendations of the Nat'l Bioethics Advisory Comm'n*, *supra* note 4, at 5.

¹⁵⁵ One justification for this position is that most, if not all, of the spare embryos will ultimately be destroyed. This justification, however, "proves too much" as it applies with just as much force to every living human. Parker, *supra* note 153, at 804.

¹⁵⁶ See Forsythe, *supra* note 5, at 475.

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suggest that IVF embryos should have more protection against experimentation than cloned embryos, not less. If experimentation on spare IVF embryos is allowed, then similar experimentation on cloned embryos should also be permitted.

The NBAC recommendation resonates with the reverence standard: An embryo should be created only for the purpose of its own life.¹⁵⁷ This standard might prohibit both therapeutic cloning and the use of IVF embryos for research. Some differences between cloning and IVF, however, might sufficiently distinguish cloning from IVF. Every day, humans lose both live and dead cells containing their DNA without ethical concerns that the cells could create a new human. Blood transfusions of one's own blood pose virtually no ethical problem. Skin grafts of one's own skin, even after it has been grown in culture, similarly present virtually no ethical problem. From any of these cells, or more fundamentally, the DNA in these cells, cloning technology could produce a human embryo. Like the cultured skin cells, if a cell's DNA is processed correctly and placed in a suitable environment, it may be able to grow and develop. The only difference between the DNA of the skin cells used for grafts and the DNA used for a cloning experiment is the environment in which the DNA finds itself. The DNA of all somatic cells has the same potential to become an embryo and gain independent existence. If embryos should be revered because of their potential for human life, then all somatic cells deserve reverence. Merely subjecting a cell to an environment where it can develop into an embryo should not change the protection afforded to the cell.¹⁵⁸

The level of protection afforded a cell or collection of cells then depends not so much on the potential for independent life but on the stage of development along that path. Prohibiting fetal experimentation after an embryo has reached a defined developmental stage is consistent with abortion jurisprudence because the state's interest in protecting the fetus grows from conception, becoming compelling when the fetus reaches viability.¹⁵⁹ Similarly, the state's interest in a cell should grow from the time it is donated for cloning to the time its resulting embryo reaches viability. The mere fact of incorporation of that cell's DNA in a new environment, such as an enucleated egg cell, is of little consequence. More important is the state of development of that DNA towards viability and ultimately self-awareness. One significant step in this process is the appearance of the primitive streak in the embryo.¹⁶⁰

¹⁵⁷ This formulation of the standard poses problems for use of IVF in assisted reproduction, because IVF assisted reproduction purposefully creates embryos with knowledge that not all of them will have the opportunity to develop.

¹⁵⁸ Should the DNA be protected more just after being placed into an enucleated egg than just before? Should the DNA be protected more after it has divided once in an enucleated egg than before? If researchers develop synthetic eggs, does the ethical analysis change?

¹⁵⁹ See *Roe v. Wade*, 410 U.S. 113 (1973).

¹⁶⁰ See *Coleman*, *supra* note 51, at 1335.

Before the appearance of the primitive streak, “the embryo cannot experience pain, is not sentient, and has no brain activity.”¹⁶¹ Until the primitive streak forms, the embryo is not unambiguously an individual because twinning can still occur (twinning is not possible once the primitive streak forms).¹⁶² The primitive streak appears within about fourteen days of fertilization.¹⁶³ Until its appearance, embryonic development consists primarily of production of the embryonic sac, the umbilical cord, and the placenta.¹⁶⁴ These cells have significance because of their environment; isolated from it, they would merit little, if any, protection. Once the primitive streak appears, however, this collection of cells has changed qualitatively, regardless of the environment in which it finds itself.¹⁶⁵ Prohibition of embryo experimentation after the primitive streak appears is more easily justified than prohibition of experimentation before the primitive streak appears because cloned human embryos before the appearance of the primitive streak are difficult to meaningfully developmentally distinguish from the cells that generated them. Stem cells collected from them should therefore be just as available for research as any other human cell.¹⁶⁶

B. Ethical Issues of Procreative Cloning

Cloning for procreation presents ethical and scientific challenges beyond those of therapeutic cloning. The scientific challenges include the likelihood that the first attempts to clone a live human will cause harm to that individual. The ethical challenges include not only how to address that likelihood but also stretch to considerations ranging from that individual’s place in society to the effect of asexual procreation on the human race.

Cloning technology is in its infancy. The danger to an embryo is immense. Wilmut’s success with Dolly came at the expense of 276 dead embryos, fetuses, and lambs.¹⁶⁷ Although success rates are now higher and growing, the

¹⁶¹ *Id.*

¹⁶² *See, e.g.,* John A. Robertson, *Embryos, Families, and Procreative Liberty: The Legal Structure of the New Reproduction*, 59 S. CAL. L. REV. 939, 970 (1986).

¹⁶³ *See, e.g., id.*

¹⁶⁴ *E.g.,* Coleman, *supra* note 51, at 1335.

¹⁶⁵ *Cf.* Kristin Leutwyler, *Dolly’s Legacy*, SCI. AM. (commenting that “most scientists maintain that a 10-day old embryo is not yet a life because the nervous system hasn’t developed”), *at* <http://www.sciam.com/article.cfm?articleID=00089781-2228-1C75-9B81809EC588EF21&pageNumber=1&catID=4> (June 21, 1999).

¹⁶⁶ *But see* Forsythe, *supra* note 5, at 506, (arguing that even before the primitive streak appears “a human organism is present” that deserves respect; commenting further that “[a]lthough current levels of scientific knowledge may not be sufficient to draw clear lines of distinction [presumably between the developmental paths of different cells in the early embryo], the single, genetically-unique, human entity is still present throughout this entire developmental process.”)

¹⁶⁷ Wilmut, *supra* note 1, at 811.

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risk to the embryo is still significant.¹⁶⁸ Application of the technology to humans presents the specter of repeatedly trying to clone a child until it comes out right.

The health of the cloned individual is also a concern. For example, some results indicate cloned mice tend to become obese, although their offspring appear healthy.¹⁶⁹ In addition, the age of a cloned individual is uncertain because the aging process is so complex. As the chromosomes in a cell age, they shorten. An individual beginning life with shortened chromosomes may be born “older” than sexually reproduced individuals.¹⁷⁰ Also, the cloned individual may risk inheriting genetic diseases and conditions from donor DNA, including, possibly, a predisposition for alcoholism and cancer.¹⁷¹ The individual may even be at risk of genetic diseases from the DNA of the enucleated egg.¹⁷²

These findings provide a glimpse into the scientific challenges researchers face when attempting to reproduce humans through cloning. These challenges present a wealth of ethical issues. A preliminary ethical consideration involves the treatment of animals used in these experiments.¹⁷³ Before beginning attempts at human cloning, animal cloning should have a high success rate. Although practicing on animals creates less of an ethical concern than practicing on humans, some may feel the hardships experienced by these animals are not worth the speculative potential gain for humans.

Nonetheless, if animal cloning becomes routine, then successful human cloning may be close. Before the first experiment on procreative human cloning begins, however, the risks to the fetus should be clearly and specifically defined, perhaps by comparison with the risks of early IVF work in humans. Only if those risks are comparable, should procreative human cloning work proceed, and then, only if the goal is nothing less than the generation of a healthy individual—otherwise, the work would squarely confront the ethical issue of the propriety of its use of a potential person as a mere means to an

¹⁶⁸ See Lanza et al., *supra* note 27, at 1893 (describing cloning techniques that produced healthy cattle although the spontaneous abortion rate was 73% compared with 7% to 24% for IVF pregnancies).

¹⁶⁹ Ogonuki et al., *supra* note 29, at 254.

¹⁷⁰ See Andrews, *supra* note 28, at 651. *But see* Tian, *supra* note 2, at 272.

¹⁷¹ Cf. William N. Eskridge, Jr. & Edward Stein, *Queer Clones*, in *CLONES AND CLONES FACTS AND FANTASIES ABOUT HUMAN CLONING*, 95, 106 (Martha C. Nussbaum & Cass R. Sunstein eds., 1998)

¹⁷² The cloned individual inherits the DNA in the egg’s mitochondria (and perhaps other organelles). See e.g., David Orentlicher, *Beyond Cloning: Expanding Reproductive Options for Same-Sex Couples*, 66 *BROOK. L. REV.* 651, 655 n.16 (2000) (citing Andrews, *supra* note 28, at 647).

¹⁷³ See Andrews, *supra* note 28, at 652 n.61.

end.¹⁷⁴ Under this framework, the ethical issues created by the science of cloning may be manageable. Ethical issues arising from other sources remain.

A human originating through the cloning of another human will not have a unique DNA sequence. This fundamental fact of the subsequent “twin” may have substantial impact on many aspects of that twin’s life. If the twin’s parent(s) knew (or one was) the twin’s progenitor, the parent(s) might saddle the twin with expectations that limit her opportunities and experiences.¹⁷⁵ Those expectations might lead to disappointment if they are not fulfilled.¹⁷⁶ The second twin, knowing that another with identical DNA went before, might have diminished self-esteem and sense of identity.¹⁷⁷ This problem could be exacerbated by the twin’s inability to control the dissemination of medical information about her from her progenitor.¹⁷⁸

The second twin’s identity problems do not end with her DNA. Biological and family relationships play a large role in social identity.¹⁷⁹ The second twin’s origin from only one progenitor confounds normal understandings of family relationships.¹⁸⁰ She is a deliberately planned, single-parent child.¹⁸¹ If raised by her elder twin, she would result from incest, being the daughter of her sibling.¹⁸² A cloned twin may be subject to discrimination because of both her origin¹⁸³ and her family structure.

The cloned twin’s emotional problems might be compounded if her parent(s) and siblings treat her more as an object than as a person because of the cloning process.¹⁸⁴ This possibility may be even more likely if the genetic structure of the twin had been either selected or designed,¹⁸⁵ which would also enhance the expectation problem. It may even lead to commodification of

¹⁷⁴ See generally *supra* text accompanying note 138 (applying this concern to therapeutic cloning).

¹⁷⁵ Andrews, *supra* note 28, at 653.

¹⁷⁶ *Id.*

¹⁷⁷ *Id.* at 655.

¹⁷⁸ *Id.* at 655-56.

¹⁷⁹ Leon R. Kass, *The Wisdom of Repugnance: Why We Should Ban the Cloning of Humans*, 32 VAL. U. L. REV. 679, 695 (1998).

¹⁸⁰ *Id.* at 690.

¹⁸¹ *Id.* at 696.

¹⁸² *Id.*

¹⁸³ Imagine the impact of, for example, STAR WARS EPISODE II, ATTACK OF THE CLONES (20th Century Fox 2002) on him or her. Imagine, too, the stigma he or she would face if procreative cloning had been banned: He or she would be worse than a bastard—he or she would be contraband. See Lawrence Tribe, *On Not Banning Cloning for the Wrong Reasons*, in CLONES AND CLONES FACTS AND FANTASIES ABOUT HUMAN CLONING, 221, 229-30 (Martha C. Nussbaum & Cass R. Sunstein eds., 1998).

¹⁸⁴ See, e.g., Andrews, *supra* note 28, at 653.

¹⁸⁵ Although “designer DNA” would eliminate a clone’s uniqueness problem.

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human beings, their parts, and their genes.¹⁸⁶ This objectification could make cloning “profoundly dehumanizing.”¹⁸⁷

From this perspective, cloning “represents a form of despotism of the cloners over the cloned.”¹⁸⁸ This despotism, this willful control of another, exists in the cloned twin’s parent(s), the scientists who made cloning possible, and the doctors who assisted in the cloning.¹⁸⁹

Many of these concerns are not unique to cloning. Organ donation may already have created a commodification of human body parts. Parents cannot help but have expectations for their children. Children already face identity and self-esteem problems. Divorce, remarriage, adoption, sperm donors, egg donors, and surrogate mothers already confound family relationships. Discrimination based on parentage and family structure already exists. The mechanization of assisted reproductive methods already poses the risk of objectifying its results.¹⁹⁰ These facts have not generated prohibition of either organ donation or pregnancy.

The main objection to procreative cloning may be simply the “it’s icky” argument.¹⁹¹ Leon Kass has elaborated this argument, describing procreative cloning as offensive, grotesque, revolting, repulsive, and repugnant.¹⁹² He compares it to incest, bestiality, rape, and cannibalism.¹⁹³ He suggests that a feeling of the inevitability of procreative cloning heightens the unease about it.¹⁹⁴ He posits that “repugnance is the emotional expression of deep wisdom, beyond reason’s power fully to articulate.”¹⁹⁵ And when assessing what methods of assisted reproduction should be permitted, he “draw[s the line] at cloning” for many reasons, but fundamentally because it’s icky.¹⁹⁶

¹⁸⁶ See, e.g., Andrews, *supra* note 28, at 657.

¹⁸⁷ Kass, *supra* note 179, at 697.

¹⁸⁸ *Id.* at 691.

¹⁸⁹ See *id.* at 698.

¹⁹⁰ But see *id.* (objecting that the ability to set standards to prevent the slippery slope was argued to promote assisted reproductive technology).

¹⁹¹ See *id.* at 686-689 (arguing the importance of repugnance); Richard Dawkins, *What’s Wrong with Cloning?* (1997), reprinted in CLONES AND CLONES FACTS AND FANTASIES ABOUT HUMAN CLONING, 54, 59 (Martha C. Nussbaum & Cass R. Sunstein eds., 1998) (counseling wariness when faced with the “yuk reaction”); William Ian Miller, *Sheep, Joking, Cloning and the Uncanny*, in CLONES AND CLONES FACTS AND FANTASIES ABOUT HUMAN CLONING, 78, 83-84 (Martha C. Nussbaum & Cass R. Sunstein eds., 1998) (“Cloning is about making us pond scum. . .”). “It’s icky” coined in discussions with Clay Masterson, law student at Thomas Jefferson School of Law, during Professor Julie Greenberg’s Sexuality, Gender and the Law course, San Diego, Ca. (Spring 2002).

¹⁹² Kass, *supra* note 179, at 686.

¹⁹³ *Id.* at 687.

¹⁹⁴ *Id.* at 686.

¹⁹⁵ *Id.*

¹⁹⁶ *Id.* at 701.

This emotion pervades the thought of other objectors to cloning: “cloning is too qualitatively different from normal reproduction” to assume the Constitution protects it as it does other forms of reproduction;¹⁹⁷ cloning’s change “in the fundamental way . . . humans can ‘reproduce’ represents such a challenge to human dignity and the potential devaluation of human life . . . that even the search for analogy has come up empty handed”;¹⁹⁸ and “cloning is not reproduction, it is replication.”¹⁹⁹

The emotional response requires attention, but in a reasoned discussion, it should sway an argument only if explicitly acknowledged. Before it influences the outcome of debate, the sources of the emotion should be understood as fully as possible. Mere fear of the unknown or the different is not adequate justification for avoiding it. Succumbing to that fear would have prevented many, if not all, of the advances and discoveries throughout human history. That fear is also a source of the anathema of discrimination. That fear, however, can also be healthy, serving a valuable role in self-preservation. Delineating the role of that fear in the debate over procreative cloning is the responsibility of each participant in the debate.²⁰⁰ Recognizing its role and power is a crucial step in the process of deciding where to draw the line at cloning.

V. CONCLUSION

Legislatures should be able to craft regulations of cloning that do not offend the Constitution. Congress and the states have important interests in protecting the potential of human life and in maintaining standards for the medical profession. Regulations of cloning that promote these interests will not impermissibly infringe on constitutionally protected rights if they appropriately account for the developmental progress of the cloned embryo and the environment in which it exists. These regulations will likely be different for therapeutic and procreative cloning, however, because the embryo’s developmental progress and environment are different for each of these purposes.

Deciding how to regulate therapeutic cloning requires determining when a group of cells reaches a level of development warranting protection. The emergence of techniques that can produce viable offspring from somatic cells implies that every cell has the potential for independent life. Unless every cell

¹⁹⁷ Andrews, *supra* note 28, at 666.

¹⁹⁸ *Scientific Discoveries in Cloning: Challenges for Public Policy: Hearing Before the Subcomm. on Public Health and Safety of the S. Comm. on Labor and Human Res.*, 105th Cong. 44 (1997) (testimony of George Annas).

¹⁹⁹ *Id.* See also Cass R. Sunstein, *The Constitution and the Clone*, in *CLONES AND CLONES FACTS AND FANTASIES ABOUT HUMAN CLONING* 207, 211 (Martha C. Nussbaum & Cass R. Sunstein eds., 1998).

²⁰⁰ *Cf.* Dormor, *supra* note 43, at 4 (arguing for a middle ground between the emotional and scientific perspectives on cloning).

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always merits protection, mere potential for life is not an adequate criterion for protection. A better criterion would account for how close to independent life a group of cells is.

In the context of therapeutic cloning, the appearance of the primitive streak provides an excellent dividing line between a group of cells with the mere potential for life and a group of cells warranting protection because of its progress in reaching its potential.²⁰¹ Until the primitive streak appears, an embryo cannot experience pain. More importantly, the primitive streak is the first structure that correlates to a potential for enabling self-awareness. For us who make the decision about the value of this group of cells, the primitive streak is the stage in its development that first truly distinguishes it from a mere group of cells. At this point, we have more to care about than simply the potential for life inherent in every cell. We have the initial feelings of a nascent human.

Likewise, we should not ignore our emotional response to procreative cloning, even though our feelings may differ greatly from our feelings for the human embryo. Despite those differences, the emotion towards the embryo suggests that when considering procreative cloning the primary focus is best placed on the goal—the new human being—not the process. That focus on the human being will help to protect the her. That focus will help to diminish the hypothesized objectification, despotism, and expectation problems.

That focus will not, however, remove the fear of cloning. That fear is deep-seated, grounded in the unknown consequences of procreative cloning's fundamental difference from all prior human reproduction. What will the first cloned human be like? Does the spark of humanity require sexual reproduction? Will a cloned human be truly human? The answers to these questions cannot be known until the first cloned human is born.²⁰² Is the fear of finding the answer to these questions worth not allowing that person to be born?

Analogies to other firsts abound. Is cloning like the development of the atomic bomb?²⁰³ Is cloning like the development of heavier-than-air flight?²⁰⁴

²⁰¹ The moment of fertilization is not a suitable dividing line for cloned cells because fertilization does not occur.

²⁰² *But see* Stephen Jay Gould, *Dolly's Fashion and Louis's Passion*, *NATURAL HISTORY*, June 1997, at 18 *reprinted in* CLONES AND CLONES FACTS AND FANTASIES ABOUT HUMAN CLONING, 41, 47-48 (Martha C. Nussbaum & Cass R. Sunstein eds., 1998) (observing that identical twins are even more identical than a clone and her progenitor and that no questions arise about identical twins' individuality or personhood).

²⁰³ Before the first atom bomb test at Trinity, scientists placed bets on how much the explosion would destroy, up to and including the whole world. *See* LT. GENERAL LESLIE GROVES, *NOW IT CAN BE TOLD: THE STORY OF THE MANHATTAN PROJECT* 296-97 (1962). *See also* Larry Hinds, *Military/Trinity Detonation*, available at <http://sopris.net/mpc/military/trinity.htm> (updated Oct. 2001).

Proponents and opponents of cloning will argue for the analogy they prefer, but the fundamental difference may be in their emotional answer to this question: Is the unknown of human cloning more like the first step of the first human on the moon²⁰⁵ or a cannibal's first taste of human flesh? This question may form the continental divide in the debate over procreative cloning. Recognizing it allows each side to understand and address the crux of the debate.

²⁰⁴ If humans were meant to fly, they would have wings. If humans were meant to clone, they would have DNA. *Cf.* Dawkins, *supra* note 191, at 59 (“If God intended us to fly, he’d never have given us the railway.”).

²⁰⁵ How sure were Neil Armstrong and Buzz Aldrin that they wouldn’t sink into lunar dust? *See* BUZZ ALDRIN & MALCOLM MCCONNELL, *MEN FROM EARTH* 238 (1989) (Aldrin stating that just after the *Eagle* landed on the moon, he was ready to hit the abort switch to send them back “in case . . . the surface was not strong enough to support our weight”); HAMISH LINDSAY, *TRACKING APOLLO TO THE MOON* 236 (2001) (quoting Armstrong that before he first stepped onto the moon he felt “a little caution, a desire to be sure it was safe to put my weight on that surface outside *Eagle*’s footpad”).