NOVEL ASSISTED REPRODUCTIVE TECHNOLOGIES AND PROCREATIVE LIBERTY: EXAMINING IN VITRO GAMETOGENESIS RELATIVE TO CURRENTLY PRACTICED ASSISTED REPRODUCTIVE PROCEDURES AND REPRODUCTIVE CLONING

CHARLES THOMAS

I. INTRODUCTION

Science and medicine continue to advance at historic rates. The continual increase of publications in scientific and medical journals year after year suggests that knowledge in these areas build and expand exponentially. As knowledge expands, society's perceptions, beliefs, ethics and laws must be reflected upon and reexamined as their applicability to new discoveries and techniques will be left behind.

Scientific advances in the field of biology and medicine fracture our understanding of the natural processes and divine determination, and thus deserve enhanced attention. For instance, consider the ability to keep persistent-vegetative-state patients alive with life-support, an issue that was scrutinized in the Supreme Court case *Cruzan v. Director, Missouri Department of Health*.[1] If life-support technology did not exist at the time Nancy Cruzan experienced her tragic car accident, there would be no controversy, case, or debate, as natural processes and divine determination would have simply played out. However, advanced medical technologies fractured our understanding of death.

Life-support technology has created a novel divide between the concept of death and the concept of brain dead with continued vitals. This divide forces society to reconsider its perceptions, beliefs, ethics, and laws on death, and how to proceed in situations involving persistent-vegetative-state individuals like Nancy Cruzan. However, Cruzan's situation is just one example requiring reflection. Much like the life-support technology, society must also consider the ethics and legal questions surrounding other fractured biological processes, such as abortion technologies, genetic

1 *See* Cruzan v. Dir., Mo. Dep't of Health, 497 U.S. 261, 265 (1990).

manipulation, stem-cell medicine, cloning, and assisted reproduction technologies.

This note focuses on the fracture of biological reproduction by assisted reproduction technologies (ARTs), through a discussion of the corresponding ethical dilemmas and legal debates. In particular, this note will closely examine an exciting new ART called in vitro gametogenesis (IVG), which has the potential to provide couples with the opportunity to procreate and contribute their genetic identity to their progeny, including infertiles and individuals in same-sex relationships.[2] To gain an understanding of IVG and whether the procedure is protected within procreative liberty, we compare the procedure with currently practiced ARTs and reproductive cloning.

As reproductive technology advances, the possibilities to procreate have expanded extraordinarily.[3] IVG is a clear example of a new prospective technology that could grant certain individuals and couples an opportunity to have genetically-related children — an opportunity that many did not imagine a short while ago.[4] However, Congress and several states may want to regulate or ban this technology because it has several parallels to the heavily regulated procedure of reproductive cloning, including the unnatural process of fertilization involving major manipulation of gametes by doctors or technicians in vitro.[5] These prospective regulations would provoke significant constitutional ramifications in procreative liberty. Thus, the overarching goal of this note is to assess exactly how IVG, cloning, and assisted reproduction in general, fit into the constitutional definition of procreative liberty and the interplay with prospective regulations. To fully appreciate these issues, the note will peruse relevant case law, academic articles, ethical inquiries, and scientific literature.

In section II, the note will provide an overview of the advancements in assisted reproduction. Furthermore, section II will explain the basic biology behind ARTs, and particularly IVG in order to provide a basis for ethical and legal discourse. Section III will aim to define procreation and procreative liberty from biological and constitutional perspectives. That section will consider whether the Fourteenth Amendment presumptively protects any modes of assisted reproduction. Section IV will analyze the potential harms and ethical qualms surrounding currently practiced ARTs, reproductive cloning, and IVG. It will consider potential state interests and their legitimacy to limit the use of any particular reproductive technique.

---

2 Guy Ringler, *Get Ready for Embryos from Two Men or Two Women*, TIME (Mar. 18, 2015), http://time.com/3748019/same-sex-couples-biological-children/.

3 *See id.*

4 John A. Robertson, *Gay and Lesbian Access to Assisted Reproductive Technology*, 55 CASE W. RES. 323, 367 n. 160 (2004) ("Nor do I discuss the possibility of deriving gametes from embryonic stem cells. While there may be potential medical applications from gametes derived in this way. . . . [t]he topic is too speculative to merit further discussion here.").

5 The note will continue to use the term "state regulation" or "state interest" for the sake of simplicity. However, Congress is also implicated when using these terms.

II. THE BIOLOGY OF ASSISTED REPRODUCTIVE TECHNOLOGIES

Assisted reproduction is a procedure in which gametes, the sperm and ova, are manipulated in vitro to achieve pregnancy.[6] In contrast to traditional coitus, ARTs manipulate the classical process of sexual reproduction in several ways. The sperm and ova could come from a donor, fertilization can occur in a laboratory dish, and the development of the fetus can occur in a surrogate womb or possibly an artificial womb in the future.[7] The intended parents can pick and choose the ARTs necessary or desired to achieve reproduction of their choice. In order to effectively assess the ethics and legal issues surrounding the decisions of assisted-reproduction patients, a rudimentary understanding of the biological processes are provided in this section.

A. CURRENTLY PRACTICED ARTS: ARTIFICIAL INSEMINATION, IN VITRO FERTILIZATION, GAMETE INTRAFOLLOPIAN TRANSFER, SURROGACY, AND PREIMPLANTATION GENETIC TESTING

Artificial insemination (AI) is the oldest and simplest form assisted reproduction, which was first documented in humans in the 1770s.[8] The procedure involves releasing semen from a selected partner or an anonymous donor into the uterus of a patient with anticipation that an ovum has been released from her ovary into her fallopian tube, where fertilization would occur.[9] This ART most mimics natural sexual reproduction, without the act of intercourse.

In vitro fertilization (IVF) and gamete intrafallopian transfer (GIFT) are very similar procedures that involve in vitro handling of sperm and ova. As such, the procedures require donation or surgical extraction of the gametes.[10] The primary difference between the two techniques is the location of fertilization. IVF involves the combining of the male and female gametes in a laboratory dish.[11] Once fertilization occurs, the zygote begins dividing into multiple cells resulting in an embryo that is implanted

---

6 In vitro is Greek for "in glass" and refers to any biological process that is manipulated outside of the body. *See* The American Society for Reproductive Medicine, *Assisted Reproductive Technologies*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/Topics/Assisted_Reproductive_Technologies/ (last visited Feb. 14, 2017).

7 *See* Perri Klass, *The Artificial Womb Is Born*, N.Y. TIMES (Sept. 29, 1996), http://www.nytimes.com/1996/09/29/magazine/the-artificial-womb-is-born.html (last visited Feb. 14, 2017).

8 Willem Ombelet & Johan Van Robays, *Artificial Insemination History: Hurdles and Milestones*, 7 FACTS VIEWS & VISION IN OBGYN 137, 138 (2015).

9 *See* The American Society for Reproductive Medicine, *Artificial Insemination*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/Topics/Artificial_Insemination/ (last visited Feb. 17, 2014).

10 *See* The American Society for Reproductive Medicine, *Egg Donation*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/FACTSHEET_Egg_Donation/ (last visited Feb. 17, 2014); The American Society for Reproductive Medicine, *Gamete (Eggs and Sperm) and Embryo Donation*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/FACTSHEET_Gamete_and_Embryo_Donation/ (last visited Feb. 14, 2017).

11 *See Artificial Insemination*, *supra* note 9.

into a woman's uterus with the hope that it attaches to the uterine lining and develops into a full-term pregnancy.[12] On the other hand, GIFT involves the transfer of unfertilized eggs along with sperm into the fallopian tube directly, where fertilization can take place and the resulting embryo will travel to the uterus and attach to the uterine lining.[13]

Traditional and gestational surrogacies are alternative options for individuals or couples that desire to have a genetically related child but cannot support pregnancy on their own. Traditional surrogacy is an arrangement in which a woman is inseminated with sperm of a man who is an intended parent.[14] The surrogate bears the pregnancy and is genetically related to the child, but is typically not intended to maintain parentage.[15] After the child is born, the intended parent(s) may need to adopt the child to obtain parental rights.[16] On the other hand, a gestational surrogate is a woman who carries and delivers a child that is genetically unrelated.[17] Typically, the surrogate and the intended parent(s) enter into a contract to determine medical expense coverage and post-birth parental rights.[18] Gestational surrogacy requires that the child be conceived by IVF and the resultant embryo transplanted into the uterus.[19]

ARTs have expanded from simply providing assistance with the process of reproduction to include preimplantation genetic testing (PGT) techniques to avoid complications with the pregnancy or the health of the child.[20] PGT are methods to screen IVF generated embryos for chromosomal abnormalities and genetic diseases.[21] If abnormalities are detected, the unhealthy embryos are not used, and the remaining healthy embryos are transferred into the uterus.[22]

---

12 The American Society for Reproductive Medicine, *In Vitro Fertilization (IVF)*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/topics/detail.aspx?id=1278 (last visited Dec. 18, 2015).

13 The American Society for Reproductive Medicine, *Gamete Intrafallopian Transfer (GIFT)*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/topics/detail.aspx?id=4796 (last visited Feb, 14, 2016).

14 The American Society for Reproductive Medicine, *Surrogacy and Gestational Carriers*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/topics/detail.aspx?id=1740 (last visited Feb. 14, 2017). The method of insemination can occur by natural coitus or by artificial insemination.

15 *See id*.

16 *See id*. The need for the biological father to adopt will depend on state laws. If there is another intended parent, most states require that he or she will need to adopt to become the legal parent because of the lack of biological contribution.

17 The American Society for Reproductive Medicine, *Gestational Carrier (Surrogate)*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/FACTSHEET_Gestational_Carrier_Surrogate/ (last visited Feb. 14, 2017). In some states, the gestational surrogate is referred to as the gestational carrier. The intended parents may or may not be biologically related, but will likely need to adopt the child, dependent on state law.

18 *See Checklist: Surrogacy Contract*, FINDLAW, http://family.findlaw.com/surrogacy-artificial-conception/checklist-surrogacy-contract.html (last visited Feb. 14, 2017).

19 *Id*.

20 The American Society for Reproductive Medicine, *Preimplantation Genetic Testing*, REPRODUCTIVE FACTS.ORG, http://www.reproductivefacts.org/FACTSHEET_Preimplantation_genetic_testing/ (last visited Feb. 14, 2017).

21 *Id*.

22 *Id*. By current screening methods, many congenic diseases can be avoided. However, PGT does not guarantee that every resultant child will be 100% healthy. Many congenic diseases are not

B. MAROONED ART: REPRODUCTIVE CLONING

Reproductive cloning results in the creation of a genetically identical twin, but born at a later point in time.[23] The process begins with a difficult procedure called somatic cell nuclear transfer (SCNT).[24] In short, SCNT is the transfer of a cell nucleus, including all the genetic information, from one cell into another.[25] Despite the difficulty of the method, the history of reproductive cloning is relatively old.[26]

Over the twentieth century, the field of reproductive biology and genetics and the technology of SCNT expanded immensely and reached pinnacle heights with the cloning of Dolly the sheep.[27] A little over one hundred years after Loeb's observation, the researchers of the Roslin Institute were the first to successfully clone a mammal.[28] Proclaimed to be the "break out of the year," Dolly the sheep was created by transferring the nucleus from an adult mammary gland cell into an enucleate egg cell.[29] The egg cell, containing the nucleus with the genetic information from the adult cell, was then transferred into a surrogate. The surrogate was able to bring the embryo to term, resulting in the birth of Dolly.[30] Dolly was an exact genetic match with the mammary gland cell donor.[31] Since Dolly's birth, several other mammals have been cloned, including cats, dogs, research animals, and cattle.[32] So far, there are no verified reports of using SCNT for human reproduction.[33] However, several different researchers have performed human therapeutic cloning.[34] Human therapeutic cloning differs

routinely tested. Other diseases are complex, and thus fertility experts would not be able to predict with certainty whether these complex diseases are present in the child's genetic identity.

23 Cloned progeny have different mitochondrial genome than their "parental source," which accounts for less than 0.2% of the genes in the entire human genome. Thus, cloned progeny are not complete genetic twins, but >99.8% genetically identical.

24 *Somatic Cell Nuclear Transfer*, SCIENCEDAILY, http://www.sciencedaily.com/terms/somatic_cell_nuclear_transfer.htm (last visited Feb. 14, 2017). SCNT can be replaced with even more complex method comprising induced pluripotency in conjunction with tetraploid complementation. *See* Michael J. Boland et al., *Adult Mice Generated from Induced Pluripotent Stem Cells*, 461 NATURE 91 (2009).

25 *Somatic Cell Nuclear Transfer*, *supra* note 24.

26 *See* Robert G. Mckinnell & Marie A. Di Berardin, *The Biology of Cloning: History and Rationale*, 49 BIOSCIENCE 945, 876 (1999). The first recorded observation of nuclear transfer was in 1894 when researcher Jacques Loeb fortuitously noticed that when a sea urchin nucleus transverses into a non-nucleated egg (i.e., nuclear transfer from a fertilized egg cell into a genetically empty egg), it would develop into a mature sea urchin. A couple decades later in the early twentieth century, a developmental biologist named Han Spielman recreated Loeb's observation by manipulating early amphibian embryos and controlling transfer of nucleus into non-nucleated cells. Spielman's experiments resulted in the cloned amphibians and thus the first cloned animals derived from human manipulation.

27 *Id*. at 875.

28 *Id*.

29 *Id*.; Ian Wilmut et al., *Viable Offspring Derived from Fetal and Adult Mammalian Cells*, 385 NATURE 810, 810−11 (1997).

30 Wilmut, *supra* note 29 at 811. The article refers to Dolly as 6LL3.

31 *Id*.

32 National Human Genome Research Institute, *Cloning*, GENOME.ORG, https://www.genome.gov/25020028 (last visited Feb. 14, 2017).

33 *Id*.

34 *See*, *e.g.*, Andrew J. French et al., *Development of Human Cloned Blastocysts Following Somatic Cell Nuclear Transfer with Adult Fibroblasts*, 26 STEM CELLS 485 (2008).

from reproductive cloning in that the resulting embryo is only used for research purposes and never transferred into a surrogate.[35]

C. NOVEL ART: IN VITRO GAMETOGENESIS

The capability of generating gametes from embryonic stem cells had long been believed to be impossible.[36] However, when President Obama lifted the federal funding ban on embryonic stem cells (ESCs) along with the advent of a new technology called "induced pluripotent stem cells" (iPSCs), research in the field of stem cell biology exponentially expanded, leading to record numbers of discoveries and inventions.[37] ESCs and iPSCs mimic the inner cells of a blastocyst (a four to five day old embryo), and thus they are pluripotent and can potentially give rise to any mature cell in the human body.[38] The major difference between ESCs and iPSCs is where they are sourced. Embryonic stem cells are extracted directly from a pluripotent cell source, such as the morula (a three to four day old embryo) or the inner cell mass of a very early blastocyst.[39] Induced pluripotent stem cells, on the other hand, are derived from any mature cell source (e.g., the skin or blood tissue of a child or an adult), and "induced" into a pluripotent state.[40]

Scientists have published the ability to differentiate human ESCs and iPSCs into several mature cell types, including blood cells, heart cells, brain cells, and pancreatic cells, among many others, but never mature gametes.[41] However, a research group at the University of Cambridge has developed a technique to differentiate human ESCs and iPSCs into "primordial germ cells," which are the precursor cells to mature sperm and ova.[42] These researchers predict that they will be able to differentiate human pluripotent cells into mature gametes soon, after overcoming a few minor hurdles.[43]

---

35 *See id*. at 487 (lysing of embryos).

36 Robertson, *supra* note 4, at 367 n. 160.

37 National Institutes of Health, *National Institutes of Health Guidelines on Human Stem Cell Research*, STEM CELL INFORMATION, http://stemcells.nih.gov/policy/pages/2009guidelines.aspx (last visited Feb. 14, 2017); Weizmann Institute of Science, *Human Primordial Cells Created in the Lab: Cells Programmed to Turn into Earliest Precursors of Sperm and Ova,* SCIENCEDAILY (Dec. 25, 2014), http://www.sciencedaily.com/releases/2014/12/141225143544.htm; Cesar Palacios-Gonzalez et al., *Multiplex Parenting: IVG and the Generations to Come*, 40 J. MED. ETHICS 752, 752 (2014).

38 California Institute for Regenerative Medicine, *Stem Cell Key Terms*, CIRM.CA.GOV, https://www.cirm.ca.gov/patients/stem-cell-key-terms (last visited Feb. 14, 2017); s*ee* The Endowment for Human Development, Inc., *The Morula and Blastocyst*, EHD.ORG, http://www.ehd.org/movies.php?mov_id=6 (last visited Feb. 14, 2017).

39 *Id.*

40 *Id.*

41 *See generally* Charles E. Murray & Gordon Keller, *Differentiation of Embryonic Stem Cells to Clinically Relevant Populations: Lessons from Embryonic Development*, 132 CELL 661, 666-71 (2008) (detailing and citing research into differentiation of pluripotent cells into hematopoietic (blood) cells, cardiac (heart) cells, brain (neural) cells, and pancreatic cells); *see also* Ian Sample, *Scientist Use Skin Cells to Make Artificial Sperm and Eggs*, GUARDIAN (Dec. 24, 2014), http://www.theguardian.com/society/2014/dec/24/science-skin-cells-create-artificial-sperm-eggs (stating differentiation "into mature sperm and eggs . . . has never been done in the lab before").

42 Naoko Irie et al., *SOX17 Is a Critical Specifier of Human Primordial Germ Cell Fate*, 160 CELL 253, 253 (2015). For purposes of simplicity, this will not refer to this technique as "in vitro gametogenesis" (IVG).

43 Weizmann Institute of Science, *supra* note 37.

The potentiality of In Vitro Gametogenesis (IVG) is realized when this technique is combined with iPSC technology and thus create gametes with the genetic identity of any individual. Because iPSCs can be created from most mature somatic cell types, medical doctors and lab technicians can derive pluripotent cells from any human being.[44] An extremely simple and practical technique to acquire adult cells is to extract skin cells from an individual by a "skin punch biopsy."[45] Doctors or technicians can convert the skin cells obtained from the biopsy into iPSCs by modulating the gene expression.[46] Further differentiation of the iPSCs into mature gametes would yield sperm and ova with genetic information of the skin-punched individual. Thus, in theory, an infertile individual or an individual who has undergone chemotherapy could reproduce with their own genetic material when medically impossible previously.[47] Likewise, this technique could conceivably be employed to create ova from male donors and sperm from female donors, creating new opportunities for same-sex couples.[48]

The IVG method will greatly expand the field of assisted reproduction. In conjunction with IVF and surrogacy, individuals who desire to have genetically related children but cannot with currently practiced methods, would have a new avenue to procreate. Likewise, couples will have another ART option that will provide children with genetic traits reflective of both intended parents.

III. DEFINING PROCREATION AND PROCREATIVE LIBERTY

The purpose of this section is to circumscribe what constitutes procreation in both a medical and constitutional sense. In the first subsection, different biological reproduction systems are explored to define what procreation really means in nature. The second subsection aims to derive the meaning of procreative liberty from the Constitution, relying on relevant Supreme Court case law.

A. PROCREATION DEFINED BY BIOLOGY

Procreation is an essential element of life and thus a central concern in the field of Biology. Scientists and researchers devote their life's work to discover and unravel the mysteries of reproduction and development. Despite the complexity in the field, defining procreation from a biological perspective is straightforward and simple. Procreation is the passage of

44 California Institute of Regenerative Medicine, *supra* note 38.

45 Johns Hopkins University, *Biopsy Procedure*, JOHNS HOPKINS MEDICINE, http://www.hopkinsmedicine.org/neurology_neurosurgery/centers_clinics/cutaneous_nerve_lab/physicians/biopsy_procedure.html (last visited Feb. 14, 2017).

46 *See* California Institute of Regenerative Medicine, *supra* note 37. Shinya Yamanaka was the scientist to create iPSCs. His work was lauded by everyone in the biology field. For his efforts, he was awarded the Nobel Prize in Medicine in 2012.

47 *See* Sample, *supra* note 41.

48 Ringler, *supra* note 2.

genetic material from one organismal generation to the next, resulting in continuation of the organismal species.[49]

Biological procreation has two principle forms: sexual reproduction and asexual reproduction.[50] Sexual reproduction is the creation of a new organism by passing along recombined genetic material from two parental sources, denoted male and female.[51] In contrast, asexual reproduction is the creation of a new organism by the passage of identical genetic material from one parental source.[52]

Most vertebrate animals (e.g., mammals, birds, reptiles, and fish) procreate by sexual reproduction via the process of gamete fertilization. To ensure the level of genetic information stays consistent from one generation to the next, both the sperm cell and the egg cell contain half of the genetic information of the organism.[53] Upon fertilization, the genetic material of the sperm and the egg recombine together, formulating a new organism. All currently practiced forms of human reproduction, including currently practiced ARTs, require both sperm and ova and thus fall under sexual-reproduction procreation. Likewise, IVG involves the artificial production of either a male and female gamete for the use in IVF. Despite the unnatural process of IVG, it is certainly a form of sexual-reproduction procreation because fertilization and genetic recombination is required to create a new organism.

Asexual-reproductive procreation occurs naturally in many invertebrate organisms, such as bacteria, yeast, and some insects. In contrast, asexual-reproductive procreation is not natural for most vertebrate animals, which can only reproduce by sexual recombination.[54] However, with the advent of reproductive cloning, any animal can reproduce asexually via human manipulation. Even though human asexual reproduction is not natural, it is a form of biological procreation, which merely requires that genetic information be passed from generation to its progeny.

---

49 Ian Quigly, *Reproduction, Asexual and Sexual*, ENCYCLOPEDIA.COM, http://www.encyclopedia.com/doc/1G2-3400500288.html (last visited Feb. 14, 2017).

50 *Id*.

51 *Id*. Sexual recombination during fertilization requires genetic information from two sources. These two sources are denoted as opposite genders in the animal and plant kingdom. Female animals provide the egg or ovum and male animals provide the sperm. In contrast, female flowering plants provide the ovule and the male flowering plants provide the pollen. *See Types of Reproduction*, Skwirk Online Education, http://www.skwirk.com/p-c_s-4_u-88_t-176_c-563/types-of-reproduction/nsw/%20%20%20%20science/code-of-life-genetics-/reproduction (last visited Feb. 5, 2015).

52 Quigly, *supra* note 49. Some animals, like hermaphroditic pond snails, can provide both male and female gametes and thus can reproduce by "auto-fertilization." Despite the resulting progeny being a genetic clone of the parental source, it is still determined to be sexual reproduction because of the act of fertilization. *See* Robert Nordsleck, *The Reproduction of Gastropods*, THE LIVING WORLD OF MOLLUSCS, http://www.molluscs.at/gastropoda/index.html?/gastropoda/morphology/reproduction.html (last visited Feb. 5, 2015).

53 Quigly, *supra* note 49. Gametes only contain one copy of the genome and are denoted as "haploid cells." All other genetic-containing cells in the body contain two copies of the genome and are denoted as "diploid cells."

54 There are only a few exceptions to the rule that vertebrate animals reproduce sexually. For example, female hammerhead sharks can reproduce asexually. *See* Queen's University Belfast, *No Sex Please, We're Female Sharks*, SCIENCEDAILY (May 23, 2007), http://www.sciencedaily.com/releases/2007/05/070523072254.htm.

In sum, all currently practiced ARTs, reproductive cloning, and IVG are all modes of procreation from the biological perspective because they involve fertilization of an egg cell by a sperm cell. Thus, IVG, along with the currently practiced ARTs, would be classified as sexual procreation. Cloning, on the other hand, would be classified as asexual procreation because it bypasses fertilization and generates a progeny with the exact same genetic information.

B. PROCREATION DEFINED BY THE CONSTITUTION

Defining procreation from a constitutional perspective is an inquiry of whether procreation is a fundamental right, or at least a liberty interest, protected by the Fourteenth Amendment's substantive due process clause.[55] Supreme Court Justices have taken different approaches when defining fundamental rights through interpretation of the Constitutional text. Chief Justice Rehnquist, for example, believed fundamental rights are derived from "our Nation's history, legal traditions, and practices."[56] Justice Scalia takes a step further by defining a protected liberty interest narrowly, and then looks to historical traditions to determine if at "the most specific level . . . the asserted right can be identified."[57] If the right is identified, then it can be protected.[58] Otherwise, the right is not "ranked as fundamental" or "implicit in our concept of ordered liberty."[59] Justice Kennedy, however, finds that "[h]istory and tradition guide and discipline this inquiry but do not set its outer boundaries."[60] Instead of confining the liberty interest to a narrow interpretation, he defines the right broadly. For example, in *Obergefell v. Hodges*, Justice Kennedy inquired whether the right to marriage applies "with equal force to same-sex couples" as opposed to defining the liberty interest narrowly as the right of same-sex couples to marry.[61]

---

55 Not all liberty interests are deemed fundamental. Whereas a government cannot intrude on a fundamental right without a compelling interest, lesser liberty interests deserve some protection, but these interests must be balanced with legitimate state interests. *Cf.* Planned Parenthood v. Casey, 505 U.S. 833, 871 (1992) ("[A] woman's right to terminate her pregnancy . . . . is a rule of law and a component of liberty we cannot renounce. On the other side of the equation is the interest of the State in the protection of potential life.") (citations omitted), with Roe v. Wade 410 U.S. 113, 155 ("Where certain 'fundamental rights' are involved, the Court has held that regulation limiting these rights may be justified only by a 'compelling state interest.'") (citations omitted).

56 *E.g.*, Washington v. Glucksberg, 521 U.S. 702, 710 (1997). Certainly all the Justices of the Supreme Court look to history and tradition to guide their interpretation of Constitutional liberties, not just Chief Justice Rehnquist.

57 Michael H. v. Gerard D., 491 U.S. 110, 127 n. 6 (1989). Chief Justice Rehnquist joined Justice Scalia on this opinion including footnote 6. Justice O'Connor and Justice Kennedy joined Justice Scalia on the opinion, except they explicitly denounced Justice Scalia's methodology described in footnote 6. *Id.* at 132 ("I concur in all but footnote 6 of Justice Scalia's opinion. This footnote sketches a mode of historical analysis to be used when identifying liberty interests protected by the Due Process Clause of the Fourteenth Amendment that may be somewhat inconsistent with our past decisions in this area.") (citations omitted).

58 *Id.*

59 *Id*. (citing Snyder v. Massachusetts, 291 U.S. 97, 105 (1934); Palko v. Connecticut, 302 U.S. 319, 325 (1937)).

60 Obergefell v. Hodges 135 S. Ct. 2584, 2598 (2015). Justice Kennedy explicitly rejected due process inquiries that only consider history and tradition. "That method respects our history and learns from it without allowing the past alone to rule the present."

61 *Id*. at 2599.

1. Early Supreme Court Views on Procreation: Eugenics and Mandatory Sterilization

Procreation was not thought to be a fundamental liberty protected by the Constitution in the early twentieth century, or at least, it was never defined to be a liberty interest by the Court. In fact, early Court decisions implied that a state could limit an individual's ability to procreate for various state interests.[62] The excogitation behind the idea to limit procreation was based, at least in part, by the theory of eugenics, which suggests that human civilization would be enhanced by controlling reproduction, immigration, and elitist segregation.[63] Eugenics was popularized by the teachings of British philosopher Francis Galton and the rediscovery of Gregor Mendel's biological inheritance.[64] Famous geneticists, such as Harry Laughlin of Cold Spring Harbor Laboratories, lobbied state legislatures to adopt eugenic laws.[65] Virginia obliged and adopted an absurd law requiring compulsory sterilization of state institution patients that are "afflicted with hereditary forms of insanity that are recurrent, idiocy, imbecility, feeble-mindedness or epilepsy."[66] Several years after enacting the law, Virginia mandated the sterilization of a young woman named Carrie Buck, who was forced into a state institution because she was pregnant out of wedlock.[67] In *Buck v. Bell*, 274 U.S. 200 (1927), Ms. Buck challenged the constitutionality of the law in court. The case was appealed and subsequently litigated in front of the United States Supreme Court in 1927.[68] The Court found the law constitutional in an 8-1 decision.[69] The majority opinion, written by Justice Oliver Wendell Holmes, infamously declared, "three generations of imbeciles are enough," referring to Ms. Buck, her mother, and her daughter.[70] *Buck* highlights the pinnacle of the eugenics movement in the United States jurisprudence. Proponents of this movement strongly asserted that procreation should be denied to certain classes of people considered unfit.

---

62 *See* Buck v. Bell, 274 U.S. 200 (1927) (affirming mandatory sterilization of a Virginia citizen for a "feeble mind").

63 Steven Selden, *Transforming Better Babies into Fitter Families: Archival Resources and the History of the American Eugenics Movement, 1908-1930*, 149 PROC. AM. PHIL. SOC'Y 199, 201−02 (2005). Eugenics, as defined in the late nineteenth century, is the "self direction of human evolution."

64 *Id.* at 202.

65 Cold Spring Harbor Laboratory, *Eugenics Record Office*, COLD SPRING HARBOR LAB. - LIBRARY & ARCHIVES (2017), http://library.cshl.edu/special-collections/eugenics.

66 Virginia Foundation for the Humanities, *Primary Resource: Chapter 46B of the Code of Virginia § 1095h–m (1924)*, ENCYCLOPEDIA VA., http://www.encyclopediavirginia.org/Chapter_46B_of_the_Code_of_Virginia_ (last visited Feb. 14, 2017). The law was developed based on theory of Eugenics, but had no basis in science. Assigning "insanity that are recurrent, idiocy, imbecility, [and] feeble-mindedness" to heritable genetics is just inaccurate and completely unfounded.

67 Kimberly M. Mutcherson, *Procreative Pluralism*, 30 BERKELEY J. GENDER L. & JUST. 22, 55 (2015).

68 *See* Buck, 274 U.S. at 205.

69 *Id*.

70 *Id*. at 207. As it turned out, J. Holmes was wrong. Ms. Buck, her mother and her daughter were mentally healthy and did not suffer from "imbecility." For a detailed review on the *Buck* case and the individuals involved in relation to the Eugenics movement, *see* Paul A Lombardo, THREE GENERATIONS, NO IMBECILES: EUGENIC, THE SUPREME COURT AND BUCK V. BELL (2008).

2. Skinner v. Oklahoma: Derivation of the Right to Procreate

Fifteen years after *Buck*, the issue of procreation came before the Supreme Court again in the landmark case *Skinner v. Oklahoma*, 316 U.S. 535 (1942).[71] This time, the Court held unconstitutional an Oklahoma law that permitted the compulsory sterilization of "habitual criminals," but excluded white-collar crimes.[72] The Oklahoma law was struck down on equal protection grounds, but Justice Douglass writing for the majority declared the right to reproduce as "one of the basic civil rights of man."[73]

At the time of the Court's decision in *Skinner*, it is likely that procreative liberty encompassed the right to procreate by natural coitus as this was the most common form of reproduction. It is virtually certain that Justice Douglass was not considering any mode of assisted reproduction when he articulated this right. While artificial insemination existed in the 1940s, the practice remained unpopular until the sperm-bank industry expansion in the 1970s.[74] Therefore, an open question remains — whether ARTs are forms of procreation protected by the Constitution. Furthermore, if certain modes of assisted reproduction are protected, it is also uncertain whether a state could a limit their use with a legitimate interest.

3. Interpretive Theories of Procreative Liberty

Justice Douglass in *Skinner* made certain that procreative liberty includes the right to coital reproduction.[75] However, the Supreme Court has still not identified the bounds of what is encompassed in procreative liberty. This inquiry becomes even more difficult with novel reproductive technologies that have never been considered in relation to Constitutional guarantees. A narrow interpretation of procreation would limit the right to mere coital reproduction, as this was clearly Douglas's intent in *Skinner*. However, different interpretative theories could be used to clearly delineate the protected interests of procreative liberty.

By looking at historical law, the Court could invoke several interpretive theories to define liberty interests as understood in the context of the Constitution. These interpretive theories include textualism and originalism, including authorial original intent and audience interpretative meaning. Textualism is the lexical meaning, or the dictionary definition, of

71 *See* Skinner v. Oklahoma, 316 U.S. 535 (1942).

72 *Id*.

73 *Id*. at 541.

74 Ombelet & Van Robays, *supra* note 8, at 140. One of the reasons artificial insemination was not popular was because there was no way to preserve the viability of the sperm. In 1953, Dr. Jerome Sherman was one of the first to introduce a cryopreservation methodology that worked well. While the development of a protocol to cryopreserve sperm seems trivial, it revolutionized the AI practice. Before cryopreservation, the sperm donor had to prepare his sample within a few hours of the AI procedure to ensure the sperm cells were viable. Thus, donors, recipients, and doctors had to prearrange all the details the procedure. Cryopreservation allowed the donor to prepare his sample at his convenience and the recipient to receive the sample at her convenience, possibly even years after the donation occurred. Nevertheless, the principle reason for the sperm-bank industry expansion in the 1970s was the development of IVF. New protocols to prepare sperm were created for IVF, and these protocols in turn enhanced the AI industry. *See also* G. Bernstein, *The Socio-Legal Acceptance of New Technologies: A Close Look at Artificial Insemenation*, 77 WASH. L. REV. 1035, 1083−84 (2002).

75 Skinner, 316 U.S. at 541.

a term.[76] Courts often use a lexical interpretation to confine a liberty interest to a precise construction at a certain in time, and perhaps without any regard to the intent of the Framers.[77] For example, in *Obergefell*, Chief Justice Roberts used both the first editions of American Dictionary and Black's Law Dictionary to define "marriage" in the nineteenth century.[78]

Originalism is the interpretation of the Constitution or the Fourteenth Amendment at the time it was enacted.[79] Thus, authorial original intent is an inquiry into what the Framers intended for the liberty interest to include.[80] Similarly, audience interpretative meaning is an investigation into how Americans understand liberty.[81] Regarding authorial intent, it is difficult to really decipher the intent of the Framers in the late nineteenth century as noted by Chief Justice Warren in *Loving v. Virginia*, 388 U.S. 1 (1967).[82] Warren stated, "although these historical sources 'cast some light' they are not sufficient to resolve the problem; '[at] best, they are inconclusive.'"[83] Instead of looking at the Framers' intent directly, many will gather circumstantial evidence to interpret how the American audience would understand the liberty interest at the time the Fourteenth Amendment ratification. Justice White applied this interpretation in *Bowers v. Hardwick*, 478 U.S. 186 (1986), to deny "a fundamental right to homosexuals to engage in acts of consensual sodomy."[84] *Bowers* supported his opinion stating, "In 1868, when the Fourteenth Amendment was ratified, all but 5 of the 37 States in the Union had criminal sodomy laws."[85]

The Court has also looked to America's history and tradition when determining whether potential liberty interests deserve protection under the Due Process Clause. One way for the Court to inquire into history and tradition is to analyze state legislature-derived laws and common law over a period of time to establish how exactly Americans value a certain interest.[86] For example, when the Court held there was not a constitutional right to physician-assisted suicide in *Washington v. Glucksberg*, 521 U.S. 702 (1997), it declared that Anglo-American common law has "punished or otherwise disapproved of . . . assisting suicide" for over 700 years and rendering such assistance has been reaffirmed as a crime in virtually every

76 William N. Eskridge, Jr., *The New Textualism*, 37 UCLA L. REV. 621, 623 (1990).

77 *See id*. at 623-24 (1990) ("The new textualism posits that once the Court has ascertained a statute's plain meaning, consideration of legislative history becomes irrelevant.").

78 *Obergefell*, 135 S. Ct. at 2614 (Roberts, C.J., dissenting) (citations omitted) ("In his first American dictionary, Noah Webster defined marriage as 'the legal union of a man and woman for life,' . . . . The first edition of Black's Law Dictionary defined marriage as 'the civil status of one man and one woman united in law for life.'").

79 *See* RANDY E. BARNETT, RESTORING THE LOST CONSTITUTION: THE PRESUMPTION OF LIBERTY 94-95 (Princeton U. Press 2013).

80 *See id*. at 94 ("[O]riginal intent originalism seeks the intentions or will of the lawmakers or ratifiers").

81 *See id*. at 94−95 ("[O]riginal meaning originalism seeks the public or objective meaning that a reasonable listener would place on the used on the constitutional provision at the time of its enactment.").

82 *See* Loving v. Virginia, 388 U.S. 1, 9 (1967).

83 *Id.*

84 Bowers v. Hardwick, 478 U.S. 186, 192 (1986).

85 *Id.* at 192−93.

86 *See*, *e.g*., Glucksberg, 521 U.S. at 711, 716; *see also Cruzan*, 497 U.S. at 270−71 (using common law to define the right to refuse treatment).

state.[87] Justice White and Justice Scalia in the dissent have articulated similar arguments in *Bowers* and *Lawrence v. Texas*, 539 U.S. 558 (2003).[88]

To determine what procreative liberty entails, the Court could look to the historical lexical meaning of procreation. The term procreation, as defined by Noah Webster in the first American dictionary, is "the act of begetting; generation and production of young."[89] The second edition of Black's Law Dictionary has a very similar definition and defines procreation as "[t]he generation of children."[90] In both dictionaries, it is apparent that the term was not narrowly defined by the physical act of coitus, but broadly defined by any act of generating offspring. Thus, by the lexical definition alone, procreative liberty would include any currently practiced ART, reproductive cloning, and IVG.

The Court could also apply an originalism analysis to determine the metes and bounds of procreative liberty. While it would be near impossible to determine what the Fourteenth Amendment Framers' thought process regarding procreation liberty would be, it is assuredly true that the Framers never contemplated what procreation entails. When the Fourteenth Amendment was ratified in 1868, human AI was still in the experimental stage, and thus, it is unlikely that a Framer considered procreation to be anything other than begetting children through natural coitus.[91] The analysis would be virtually the same for the American audience. It seems rather unlikely that an average American would suggest that procreative liberty includes any form of assisted reproduction. Because of the lack of assisted reproductive procedures during the ratification of the Fourteenth Amendment, a justice relying on originalism would probably find that procreative liberty is limited to natural coitus between a man and woman, as this was the dominant form of procreation.

It would be difficult for the Court to use history and tradition to confer protection, or a lack of protection, of assisted reproduction procedures. Although the history of AI goes backs hundreds of years, the difficulty of the procedure rendered it an afterthought in American history and jurisprudence until the advances of the technology in the mid-twentieth century expanded its utility.[92] In addition, IVF wasn't developed until the late 1970s.[93] Therefore, AI, IVF and all subsequent developments in assisted reproduction have not existed long enough to be considered

87 *Id.*

88 *See Bowers*, 478 U.S. at 194; Lawrence v. Texas, 539 U.S. 558, 593 (2003) (Scalia, J., dissenting).

89 Noah Webster, *Procreation*, WEBSTER'S DICTIONARY 1828 - ONLINE EDITION, http://webstersdictionary1828.com/Dictionary/procreation (last visited Feb. 14, 2017).

90 Henry C. Black, A LAW DICTIONARY (2nd ed. 1910) 950.

91 *See* Ombelet & Van Robays, *supra* note 8, at 139.

92 *See id*. at 139−140; Gaia Bernstein, *The Socio-Legal Acceptance of New Technologies: A Close Look at Artificial Insemenation*, 77 WASH. L. REV. 1035, 1060−61 (2002) (noting that the practice of AI was not widespread).

93 Susan L. Crockin & Gary A. Debele, *Ethical Issues in Assisted Reproduction: A Primer for Family Law Attorneys*, 27 J. AM. ACAD. MATRIMONIAL L. 289, 291−92 (2015).

"deeply rooted in this Nation's history and tradition."[94] Nevertheless, the Court could examine recent history to get a relatively current perception of whether procreation liberty includes assisted modes of reproduction.

By looking to recent state-legislature derived laws and common law, the Court would find that both AI and IVF met some resistance in the mid-twentieth century.[95] Despite some initial qualms, these procedures did not become subject to major regulations and have remained lightly regulated by either the federal or state governments.[96] Therefore, a justice would not likely find concrete facts that demonstrate currently practiced ARTs were traditionally and continually disapproved of in American jurisprudence.[97] However, a justice probably could use a similar analysis to determine that reproductive cloning was explicitly disapproved because it has been banned in eighteen states.[98] In consideration of these recent regulations, a justice could conclude that the currently practiced ARTs weigh in favor of protection as a liberty interest, whereas reproductive cloning weighs against protection. However, because "[h]istory and tradition guide and discipline this inquiry but do not set its outer boundaries" some justices would probably examine more than the lexical definition, Framers' intent, and tradition to determine whether any method of assisted reproduction deserves protection under the Fourteenth Amendment, as this is just.[99]

4. Defining Procreative Liberty in Light of Other Liberty Interests

Based on the foregoing analysis, it is difficult to predict whether any or all ARTs would fall under procreative liberty and be Constitutionally protected. Likewise, IVG is a completely novel ART, meaning there is even less legal or social history and tradition to suggest that it would be protected. Narrow interpretations of procreative liberty relying solely on originalism and deeply rooted history and tradition would probably exclude both cloning and IVG. However, as Justice Kennedy has suggested, "History and tradition are the starting point, but not in all cases the ending point of the substantive due process inquiry."[100]

A procreative liberty interest can be further supported by other constitutional liberties inherent in this intimate act. For example, intentional procreation innately invokes individual autonomy and privacy in decision-making. As Justice Brennan points out, "[i]f the right of privacy

94 Moore v. E. Cleveland 431 U.S. 494, 503 (finding "that the Constitution protects the sanctity of the family precisely because the institution of the family is deeply rooted in this Nation's history and tradition.")

95 *See* Bernstein, *supra* note 92, at 1076 (noting AI from an anonymous Donor (AID) was found to be against "public policy and good morals" in an Illinois court); & Debele, *supra* note 91 at 291-92 (noting that the federal government's failed to support IVF).

96 Crockin & Debele, *supra* note 93 at 291.

97 A few states such as New Jersey and Mississippi have laws regarding parental rights in gestational surrogacy that limit the contractual freedom of intended parents. These laws will be discussed in greater detail in § IV(A)(2) of this note.

98 Those states are: Arizona, Arkansas, California, Connecticut, Iowa, Indiana, Maryland, Massachusetts, Michigan, Missouri, North Dakota, New Jersey, Rhode Island, South Dakota, Florida, Georgia, and Virginia.

99 Obergefell, 135 S. Ct. at 2598.

100 Cnty. of Sacramento v. Lewis, 523 U.S. 833, 857 (1998).

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."[101] Likewise, the right of procreation also implicates family formation and child rearing, which the Court has "consistently acknowledged a private realm of family life which the state cannot enter."[102] In addition, Justice Kennedy has ascribed the right of procreation as a basis for protecting the right to marry.[103] By inverting Kennedy's reasoning, one could argue that the right to procreation is solidified when combined with marriage.[104] Therefore, the Court has provided a strong foundation of liberty interests to support the right to procreate. This foundation suggests that noncoital forms of procreation would necessarily be protected as well. Individuals who cannot procreate by coital means can only invoke their procreative liberty with assisted reproduction. As bona fide modes of assisted reproduction, both reproductive cloning and IVG, along with all other ARTs, are presumably constitutional along with all forms of currently practiced assisted reproduction under this expansive fundamental right inquiry. However, as the Court has noted, this presumption can be rebutted with "legitimate interests" of the state.[105] In the next section, the currently practiced ARTs, reproductive cloning, and IVG will be examined to determine if a state can invoke any constitutionally adequate interest to rebut their presumed constitutionality.

IV. STATE INTERESTS AND REGULATIONS OF ASSISTED REPRODUCTION

If states desired, they could regulate assisted reproduction, including IVG, in a number of ways. The simplest and most straightforward regulation is to ban assisted reproduction procedure completely. Several states have taken this approach with reproductive cloning.[106] Alternatively, they could impose burdens, limitations, or requirements on the practice, like many have placed on abortion. Although assisted reproduction remains a highly unregulated area, this section explores potential reasons why a state may implement these restrictive regulations.[107]

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

102 Moore, 431 U.S. at 499. (citing Meyer v. Nebraska, 262 U.S. 390, 399-401 (1923); Pierce v. Society of Sisters, 268 U.S. 510, 534-535 (1925)) (internal quotations omitted).

103 Obergefell, 135 S. Ct. at 2600.

104 While the right to procreate is not necessarily intertwined with marriage, it can arguably provide a basis for each other when combined. However, the right to procreate is not less important without marriage, just as J. Kennedy assured "the right to marry is [not] less meaningful for those who do not or cannot have children." Obergefell, 135 S. Ct. at 2601.

105 *See* Casey, 505 U.S. at 875−76.

106 Nikas & Bordlee, *supra* note 98, at 2.

107 Crockin & Debele, *supra* note 93, at 295−96.

A. REGULATING CURRENTLY PRACTICED ARTS AND REPRODUCTIVE CLONING: ANALYZING STATE LAWS AND STATE INTERESTS

1. The Lightly Regulated ARTs: Artificial Insemination, In Vitro Fertilization, Gamete Intrafallopian Transfer & Preimplantation Genetic Testing

When AI was gaining popularity in twentieth-century America, it was met with a fair amount of resistance.[108] Development, experimentation, and procedures were performed in secrecy for fear of the appearance of impropriety.[109] These fears developed from moral condemnation for violating social norms that tied procreation with natural coitus.[110] In addition, opponents of AI believed that the procedure was indirectly associated with adultery and illegitimacy and thus lacked traditional family values.[111] By the 1950s, women began to accept the procedure as an acceptable and even preferable method to adoption.[112] Even as the procedure gained acceptance with the public, it was still viewed with disdain in some courts of law. For example, an Illinois and New York court each found that a woman committed adultery and declared her child illegitimate because the child was conceived by AI with an anonymous donor, even though her husband had consented.[113] These same views were advocated in law review articles even in late 1960s.[114] Despite the rejection of AI by legal and academic authorities, the medical field embraced the technology and considered the procedure an ethical and moral medical treatment for the infertile.[115] By the mid-1960s and 1970s, state legislatures began passing laws that granted legitimacy to children conceived by AI.[116] In addition, new laws also granted the husband of women who procreate via AI paternal rights to the child, even if he was not genetically related.[117] Thus, AI became a well-respected alternative of natural coitus.

---

108 Bernstein, *supra* note 92 at 1059.

109 *Id*.

110 *Id*.

111 *Id*.

112 *Id*. at 1072.

113 *Child Conceived by A.I.D. is Illegitimate but Consenting Husband Held Liable for Support*, 64 COLUM. L. REV. 376, 376-79 (1964) (citing Doornbos v. Doornbos 23 U.S.L.W. 2308 (Ill. Super. Ct. 1954); Gursky v. Gursky, 242 N.Y.S. 2d 406 (Sup. Ct. 1963).

114 *See* George P. Smith, *Through a Test Tube Darkly: Artificial Insemination and the Law*, 67 MICH. L. REV. 127, 128 (1968) (noting that the central concerns of artificial insemination are adultery, illegitimacy, and genetic determinism); Walter Wadlington, *Artificial Insemination: The Dangers of a Poorly Kept Secret*, 64 NW. U. L. REV. 777, 779 (1969) (suggesting that children procreated via artificial insemination are probably illegitimate).

115 Bernstein, *supra* note 92 at 1079.

116 *Id*. at 1084. See also Uniform Law Commission, *Why States should adopt UPA*, THE NAT'L CONFERENCE OF COMMISSIONERS ON UNIFORM ST. LAWS, http://www.uniformlaws.org/Narrative.aspx?title=Why%20States%20Should%20Adopt%20UPA (last visited Feb. 14, 2017); Uniform Parentage Act § 5 (1973). The Uniform Parentage Act of 1973, which was adopted in nineteen states, was a major driving force in getting states to sanctify AI. Section 5 of the model legislation granted husbands of women "inseminated artificially with semen donated by a man not her husband" natural father treatment, if the procedure was performed under the supervision of a licensed physician and the husband and wife consented in writing. Likewise, the "donor of semen" was "treated in law in law as if he were not the natural father."

117 *Id*.

Similar resistance and concerns were also present when the IVF procedure was introduced. As AI was gaining acceptance in the 1970s, scientists and doctors were experimenting to perfect IVF in the midst of much controversy.[118] Unlike the support from the medical community regarding AI, the community was very concerned about the safety of the IVF procedure, which prompted the American Medical Association to impose a moratorium on the procedure.[119] During this time, the national government was also very skeptical and debated whether to regulate, ban, or fund the procedure.[120] As Congress debated, fertility doctors continued to experiment, leading to the first successful IVF pregnancy in England in 1978.[121] Three years later, American physicians successfully mastered the procedure resulting in the first American IVF-derived child.[122] Ultimately, Congress never passed any statutory regulations or publicly funded assisted reproduction program.[123] The stalemate in Congress meant new advances in reproductive technology along with the ethical implications of ARTs were left to the private sector.[124] As time has passed, Congress and state legislators have not intervened, leaving the ART industry to regulate itself.[125] Therefore, IVF and subsequent forms of ARTs were generally regarded as acceptable medical procedures to conceive and beget children.

Despite a lack of regulation from the government, some individuals concern themselves with the fractured, "unnatural" mechanisms to procreate. These concerns are often rooted in moral objections to certain necessities in assisted reproduction, such as the destruction of unused embryos in IVF or the lack of intimacy when intended parents choose to reproduce by an ART.[126] While certain conservative, pro-life states may want to ban or limit AI or IVF on moral grounds, the Supreme Court has declared that morality is not a compelling or legitimate interest.[127]

Several states have successfully limited the ability to get an abortion.[128] These regulations are often supported by the states' legitimate interest in the health of the mother and the potential life of the fetus.[129] However, these legitimate interests do not protect unviable fetuses.[130] By current technology standards, all IVF derived embryos are unviable, so a state cannot have a legitimate interest in protecting these embryos.[131] Thus, a

118 WGBH Educational Foundation, *Timeline: The History of In Vitro Fertilization*, PBS, http://www.pbs.org/wgbh/americanexperience/features/timeline/babies/ (last visited Feb. 14, 2017).
119 *Id.*
120 Crockin & Debele, *supra* note 93, at 291.
121 *Id.*
122 *Id.*
123 *Id*. at 292.
124 *Id*.
125 *Id*. at 296.
126 Mutcherson, *supra* note 67, at 68.
127 Lawrence, 539 U.S. at 577−78 (quoting J. Stevens dissent in Bowers v. Hardwick).
128 *An Overview of Abortion Laws*, GUTTMACHER INST. (Feb. 1, 2017), https://www.guttmacher.org/statecenter/spibs/spib_OAL.pdf.
129 Casey, 505 U.S. at 846.
130 *Id*. at 870.
131 As the field of ART advances, it is certainly likely that entire pregnancies could occur entirely out of the womb and in an artificial uterus (e.g. neonatal incubator). Thus, all embryos, including IVF embryos, would be viable by the current definition laid out in Planned Parenthood v.

state would not be able to justify any regulation limiting AI, IVF, GIFT, or PGT with similar interests.

Preimplantation genetic testing offers an additional level of inquiry because it involves the selection of some embryos over other embryos based on genetic results.[132] The principal application of PGT is to test for chromosomal or genetic disorders to ensure implanted embryos are healthy.[133] Thus, this procedure is likely to be popular with individuals requiring IVF to procreate, along with individuals with a congenic disorder that they do not wish to pass on to their children.[134] However, as the field of genetics progresses, prospective parents could use PGT to select embryos with the most desired genetic qualities.[135] In theory, using PGT with the intent of concieving children with superior qualities could be a form of neo-Eugenics, in essence creating a superclass of humans. If the field of assisted reproduction crosses that line, a state may have a legitimate interest in preventing such genetic predeterminism. Furthermore, a state may also want to limit the procedure to prevent any subsequent individual commandeering to protect the child's psychological well-being. As of yet, the Supreme Court has not considered genetic predeterminism, so it may be a legitimate state interest that the Supreme Court would recognize. Regarding individual commandeering, the Court has declared "the Fourteenth Amendment protects the fundamental right of parents to make decisions concerning the care, custody, and control of their children."[136] Therefore, if a state wanted to regulate PGT, commandeering is probably not a legitimate state interest, but an open question remains whether genetic predeterminism could be a legitimate interest.

2. The Moderately Regulated ART: Surrogacy, Exemplified by New Jersey Law

A common concern affecting several state legislatures is the issue of surrogacy.[137] In New Jersey, for example, Governor Christie has twice rejected a bill that would clearly define the parental rights of intended

Casey and would be subject to state regulations. Certainly, the Supreme Court will have to readdress this issue when the time comes.

132 *Preimplantation Genetic Diagnosis: PGD*, AM. PREGNANCY ASS'N (Sept. 2, 2016, 7:29 AM), http://americanpregnancy.org/infertility/preimplantation-genetic-diagnosis/.

133 *Id.*

134 Congenic diseases are passed down through the genes of an individual. Individuals with certain autosomal dominant diseases, such as Huntington's Disease, can expect fifty-percent of their children to carry the disorder. Thus, IVF in conjunction with PGT can assure that certain patients' children will be free of the disorder by selecting only the untainted embryos.

135 For instance, certain genetic markers can denote certain physical and mental features, such has eye color, hair color, size, and cognitive features.

136 Troxel v. Granville, 530 US 57, 66 (2000) (striking down a Washington state law that allowed third parties to petition for visitation rights). If the Court believes parents presumptively act in the best interests of the child, it is likely that the Court would also find that intended parents of prospective children would also have the best interests for that child.

137 Genevieve Plaster, *Surrogacy: The Commodification of Motherhood and Human Life*, CHARLOTTE LOZIER INST. (June 1, 2015), https://lozierinstitute.org/surrogacy-the-commodification-of-motherhood-and-human-life/.

parents when using a surrogate.[138] By vetoing the bill, New Jersey's law regarding surrogacy continues to be governed by the controversial state supreme court case *In re Baby M*, 537 A.2d 1227 (1988), which granted parental rights to the intended father and traditional surrogate mother, but not to the intended mother.[139] In Christie's veto statement, he defended the veto with morality, declaring he takes "seriously the need to guard against any societal deprecation of the miracle of life."[140]

The New Jersey example characterizes the reluctance of certain states to embrace certain ARTs because they may fear it hinders the sanctity of life. However, as stated previously, morality is not a legitimate state interest. Therefore, if this issue were to be tried in front of the Supreme Court, New Jersey would need to defend their current state of law with a different legitimate interest. Perhaps, the state would argue that surrogacy is not in the best interest of the child or that it exploits the surrogate and women generally.[141] As previously mentioned, the Supreme Court found that parents presumptively act in the best interests of the child, thus any argument to the contrary is not likely to be legitimate.[142] In addition, if the Fourteenth Amendment presumptively protects surrogacy as a form of procreative liberty, then the state would have the burden of proving the factuality of the claim that surrogacy exploits women. The prevalence of surrogacy and lack of surrogates complaining of the exploitation suggest this is likely a difficult claim to prove. Therefore, New Jersey's current law regarding surrogacy is probably unconstitutional. Without legitimate state interests, the right of intended parents to use traditional or gestational surrogacy is constitutional and protected by the Fourteenth Amendment.

3. The Heavily Regulated ART: Reproduction Cloning

Eighteen states have passed a law banning reproductive cloning.[143] On a national level, Congress has initiated legislation to ban reproductive cloning four separate times.[144] The House of Representatives ratified the first two bills in 2001 and 2003, but the Senate never acted upon them.[145] Congress's second two attempts to ban cloning never made it to a vote.[146]

---

138 Susan K. Livio, *Christie again vetoes bill regulating surrogate parenting pacts in N.J.*, NJ.COM (June 30, 2015), http://www.nj.com/politics/index.ssf/2015/06/christie_again_vetoes_bill_regulating_surrogate_pa.html.

139 *Id.*; See In re Baby M, 537 A.2d 1227 (1988).

140 Livio, *supra* note 138.

141 Baby M, 537 A.2d at 425.

142 Troxel, 530 U.S. at 66.

143 Nikas & Bordlee, *supra* note 98, at 2.

144 Human Cloning Prohibition Act of 2001, H.R. 2505, 107th Cong.; Human Cloning Prohibition Act of 2003, H.R. 534, 108th Cong.; Human Cloning Prohibition Act of 2007, H.R. 2560, 110th Cong.; Human Cloning Prohibition Act of 2012, H.R. 2164, 113th Cong.

145 *H.R. 2505 (107th): Human Cloning Prohibition Act of 2001*, GOVTRACK.US, https://www.govtrack.us/congress/bills/107/hr2505 (last visited Feb. 15, 2017); *H.R. 534 (108th): Human Cloning Prohibition Act of 2003*, GOVTRACK.US, https://www.govtrack.us/congress/bills/108/hr534 (last visited Feb. 15, 2017).

146 *H.R. 2564 (110th): Human Cloning Prohibition Act of 2007*, GOVTRACK.US, https://www.govtrack.us/congress/bills/110/hr2564 (last visited Feb. 15, 2017); *H.R. 6623 (112th): Human Cloning Prohibition Act of 2012*, GOVTRACK.US, https://www.govtrack.us/congress/bills/112/hr6623 (last visited Feb. 15, 2017).

Despite Congress's failures to enact a ban, the Food and Drug Administration claims to have federal jurisdiction over reproductive cloning and would require an investigational new drug application to implement any procedure.[147] Some of the state interests behind these regulations were to ensure the safety and to protect the future interests of a child.[148] Undoubtedly, early studies of animal clones such as Dolly the sheep provided a basis for these fears. Dolly's short telomeres and early arthritis were not normal for a sheep her age.[149] In addition, the cloning bans were likely coupled with ulterior motives. Cloning was considered immoral and cloned progeny would likely be perceived as "repugnant" or "less than human" due to the vary nature of how they were created.[150] A state may also have an interest in banning cloning in order to prevent genetic predeterminism.[151] Because reproductive cloning is the creation of a genetically identical twin, it is inherently a choice of which genetic information to pass along.

Under a broad definition of procreative liberty, the Fourteenth Amendment would presumably protect reproductive cloning. Therefore, legitimate state interests must support any ban. As discussed previously, morality and the child's best interests to prevent psychological damage will most likely not prevail. However, reproductive cloning has some valid medical concerns regarding the health of the future child. Indeed, a recent study performed by the FDA found cloning, as compared to other ARTs, result in significant adverse health outcomes for cattle and sheep.[152] These health concerns, in conjunction with the genetic predeterminism interest, may be legitimate enough to support a state's prohibition on reproductive cloning.

B. POTENTIAL REGULATION OF IN VITRO GAMETOGENESIS

In vitro gametogenesis is arguably the most exciting advance in the field of assisted reproduction since IVF. It provides hope and opportunity for a class of individuals to procreate that currently practiced ARTs simply cannot. Based on a Justice Kennedy style analysis, the Fourteenth Amendment presumptively protects IVG; however legitimate state interests could limit its practice.

147 *Cloning*, U.S. FOOD & DRUG ADMIN., http://www.fda.gov/BiologicsBloodVaccines/CellularGeneTherapyProducts/Cloning/default.htm (last visited Feb. 5, 2017).

148 Alissa Johnson, *Attack of the Clones*, ST. LEGISLATURES, Apr. 2003, at 30, 31−32.

149 *Dolly The Sheep,* THE ROSLIN INST. AT THE U. OF EDINBURGH, http://www.roslin.ed.ac.uk/public-interest/dolly-the-sheep/a-life-of-dolly/ (last visited Feb. 15, 2017)..

150 Michael H. Shapiro, *I Want A Girl (Boy) Just Like The Girl (Boy) That Married Dear Old Dad (Mom): Cloning Lives*, 9 S. Cal. Interdisc. L.J. 1, 12−14 & 36−40 (1999).

151 Robertson, *supra* note 4, at 367.

152 U.S. FOOD & DRUG ADMIN., ANIMAL CLONING: A RISK ASSESSMENT, at 328 (Jan. 8, 2008), available at http://www.fda.gov/downloads/AnimalVeterinary/SafetyHealth/AnimalCloning/UCM124756.pdf (last visited Feb. 15, 2017). However, the same study found no adverse outcomes in goats or swine.

1. State's Potential Interests in Regulating In Vitro Gametogenesis

In some regards, IVG is more similar to reproductive cloning than currently practiced ARTs, and vice versa. This section compares IVG to both currently practiced ARTs and cloning to predict whether IVG would be constitutionally protected.

One area that IVG and reproductive cloning share strong similarities is the amount of human manipulation in the procedure. Of the ARTs currently in practice, IVF is arguably the most manipulated procedure.[153] However, the basic process of IVF can be summarized in three simple steps: (1) acquire individuals' sperm and ova, (2) mix the sperm and ova in a dish to allow fertilization, and (3) localize the fertilized embryo into the uterus to allow self-implantation and subsequent development.[154] Because the sperm and ova are produced naturally and recombine naturally, it is arguable that no biological process is manipulated and merely the location of the process has changed. In contrast, reproductive cloning involves the complex technique of SCNT.[155] By physically removing the nucleus from a donor cell and inserting it into an enucleated ovum, the genetic material tricks the egg into thinking it has been fertilized and begins embryonic development.[156] Thus, this procedure totally circumvents the entire process of sexual recombination. The exchange of nuclei is clearly a human intervention and manipulation of a biological process. Likewise, the procedure of IVG requires an extraordinary amount of care and control at the hands of the technician to procure gametes from a patient's skin cells.[157] The technology requires conversion of skin cells into pluripotent cells and subsequently into gametes, all manipulated by modulating the expression of "factors" in the cell.[158] Thus, the amount of biological manipulation in IVG is probably greater than the amount of manipulation in SCNT. Because of the great amount of human intervention and manipulation, it's extremely likely that IVG would be objected to on moral and religious grounds. However, as discussed previously, morality interests would not be legitimate.

As discussed in Section IV(A), genetic predeterminism is one possible legitimate interest a state may proffer to ban reproductive cloning. However, this same interest cannot be invoked for IVG. The process of IVG replicates currently practiced ARTs and natural coitus in this regard.

153 IVF is the most manipulative procedure in the sense of the amount manipulation performed by doctors and technicians to perform the procedure.

154 *See In Vitro Fertilization (IVF)*, *supra* note 12.

155 *Somatic cell nuclear transfer*, *supra* note 24.

156 *Id*.

157 *See supra* Section II (C), which explains the extensive steps of IVG.

158 In biology, there are proteins called "factors" (e.g. transcription factors) that have the ability to regulate and alter the expression of hundreds of other proteins. For example, Sox17 is a transcription factor, which was critical to generation of primordial germ cells. Once the protocol, including the identification of any factors in addition to Sox17 that are necessary to create gametes is delineated and optimized, the author predicts, based on his own experience in iPSC experimental work, that it would take approximately four to six months to create mature sperm and ova. Because of the long procedure with extreme manipulation, several procedural checks would need to be implemented to ensure health and competence of the cells before use in an IVF procedure.

The IVG procedure would generate thousands to millions of sperm or ova, each with a unique, unidentified genome.[159] Thus, when the IVG-generated gametes recombine to procreate, there is no selection of a particular genome. Because there is no selection of which genomes to recombine, the procedure in its basic form does not entail genetic predeterminism.[160]

Human IVG is a novel procedure, and the effects on patients are unknown. The uncertainty surrounding the health of children and surrogate procured by IVG may be a legitimate state interest to ban the procedure. Indeed, the studies demonstrating the health complications with reproductive cloning would cause some to pause and consider the ramifications of permitting IVG, a procedure with unknown consequences.[161] However, as mentioned in Section IV(A), many legislatures and medical experts feared IVF could have detrimental effects on the offspring.[162] These fears culminated in moratoriums and delays in the United States despite the fact that IVF is a safe procedure with little to no effect on the resulting children or surrogates.[163] Therefore, the uncertainty of health effects should not be a legitimate purpose when implementing proper regulation can mitigate the health and safety concerns with this procedure.

In sum, states probably do not have a legitimate interest in banning the procedure of IVG. On its face, there are no genetic predeterminism concerns. Furthermore, if states are concerned about the amount of human manipulation in the procedure, then they will have to invoke a legitimate interest that is not morality. And while the uncertainty of potential negative health effects is possibly of concern, proper regulatory controls to determine the positive and negative effects would be a better resolution.

2. State's Potential Interest in Regulating In Vitro Gametogenesis in Combination with Genetic Engineering

In vitro gametogenesis, on its face, is the mere generation of gametes in order to perform IVF. The two major differences between IVG gametes and naturally created gametes are the source and location of maturation.[164] Natural gametes, of course, are derived from and developed in the ovaries and testes. IVG gametes, on the other hand, are derived from adult skin cells and created in the laboratory. However, beyond those major distinctions, IVG gametes and natural gametes would be identical. Both

159 Each gamete would contain 50% of the genetic material of donor. The precise identity of which genes were derived maternally and paternally would be unknown, as with natural gametogenesis.

160 IVG could be manipulated to modify and even select certain traits before fertilization when used in combination with genetic editing tools. But, on its face, IVG does not predetermine the genetic traits of the resulting child.

161 *See* U.S. FOOD & DRUG ADMIN., *supra* note 152, at 328.

162 WGBH, *supra* note 118.

163 *Id*.

164 See Section II(C) for detailed explanation of IVG. In short, IVG gametes are sourced from a patient's skin cells and generated in a laboratory dish. In contrast, naturally occurring gametes are generated in the ovary or testes through natural development.

would have identical genetic and functional capabilities.[165] Therefore, unadulterated IVG gametes should garner similar scrutiny as AI, IVF, and any other currently practiced ART.

Because IVG gametes are generated in a laboratory, they can be subject to further manipulation. Of principal concern would be the combination of IVG with genetic engineering. Genetic engineering is the modification of genetic material (DNA) by human manipulation to of produce new substances or improving functions of existing organisms.[166] Therefore, one could modify the DNA of IVG gametes with intent to achieve certain genetically linked function(s) in the prospective child.

Genetically modified IVG gametes are a double-edged sword. On the one hand, gene editing could be used to edit out, or correct, disease-causing mutations.[167] Thus, an individual with a congenic disorder such as, for example, Duchenne Muscular Dystrophy, could genetically modify IVG gametes and correct the genetic abnormality to ensure her progeny are not afflicted with the disease. On the other hand, gene editing could be used to create "designer babies" whose genes have been edited to make them smarter, stronger, or more beautiful.[168]

A state may want to regulate IVG in a way to control its use in conjunction with genetic engineering. A state could impose different forms of regulation. The most dramatic regulation would be a complete ban on IVG to prevent any form of genetically engineered procreation. However, this measure would prevent the individuals to practice a procreative liberty interest and beget children with genetic similarities, but cannot due to physical or social limitations. Instead of a complete ban on IVG, a state could limit IVG practice to ensure no genetic engineering or only disease-correcting engineering.

It is debatable whether a state would need a legitimate interest to regulate genetically engineered IVG procedures. On one side of the argument, one could invoke privacy in decision-making and family-formation interests to suggest that she has the right to choose the genetic features of her child.[169] Therefore, genetically engineered IVG procedures would have some protection under the Fourteenth Amendment. On the other hand, one would argue the precise selection of traits is too tenuously

165 Of course, this assumption would need to be proven by experimentation. But, for purposes of this note, we can assume if mature sperm cells and ova can be generated, then by definition, they would have the same genetic and functional characteristics.

166 The currently most popular format to genetically engineer cells is to use a system called CRISPR (pronounced like "crisper"). Despite being developed for gene modification just a few years ago, it has already become the most significant advance in biology since iPSCs. CRISPR is super cheap, easy, and quick tool that acts like molecular scissors. Essentially, one can remove, insert, or change a DNA sequence as desired, using an enzymatic "cut-and-paste" like system. See Heidi Ledford, *CRISPR, the disruptor*, 522 NATURE 20 (2015); Tanya Lewis, *Scientists May Soon Be Able to 'Cut and Paste' DNA to Cure Deadly Diseases and Design Perfect Babies*, BUS. INSIDER (Nov. 19, 2015, 11:15 AM), http://www.businessinsider.com/how-crispr-will-revolutionize-biology-2015-10.

167 Ledford, *supra* note 166 at 21; Lewis, *supra* note 166.

168 Lewis, *supra* note 166.

169 It should be noted, that proponents of preimplantation genetic testing already articulate this type of argument. Of course, the major difference between PGT and genetic engineering is that PGT is the selection of an embryo with desired traits over less desired embryos, where as genetic engineering is the selection of precisely which trait(s) are to be included or excluded in the resultant child.

related to decisions to beget children and form families. Thus, a state would only need a rational basis to ban genetic engineering in conjunction with IVG. Nevertheless, for purposes of this note, we will assume IVG procedures that include some genetic engineering have at least some liberty interest under procreation, so a state would need a legitimate interest to regulate the procedures.

In vitro gametogenesis with genetic engineering would involve extreme manipulation. Without a doubt, the level of manipulation would be greater than reproductive cloning. In addition to the extraordinary amount of manipulation already involved with IVG as described in Section IV(B)(1), genetic engineering would add several more layers.[170] Because of the extraordinary amount of manipulation, it's extremely likely that IVG would be objected to on moral and religious grounds. However, as discussed previously, morality interests would not be legitimate.

A state would also likely cite genetic predeterminsim as a legitimate interest. If predeterminism is in fact a legitimate interest, the state would have a very strong argument. Genetic engineering, at least on some level, is a form of genetic predeterminism. When an individual chooses to have her gametes modified so that they contain genetic information to yield smarter, stronger, or more beautiful children, she has in fact predetermined, to some extent, the genetic code and life of the resultant child. Of course, genetics in only part of the equation, as environmental factors also contribute to the phenotypic attributes of individuals.

In an alternative view, when an individual chooses to have her gametes modified so that they exclude congenic diseases, she has again, predetermined an aspect of the genetic information that is passed on to her child. However, exclusion of harmful disorders is very different than "designing" the genetic code of one's child. When an individual has a been identified as a carrier of a genetic disorder, such as Duchenne Muscular Dystrophy, she knows the exact likelihood that she would pass the disease onto her progeny.[171] Thus, if she were to have children, she has predetermined that there is twenty-five percent chance that she would have an affected boy. In that sense, the correction of harmful gene in an IVG procedure has no more of a predetermined effect than if she were to have a child by natural coitus.

Another legitimate interest a state could argue is the uncertainty of the health of the genetically modified child. This is certainly true for "designer babies" who may have alterations that, in theory, would make render them superior, but may have unintended consequences or side effects. For example, one could change the genetics of IVG gametes to express more

170 Genetic engineering would entail several more steps, including expressing gene-modifying enzymes in the iPSCs, selecting the iPSCs with the proper modification, discarding any iPSCs that have unintended alterations, clonally expanding the selected iPSCs, and performing quality-control checks along the way. Furthermore, certain genetic modifications, such as inserting a full gene or precisely changing a single nucleotide, can make the procedure more difficult.

171 A woman who is a carrier of Duchenne Muscular Dystrophy has 50% chance of passing the disease onto her male children. Likewise, she would have a 50% chance of passing the damaged gene onto her daughter, making her a carrier as well.

growth hormone, which could probably make one much bigger and stronger. However, there are many unwanted consequences of increased expression of growth hormone. Laboratory transgenic mice with an extra growth hormone levels suffer from a shortened lifespan, kidney disorders, shortened reproductive life span, increased likelihood of infertility, disrupted sleep rhythm, altered cognitive ability, and other brain abnormalities.[172]

In sum, a state probably does not have a legitimate state interest to regulate IVG on its own. However, when IVG is combined with genetic engineering, a state may have a legitimate interest. A state could invoke either genetic predeterminism or health concerns to ban or limit the procedure.

V. CONCLUSIONS

The excitement surrounding the possibilities of IVG is warranted. The procedure could grant many individuals an opportunity to procreate that did not exist before. However, IVG fractures society's understanding of procreation. By creating gametes in vitro, the natural process of reproduction is altered and brings into question whether the process is protected under the Fourteenth Amendment and procreative liberty.

IVG, along with all currently practiced ARTs and reproductive cloning, is a bona fide form of biological procreation. But the Constitution does not define procreative liberty in the biological sense. Instead, the justices look to history, tradition, and other sources liberty to define the right. If history and tradition are the only sources to determine a fundamental right, an approach taken by some conservative judges, then IVG and reproductive cloning are probably not protected under procreative liberty. In comparison, the acquiescence by state legislatures over decades of history suggests that currently practiced ARTs are modes of procreation protected by the Constitution. Under a broad definition of procreative liberty that invokes more than tradition and history, IVG and reproductive cloning are probably protected along with currently practiced ARTs, and thus, a state would need a legitimate interest to ban or limit the access to these procedures.

This note considered many interests that a state would invoke to support a ban on assisted reproduction. Analyzing Supreme Court jurisprudence, morality, potential life of a nonviable fetus, and a child's best interest to prevent psychological damage have been declared as illegitimate interests. While exploitation of women may be a legitimate interest, it is highly speculative and difficult to prove and thus probably could not be invoked by a state. In contrast, the health of the child or surrogate mother are probably legitimate interests a state could invoke. Genetic predeterminism may or may not be a legitimate interest, as this issue has never been before the Supreme Court. Based on these analyses, the note concluded that the Fourteenth Amendment fully protects any

172 Andrzej Bartke, *Can Growth Hormone (GH) Accelerate Aging? Evidence from GH-Transgenic Mice*, 78 NEUROENDOCRINOLOGY 210 (2003).

currently practiced ART. On the contrary, reproductive cloning is probably not protected because the state has a legitimate interest in the health of the future child and possibly a legitimate interest in preventing genetic predeterminism. The ultimate question of whether the Constitution protects IVG is likely to depend on the safety of the procedure. If IVG is safe and the resulting child is as healthy as other children, then the Fourteenth Amendment should protect the procedure.