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Intergenerational Control: Why Genetic Modification of Embryos via CRISPR-Cas9 is Not a Fundamental Parental Right

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Intergenerational Control: Why Genetic Modification of Embryos via CRISPR-Cas9 is Not a Fundamental Parental Right

COMMENT

INTERGENERATIONAL CONTROL: WHY GENETIC MODIFICATION OF EMBRYOS VIA CRISPR-CAS9 IS NOT A FUNDAMENTAL PARENTAL RIGHT

FERNANDO MONTOYA*

In 2012, a momentous scientific breakthrough occurred in the field of genetic editing: the discovery of CRISPR-Cas9. This new technique allows scientists to edit the human genome more rapidly, cheaply, and precisely than ever before. Researchers now have the potential to cure illnesses like cancer, ALS, and Alzheimer's disease. CRISPR not only provides a mechanism for curing people currently suffering from a disease, but it establishes a manner in which an embryo's DNA can be modified to prevent any future generation from inheriting that disease. Because using CRISPR to alter the human genome presents irreversible intergenerational consequences for the human gene pool—and given the appealing nature of the technology to change a child's future from the womb—this Comment considers whether parents have a fundamental constitutional right to use CRISPR to edit their child's DNA.

This Comment argues that the right to permanently modify an embryo's DNA, and consequently alter future generations' genetic make-up, via CRISPR significantly deviates from Supreme Court precedent. Because the right to use CRISPR modifications is not engrained in the minds of people or traditions of society, it does not qualify as a

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fundamental right and is not subject to a strict scrutiny standard. Moreover, the Court has also held that a “special weight” should be given to parents in regard to visitation and child-rearing decisions, effectively ruling out the application of a rational basis standard. Therefore, intermediate scrutiny is a more appropriate test for courts to apply in cases regarding parents’ constitutional rights of CRISPR’s use to genetically modify embryos. An intermediate scrutiny standard allows for the most flexible standard when making decisions that will have enduring repercussion on our species.

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History repeats, but science reverberates.
—Siddhartha Mukherjee¹

INTRODUCTION

Imagine having the ability to manipulate your child’s genetic make-up to change her eye color, raise her intelligence, or permanently rid her of a disease to which she was predisposed—all before she was born. While genetic modification of this kind historically seemed implausible, it recently gained monumental traction and “marked the beginning of a new era for biology.”² For the first time in human history, in 2018, a scientist used a genetic modification technique called Clustered Regularly Interspaced Short Palindromic Repeats (CRISPR-Cas9)³ to create two young and healthy girls, Lulu and Nana.⁴ The twin girls’ father was HIV-positive; however, while Lulu and Nana were a single cell, scientists were able to remove “the doorway through which HIV enter[s] to infect people.”⁵

1. SIDDHARTHA MUKHERJEE, *THE EMPEROR OF ALL MALADIES: A BIOGRAPHY OF CANCER* 466 (2010).

2. *How Does Genome Editing Work?*, NAT’L HUM. GENOME RES. INST., <https://www.genome.gov/about-genomics/policy-issues/Genome-Editing/How-genome-editing-works> [<https://perma.cc/FX4K-8S7L>] (last updated Aug. 3, 2017); Patrick D. Hsu et al., *Development & Applications of CRISPR-Cas9 for Genome Engineering*, 157 CELL 1262, 1262 (2014).

3. All references to CRISPR in this Comment refer specifically to CRISPR-Cas9. The CRISPR technique is regularly associated with the Cas9 protein and is formally referred to as “CRISPR-Cas9.” Sarah Nelson, *Co-Creator of CRISPR Lectures About Future Applications of Genome Editing Technology*, DAILY BRUIN (Nov. 19, 2019, 12:48 AM), <https://dailybruin.com/2019/11/19/co-creator-of-crispr-lectures-about-future-applications-of-genome-editing-technology> [<https://perma.cc/GKP8-LBVW>].

4. See Rob Stein, *Chinese Scientist Says He’s First to Create Genetically Modified Babies Using CRISPR*, NAT’L PUB. RADIO (Nov. 26, 2018 5:02 AM), <https://www.npr.org/sections/health-shots/2018/11/26/670752865/chinese-scientist-says-hes-first-to-genetically-edit-babies> [<https://perma.cc/6AV6-GC35>] (pointing out that the Chinese researcher, Dr. He, stated “I understand my work will be controversial,” but that “I believe families need this technology. And I am willing to take the criticism for them”). See generally Jing-ru Li et al., *Experiments that Led to the First Gene-Edited Babies: The Ethical Failings & the Urgent Need for Better Governance*, 20 J. ZHEJIANG UNIV. 32, 32 (2019) (calling for “[a] more robust system of ethical governance” in China because Dr. He’s experiment shows that the government cannot keep pace with the rapidly changing bioethics issues arising from genetic modification).

5. See Stein, *supra* note 4 (pointing out that the researchers created the viable twin pregnancy by taking one-day old embryos, editing sixteen of them, and implanting eleven). Researchers have already begun pushing the boundaries of this technique

These relatively nascent⁶ genetic modification technologies allow scientists to permanently and precisely add, remove, or alter an organism's DNA.⁷ At first, editing techniques were tested and used on somatic cells—any cells that are neither egg nor sperm cells—and only resulted in genetic changes that did not carry any intergenerational implications.⁸ However, as scientific methods for editing techniques progressed, scientists were eventually able to make changes to human DNA that could be passed to future generations.⁹ Among those new technologies was the revolutionary CRISPR,¹⁰ with which scientists could make all desired DNA changes “faster, cheaper, more accurate, and more efficient” than ever before.¹¹

The significance of CRISPR's achievements cannot be overstated. CRISPR was named “Breakthrough of the Year” in 2015 and has the potential to permanently cure diseases such as, inter alia, human immunodeficiency virus (HIV) and some cancers.¹² In fact, CRISPR allowed scientists to create Lulu and Nana by changing “[n]o gene . . .

beyond embryos and are working toward editing human reproductive cells themselves. Rob Stein, *Scientists Attempt Controversial Experiment to Edit DNA in Human Sperm Using CRISPR*, NAT'L PUB. RADIO (Aug. 22, 2019, 5:04 AM), <https://www.npr.org/sections/health-shots/2019/08/22/746321083/scientists-attempt-controversial-experiment-to-edit-dna-in-human-sperm-using-cri> [<https://perma.cc/4838-MTZQ>] (explaining how reproductive biologists are attempting to use CRISPR to modify genes in human sperm to help combat, among other things, male infertility and prostate cancer).

6. See Noah C. Chauvin, Note, *Custom-Edited DNA: Legal Limits on the Patentability of CRISPR-Cas9's Therapeutic Applications*, 60 WM. & MARY L. REV. 297, 304–05 (2018) (noting that genome editing techniques have only been in use since 1994).

7. *What Are Genome Editing & CRISPR-Cas9?*, U.S. NAT'L LIBR. MED. (Nov. 12, 2019), <https://ghr.nlm.nih.gov/primer/genomicresearch/genomeediting> [<https://perma.cc/R48C-YXEK>].

8. *Id.*; see also ANTHONY J.F. GRIFFITHS ET AL., AN INTRODUCTION TO GENETIC ANALYSIS 469 (7th ed. 2000) (explaining that somatic cells by definition “are never transmitted to progeny” but that germline cells “participate[] in fertilization” and are “passed on to the next generation”).

9. *What Are Genome Editing & CRISPR-Cas9?*, *supra* note 7; see also Rajat M. Gupta & Kiran Musunuru, *Expanding the Genetic Editing Tool Kit: ZFNs, TALENs, and CRISPR-Cas9*, 124 J. CLINICAL INVESTIGATION 4154, 4156, 4159 (2014) (comparing and contrasting the advantages and disadvantages of Zinc Finger Nucleases (ZFNs), Transcription activator-like effector nucleases (TALENs), and CRISPR-Cas9).

10. See MARCY E. GALLO ET AL., CONG. RESEARCH SERV., R44824, ADVANCED GENE EDITING: CRISPR-CAS9 I (2018).

11. *What Are Genome Editing & CRISPR-Cas9?*, *supra* note 7.

12. GALLO ET AL., *supra* note 10, at 1; see also Kelly E. Ormond et al., *Human Germline Genome Editing*, 101 AM. J. HUM. GENETICS 167, 168 (2017).

except the one to prevent HIV infection.”¹³ However, because of the serious intergenerational implications that come with editing viable embryos through CRISPR, many, including those under the Obama Administration, have been wary of accepting widespread, unregulated use of the technology.¹⁴

While no Supreme Court precedent discusses parents’ rights to genetically modify an embryo’s DNA, the question is likely to come before the Court in the near future. When the Court addresses this issue, it will look to its precedents addressing parental rights and caselaw closely related to those rights.

This Comment argues that human germline genome modification through CRISPR technology is not a traditionally protected right under the test that Justice Scalia established in *Michael H. v. Gerald D.*¹⁵ The right to permanently modify an embryo’s DNA, and consequently future generations’ genetic make-up, is not a fundamental right subject to strict scrutiny because it differs remarkably from the fundamental rights to “bear and beget” a child and to raise a child as one wishes. This Comment goes on to explain why *Troxel v. Granville*¹⁶ effectively overcomes *Michael H.*’s application of a rational-basis standard, making intermediate scrutiny the appropriate standard for courts to apply in cases concerning parents’ constitutional rights to use CRISPR to genetically modify embryos.

Part I of this Comment provides a scientific background of how DNA functions and discusses how CRISPR fundamentally changed the field of genetic editing. Additionally, this Part provides the relevant history and jurisprudence of caselaw directly related to parental rights and closely related interests created by the Court.¹⁷ Next, Part II of this Comment analyzes existing Fourteenth Amendment Due Process rights and shows how CRISPR modification is drastically different from the current interests that Supreme Court jurisprudence protects. This Part also shows how *Michael H.* establishes that germline editing

13. See Stein, *supra* note 4.

14. John P. Holdren, *A Note on Genome Editing*, WHITE HOUSE BLOG (May 26, 2015, 10:40 AM) <https://obamawhitehouse.archives.gov/blog/2015/05/26/note-genome-editing> [<https://perma.cc/Q48G-W5CP>] (applauding the National Academy of Sciences and its National Academy of Medicine for discussing ethical boundaries while simultaneously reiterating their position that the ethical line into clinical applications of human germline modification “should not be crossed at this time”).

15. 491 U.S. 110 (1989).

16. 530 U.S. 57 (2000) (plurality opinion).

17. See *infra* Section I.

through CRISPR is likely not a fundamentally protected interest. Part II also explains how the most recent parental rights case, *Troxel*, casts doubt on what standard of review courts should apply to these types of cases.¹⁸ Finally, in Part II, this Comment argues that CRISPR technology is not a fundamental right protected under the Due Process Clause of the Fourteenth Amendment, but, because courts will give some deference to parental decisions under *Troxel's* precedent, intermediate scrutiny is the applicable standard of review.¹⁹

I. BACKGROUND

Before exploring Supreme Court caselaw concerning parental rights, it is essential to comprehend the enormous leap that CRISPR made in the field of genetic modification. This Part first explains the basics of DNA function and discusses how the flow of genetic information dictates how the human body ultimately expresses genes. Next, this Part briefly discusses the science behind CRISPR technology and explains the numerous scientific benefits that CRISPR provides researchers. Finally, this Part explores the promising applications that CRISPR has on infectious and inherited diseases, heritable and nonheritable genome modifications, and DNA edits that result in artificial human enhancement.

A. *The Road to CRISPR*

A general understanding of DNA functionality provides a useful base for the science of genetic modification and, in turn, the constitutional implications that CRISPR would compel the Supreme Court to consider when weighing in on the breadth of parental rights.

1. *The “Central Dogma”*

DNA serves as the instructional code or “blueprint” that tells every part of a human body how to work properly.²⁰ All the instructional code contained in a single human body is referred to as a person’s genome.²¹ Additionally, DNA serves as the initial step in the flow of

18. See *infra* Section II.B.

19. See *infra* Section II.C.

20. See A. JAMIE CUTICCHIA, GENETICS: A HANDBOOK FOR LAWYERS 16 (2d ed. 2018).

21. The human genome, which is made up of about three billion DNA base pairs and contains everything necessary to help an organism grow and survive, is contained in almost every single cell in the body. See, e.g., *id.*; A *Brief Guide to Genomics*, NAT’L HUM.

information that helps make ribonucleic acid (RNA),²² which aids in directing when and how many proteins are created.²³ Proteins play an integral role in the “structure, function, and regulation of the body’s tissues and organs.”²⁴ This flow of information is “essential for all known forms of life” and is so integral in the field of molecular biology that it is often referred to as the “central dogma.”²⁵ Two significant steps comprise the process of protein creation: transcription and translation.²⁶ Together, these two steps dictate how a gene is expressed.²⁷

More recently, scientists have discovered new techniques for modifying the human genome.²⁸ By cutting targeted areas of a DNA’s code, researchers now have the ability to add, remove, or replace that DNA sequence with different, more desirable code.²⁹ Consequently, the slightest modification in a DNA sequence can result in significant effects on the information flow described above, causing permanent changes to the overall genome. This extraordinary capability is fairly new to the biotechnological community, and its development—while swift—has gone through many different iterations, ultimately leading to the discovery of the CRISPR system.³⁰

GENOME RES. INST., <https://www.genome.gov/about-genomics/fact-sheets/A-Brief-Guide-to-Genomics> [<https://perma.cc/F8KR-82L6>] (last updated Aug. 27, 2015).

22. RNA is short for ribonucleic acid and functions as a “DNA photocopy” of a cell, which can then be used for different tasks. *What Is RNA?*, RNA SOC’Y, <https://www.rnasociety.org/about/what-is-rna> [<https://perma.cc/Mt3V-EHW8>].

23. *Id.* (stating that these “DNA photocop[ies]” help dictate this regulatory process); *see also* GENETICS HOME REFERENCE, U.S. NAT’L LIBR. OF MED., HELP ME UNDERSTAND GENETICS 74 (2019), <https://ghr.nlm.nih.gov/primer> [<https://perma.cc/MSB5-X9R7>].

24. GENETICS HOME REFERENCE, *supra* note 23, at 67 (explaining that proteins can function as, among other things, antibodies against viruses and bacteria as well as structural components that essentially “allow the body to move”).

25. *Id.* at 74; *What Is RNA?*, *supra* note 22.

26. GENETICS HOME REFERENCE, *supra* note 23, at 74.

27. *See id.*

28. *See What Is Genome Editing?*, NAT’L HUM. GENOME RES. INST., <https://www.genome.gov/about-genomics/policy-issues/what-is-Genome-Editing> [<https://perma.cc/D2GC-UMYZ>] (last updated Aug. 15, 2019).

29. *Id.*

30. One of the traditional methods of genetic modification, homologous recombination, was inefficient because it had an extremely low rate of success that could fall as low as a one-in-a-million chance of making a desired edit correctly. *How Does Genome Editing Work?*, *supra* note 2. Another technique, zinc-finger nucleases (ZFNs), proved troublesome because effectively designing, creating, and testing the technique could take quite a long time. *See* Gupta & Musunuru, *supra* note 9, at 4154–55 (estimating a one-year time frame for mice and stating that human cells proved to be even more complex, which would lead to significantly prolonged scientific

2. *The Discovery of CRISPR*

In 2012, biochemist Jennifer Doudna and her bacteriologist colleague Emmanuelle Charpentier published their landmark study on a new genetic modification system called CRISPR.³¹ The publication immediately sparked the biology community's interest.³² George Church, a professor at Harvard University, has gone so far as to state that CRISPR "trumps just about anything" with respect to the effectiveness and usability of gene editing tools.³³ With such high praise, it is no wonder that CRISPR's use and presence in scientific research has exploded since its discovery.³⁴ Before discussing the endless scientific opportunities that CRISPR presents, it is important to understand why the technology is so groundbreaking that it was described as potentially triggering "Sputnik 2.0."³⁵

experimentation). Additionally, both homologous recombination and ZFNs tended to result in a "high rate of random," off-target edits. Karen M. Vasquez et al., *Manipulating the Mammalian Genome by Homologous Recombination*, 98 PROC. NAT'L ACAD. SCI. 8403, 8403 (2001). An off-target edit is when the DNA insert misses the region for desired modification and instead occurs in a different portion of the genome, potentially resulting in "permanent[] disrupt[ion of] normal gene function," which can cause undesired health complications. See Hanna R. Kempton & Lei S. Qi, *When Genome Editing Goes Off-Target*, 364 SCI. 234, 234 (2019) (positing that the "specificity of gene editing tools is critical to their utility, which is why off-target potential is a major concern").

31. See, e.g., SIDDHARTHA MUKHERJEE, *THE GENE: AN INTIMATE HISTORY* 472 (2016); JENNIFER A. DOUDNA & SAMUEL H. STERNBERG, *A CRACK IN CREATION: GENE EDITING AND THE UNTHINKABLE POWER TO CONTROL EVOLUTION* xvi–xvii (2017).

32. MUKHERJEE, *supra* note 31, at 472.

33. Elizabeth Pennisi, *The CRISPR Craze*, 341 SCI. 833, 834 (2013).

34. See generally DOUDNA & STERNBERG, *supra* note 31, at 60–61 (explaining how Jennifer Doudna and an international group of researchers pioneered studies of CRISPR-Cas9's development and its applications); YUVAL N. HARARI, *HOMO DEUS: A BRIEF HISTORY OF TOMORROW* (2017); JAMIE METZL, *HACKING DARWIN: GENETIC ENGINEERING AND THE FUTURE OF HUMANITY* 3–4 (2019) (arguing that the Homo sapiens have moved beyond the point of "Darwinian evolution[']s" random mutations and natural selection and progressed into a "self-designed" and "self-directed" evolutionary process); MUKHERJEE, *supra* note 31, at 489 (explaining how CRISPR-based techniques have allowed scientists to do things that were "unimaginable in the past," leading us to a precipice in which "transgenic humans can be created"). However, not all publications have had such a positive outlook on CRISPR's capabilities. See Pete Shanks, *Pernicious Optimism and Selective Science: A Review of 'Hacking Darwin'*, *CTR. GENETICS & SOC'Y* (May 31, 2019), <https://www.geneticsandsociety.org/biopolitical-times/pernicious-optimism-and-selective-science-review-hacking-darwin-jamie-metzl> [<https://perma.cc/MP2S-ZAUZ>] (criticizing Metzl's book by stating that Metzl continually uses "superficially plausible extrapolation" to speak in a technophilic and glib manner).

35. David Cyranoski, *CRISPR Gene Editing Tested in a Person*, 539 NATURE 479, 479 (2016) (quoting Carl June, an immunotherapy specialist at the University of

CRISPR's operation is best understood by breaking it into two components. "CRISPR" is a short DNA sequence that provides a code to, and then works in tandem with, RNA to guide and detect specific sequences in the genome.³⁶ Essentially, CRISPR provides a roadmap that instructs a molecule on how to get to its ultimate destination. "Cas9" refers to the protein that cuts the desired DNA site.³⁷ These Cas9 proteins virtually function like a pair of molecular scissors that cleave the targeted locations in the genome.³⁸ Although seemingly similar to some of its more recent predecessors, CRISPR is superior in numerous ways.

To begin with, CRISPR has proven to be more precise, efficient, and reliable than previous genome editing methods.³⁹ Some researchers found that CRISPR can be up to six times more efficient in successfully making targeted genomic edits than its ZFN counterparts.⁴⁰ Specifically, using CRISPR presents only a one-in-one-trillion chance of making an off-target edit.⁴¹ This achievement in reliability is monumental considering that only forty years prior, the success rate of making an *on-target* edit was as low as one-in-one-million.⁴² In fact, CRISPR is so precise that scientists analogize it to "a copyediting device that scans sixty-six volumes of the Encyclopedia Britannica and finds, erases, and changes one word, leaving all other words untouched."⁴³ This spectacular accuracy is especially important considering that, as stated before, the human genome is comprised of three billion base

Pennsylvania, who argued that a "biomedical duel" between China and the United States could be beneficial in rapidly improving CRISPR technology).

36. *How Does Genome Editing Work?*, *supra* note 2.

37. *See id.*

38. *See* Chauvin, *supra* note 6, at 304–05 & n.36.

39. *What Are Genome Editing & CRISPR-Cas9?*, *supra* note 7.

40. *How Does Genome Editing Work?*, *supra* note 2.

41. *See* Chauvin, *supra* note 6, at 306.

42. *How Does Genome Editing Work?*, *supra* note 2.

43. *See* MUKHERJEE, *supra* note 31, at 489 ("Between 2010 and 2014, a postdoctoral researcher in my laboratory tried to introduce a defined genetic change into a cell line using the standard gene-delivery viruses, but with little success. In 2015, having switched to the new CRISPR-based technology, she engineered fourteen alterations of genes in fourteen human genomes, including the genomes of human embryonic stem cells, in six months—a feat unimaginable in the past."); *see also* Tracey Tomlinson, Note, *A CRISPR Future for Gene-Editing Regulation: A Proposal for an Updated Biotechnology Regulatory System in an Era of Human Genomic Editing*, 87 *FORDHAM L. REV.* 437, 446 (2018) (explaining that scientists' continual refining of CRISPR after its discovery led to the technique's high degree of accuracy).

pairs and even a single error can result in serious diseases or death.⁴⁴ The lowered probability of making off-target edits with CRISPR results in a technology that scientists can use more safely and confidently.

Furthermore, because CRISPR can use numerous guide RNA in tandem, it can target multiple sites at once.⁴⁵ This adaptability to more sites is a stark shift from using a single ZFN to target a single gene.⁴⁶ Apart from improving efficiency by targeting multiple genes at once, this new approach saves researchers a tremendous amount of money.⁴⁷ Before the discovery of CRISPR, creating a single protein with previous technologies could cost a research facility upwards of \$1000.⁴⁸ With this new invention, scientists can produce guide RNA templates in a few days with free software and a \$65 DNA starter kit.⁴⁹ CRISPR's beneficial components show that the technology is ultimately far easier to use, faster to create and deploy, more reliable, and much less expensive.⁵⁰ That CRISPR provides immense clinical possibilities for future development bolsters these current achievements.

3. *CRISPR's Revolutionary Applications to the Human Genome*

The potential applications of CRISPR technology range from therapeutics to diagnostics and, as previously discussed, to gene editing.⁵¹ Through these applications, many scientists believe that CRISPR could help “prevent, treat, or cure medical conditions or

44. Mark Shwartz, *Target, Delete, Repair: CRISPR Is a Revolutionary Gene-Editing Tool, but It's Not Without Risk*, STAN. MED., <https://stanmed.stanford.edu/2018winter/CRISPR-for-gene-editing-is-revolutionary-but-it-comes-with-risks.html> [<https://perma.cc/3GR7-24T5>].

45. See, e.g., Gupta & Musunuru, *supra* note 9, at 4156–57; Itishree Kaushik et al., *CRISPR-Cas9: A Multifaceted Therapeutic Strategy for Cancer Treatment*, 96 SEMINARS CELL & DEVELOPMENTAL BIOLOGY 4, 4 (2019).

46. *How Does Genome Editing Work?*, *supra* note 2.

47. See *id.* (pointing out that large genome projects “took many years and tens of thousands of dollars” but could “now be completed at a small fraction of time and price”).

48. See Shwartz, *supra* note 44.

49. *Id.*

50. See Liting You et al., *Advancements and Obstacles of CRISPR Cas9 Technology in Transactional Research*, 13 MOLECULAR THERAPY: METHODS & CLINICAL DEV. 359, 359–60, 366 (2019) (pointing out that CRISPR can play an important role in the “metadata revolution” which includes “large scale analyses of genome sequences, deep sequencing technologies, and single-cell transcriptomics”); *How Does Genome Editing Work?*, *supra* note 2.

51. Safikur Rahman et al., *CRISPR/Cas: An Intriguing Genomic Editing Tool with Prospects in Treating Neurodegenerative Diseases*, 96 SEMINARS IN CELL & DEVELOPMENTAL BIOLOGY 22, 28 (2019).

disease[s],”⁵² like diabetes,⁵³ malaria,⁵⁴ and HIV.⁵⁵ However, CRISPR also possesses the potential to help those affected by inherited diseases like Duchenne Muscular Dystrophy⁵⁶ and certain neurogenerative disorders.⁵⁷ Furthermore, this new technology demonstrates the potential to combat the growing problem of antibiotic resistance.⁵⁸ While some of these feats may be out of reach for now, the therapeutic possibilities have piqued the pharmaceutical industry’s interest, “show[ing] a promising futuristic approach for treatment of human diseases and inherited anomalies.”⁵⁹ Even more groundbreaking, the capabilities of CRISPR can affect future generations, extending far beyond assisting or potentially curing only those who are alive today.

52. See GALLO ET AL., *supra* note 10, at 12.

53. See *id.* (explaining that by using CRISPR, researchers have developed a method that uses a patient’s own insulin-producing cells, which reduced transplant rejection risks and eliminated patients’ reliance on third-party donors for Type I diabetes). Scientists maintain high hopes that this same process could work to help treat patients with Type II diabetes. *Id.*

54. See *id.* at 12 (explaining that scientists are targeting *Anopheles* mosquitos, the primary transmitters of this globally widespread and lethal disease, by attempting to make them infertile, causing “all offspring [to] be[] male,” or by making the mosquitos “resistant to the malaria parasite[s]”).

55. See Ormond et al., *supra* note 12, at 168. *But see* Stein, *supra* note 4 (claiming that other “CRISPR pioneer[s]” like Feng Zhang and Jennifer Doudna have criticized Dr. He’s experiments on Lulu and Nana because it “will likely render a person much more susceptible for West Nile Virus” and because the technique of “washing the sperm of infected sperm donors to eliminate HIV” is already an established, effective alternative (internal quotations omitted)).

56. See GALLO ET AL., *supra* note 10, at 13–14 & n.50 (detailing how a Texas medical center used the technique to repair dogs’ cells to produce dystrophin, a protein which the genetic disorder prevents bodies from naturally creating). Duchenne Muscular Dystrophy cripples the body and “leads to heart and respiratory muscle problems, and death.” *Id.* at 13.

57. See Rahman et al., *supra* note 51, at 24–26 (describing how CRISPR could be used as a therapeutic application for Alzheimer’s, Parkinson, and Huntington’s disease).

58. See GALLO ET AL., *supra* note 10, at 14 (describing how the technique has been used to effectively destroy harmful bacteria while avoiding bacteria that can be beneficial to humans); Rob Stein, *Scientists Modify Viruses with CRISPR to Create New Weapon Against Superbugs*, NAT’L PUB. RADIO (May 22, 2019, 5:01 AM), <https://www.npr.org/sections/health-shots/2019/05/22/723582726/scientists-modify-viruses-with-crispr-to-create-new-weapon-against-superbugs>

[<https://perma.cc/26NL-44CP>] (explaining how a doctor who specializes in treating spinal cord injuries plans to research CRISPR technology and its applicability for targeting increasingly antibiotic-resistant bacteria to help prevent bladder infections).

59. See Kaushik et al., *supra* note 45, at 8 (describing how CRISPR Therapeutics, Intellia Therapeutics, and Editas Medicine are the three pioneers of the market and that Editas has received upwards of \$120 million from the tech billionaire Bill Gates as well as Google).

The Congressional Research Service found that many studies are being conducted around the world using both nonheritable and heritable modifications.⁶⁰ Nonheritable modifications are changes made to a somatic cell—any cell other than an egg or sperm cell—that do not result in genetic alterations to the modified individual’s progeny.⁶¹ Significantly, researchers also used CRISPR to edit reproductive cells in viable and non-viable embryos.⁶² These types of edits do not only change the modified individual but also ensure that his or her germline retains those changes and passes them to offspring and future generations.⁶³ This type of germline modification allows scientists to alter the human embryo or gamete to remove or repair any deleterious genes while making certain that future generations do not inherit those diseases.⁶⁴ CRISPR’s powerful capabilities, and its premature use, make genetic watchdog groups leery of creating a potentially unfair “society of genetic haves and have-nots.”⁶⁵

Beyond prevention, treatment, and curing of diseases, CRISPR enables scientists to enhance the human genome.⁶⁶ That enhancement could come in the form of changing someone’s eye or hair color, making someone taller, or even raising someone’s IQ.⁶⁷ Other enhancements come in the form of selecting naturally occurring mutations that could result in a heightened resistance to disease, bones

60. See GALLO ET AL., *supra* note 10, at 14–16 (pointing out multiple research studies carried out in the United States and China—which are at the forefront of CRISPR research—seek to manipulate heritable and nonheritable traits to combat mutations that lead to illnesses like fatal blood disorders and Marfan Syndrome).

61. *Id.* at 14; see also Tomlinson, *supra* note 43, at 448 (stating that another reason somatic cells are nonheritable is because of their uniqueness to each individual, which results in their dying off with a person).

62. See also GALLO ET AL., *supra* note 10, at 14–16 (citing an international research team that used “CRISPR in viable human embryos to correct a genetic defect” that was one of the leading causes in young athletes’ sudden deaths).

63. *Id.* at 14; see Schwartz, *supra* note 44 (cautioning that an off-target genetic edit could have “serious consequences” for descendants).

64. See generally GALLO ET AL., *supra* note 10, at 14–15; Schwartz, *supra* note 44.

65. See generally Stein, *supra* note 4 (describing concerns about a society where children are modified for nonmedical reasons, such as to be “taller, stronger or smarter”).

66. See MUKHERJEE, *supra* note 31, at 477.

67. See NAT’L ACADS. OF SCIS., ENG’G, & MED., HUMAN GENOME EDITING: SCIENCE, ETHICS, AND GOVERNANCE 137 (2017) (exploring genome editing to achieve “enhancements,” which is “a term that itself is problematic”); Schwartz, *supra* note 44; see also STEPHEN HAWKING, BRIEF ANSWERS TO THE BIG QUESTIONS 132 (2018) (positing that qualities likely controlled by a larger number of genes, like intelligence and the instinct of aggression, will be editable this century).

that become so hard “they’ll break a surgical drill,” and modifications that will help people “remain [mentally] sharp into old age.”⁶⁸

However, if germline editing becomes commonplace, it could have repercussions beyond one person’s well-being or that of their offspring.⁶⁹ Editing could result in long-term effects on people’s “life span, identity, and economic output.”⁷⁰ Additionally, gene modification using CRISPR could raise serious societal issues if it is only available to the richest people around the world or if it results in certain people’s genes becoming “obsolete.”⁷¹ According to Stephen Hawking, when “superhumans” appear, there will be significant political problems because unedited humans will be unable to compete and could either “die out or become unimportant.”⁷²

Unsurprisingly, the public has expressed general concern with human germline editing because of the “slippery slope from disease-curing applications toward uses with less compelling or even troubling implications.”⁷³ Under the Obama Administration, the Director of the Office of Science and Technology Policy cautioned about CRISPR’s unrestricted use,⁷⁴ and its Director of National Intelligence warned of CRISPR’s potential use to create weaponized biological agents.⁷⁵

68. See Antonio Regalado, *Engineering the Perfect Baby*, 118 MIT TECH. REV. 27, 32 (2015).

69. See *id.* at 31.

70. *Id.*

71. See *id.* (stating that base price for in vitro fertilization hovers around \$20,000 and rises to \$100,000 if a parent utilizes additional services such as a surrogate mother, an egg donation, or a genetic test); Robert Sparrow, *Yesterday’s Child: How Gene Editing for Enhancement Will Produce Obsolescence—and Why It Matters*, 19 AM. J. BIOETHICS 6, 13 (2019) (arguing that technologically enhancing humans through genetic modification will result in “yesterday’s child,” which he defines as a genetically obsolete child).

72. See HAWKING, *supra* note 66, at 132–33. (stating that some people will not be able to resist genetically enhancing human DNA, regardless of laws banning such practices, which will result in “a race of self-designing beings, who are improving themselves at an ever-increasing rate”).

73. See MUKHERJEE, *supra* note 31, at 476.

74. Holdren, *supra* note 14 (warning that modifications in clinical settings are “a line that should not be crossed” until an international summit explored potential implications and alternatives that could derive the same benefits to patients while “not requir[ing] germline alteration”).

75. See Tomlinson, *supra* note 43, at 449–50 (discussing the DNI’s concern that CRISPR research “conducted by countries with different regulatory or ethical standards than those of Western countries probably increases the risk of the creation of potentially harmful biological agents or products” like “weaponized vectors, such as mosquitos” that transmit diseases and toxins). However, the Congressional Research Service stated that CRISPR is likely to play an integral role in developing “countermeasures against both traditional and genetically engineered biological weapons” because of its “dual-use nature.” GALLO ET AL., *supra* note 10, at 34.

Furthermore, a large international consensus has stated that, at this time, germline modification on humans would be “irresponsible.”⁷⁶ Because of this global concern, scientists who have used CRISPR on humans have been widely criticized and reprimanded. The Chinese doctor who used CRISPR to create Lulu and Nana received a three-year jail sentence and a \$400,000 fine for violating his country’s ethical principles and regulations.⁷⁷

All of these uncertainties associated with CRISPR’s use led Pulitzer Prize-winning author Siddhartha Mukherjee to opine on one of the central questions that humans will have to answer when creating a framework for genetic modification.⁷⁸ He stated: “[t]he crux then is not genetic *emancipation* (freedom from the bounds of hereditary illnesses), but genetic *enhancement* (freedom from the current boundaries of form and fate encoded by the human genome).”⁷⁹

B. Caselaw Establishing Rights Related to CRISPR

The Fourteenth Amendment declares that “[n]o State shall . . . deprive any person of life, liberty, or property, without due process of law.”⁸⁰ From this Amendment, the Supreme Court extrapolated substantive due process, equal protection, and procedural due process rights.⁸¹ Substantive due process rights have historically protected citizens from state intervention through two major avenues.

76. *Genetic Modification, Genome Editing, & CRISPR*, PERS. GENETICS EDUC. PROJECT, <http://pged.org/genetic-modification-genome-editing-and-crispr> [<https://perma.cc/72Y4-BKXQ>] (explaining that the US National Academies, the UK Royal Academy, and the Chinese Academy of Sciences came to this consensus but that they had not recommended banning the technique and instead wished research to continue). Currently, a number of European countries and Canada have made it illegal to use germline genome modification in clinical settings, and the United States has banned all federal funding for its clinical application. *Id.*

77. Merrit Kennedy, *Chinese Researcher Who Created Gene-Edited Babies Sentenced To 3 Years In Prison*, NAT’L PUB. RADIO (Dec. 30, 2019, 01:30 PM), <https://www.npr.org/2019/12/30/792340177/chinese-researcher-who-created-gene-edited-babies-sentenced-to-3-years-in-prison> [<https://perma.cc/8W34-YQ9L>] (quoting the executive director of the Center for Genetics and Society, Marcy Darnovsky, as having called Dr. He “reckless and self-serving”).

78. MUKHERJEE, *supra* note 31, at 477.

79. *Id.* (emphasis added) (pointing out that there was a very fine line betwixt emancipation and enhancement but that it would be the “fragile pivot on which the future of genome editing whirls”).

80. U.S. CONST. amend. XIV.

81. Anthony Miller, *The Case for the Genetic Parent: Stanley, Quilloin, Caban, Lehr, and Michael H. Revisited*, 53 LOY. L. REV. 395, 400–02 (2007). A detailed analysis of potential procedural due process and equal protection challenges to CRISPR is beyond the scope of this Comment.

The first avenue of protection derives from the Bill of Rights, which the Court has incorporated almost in its entirety.⁸² Some of those rights include the First Amendment's free exercise of religion;⁸³ the Fourth Amendment's protection against unreasonable searches and seizures;⁸⁴ and, most recently, the Second Amendment's right to bear arms.⁸⁵

The second avenue has developed through the Court's creation of "general protection[s] against certain arbitrary, wrongful government actions."⁸⁶ These protections include the right to personal privacy,⁸⁷ the right to marriage,⁸⁸ and the right for a woman to decide whether to obtain an abortion.⁸⁹ Through this second avenue, the Supreme Court established a line of caselaw protecting parental and family-related rights.⁹⁰ This use of the latter branch was necessary because parental rights are not specifically enumerated in the Bill of Rights and

82. 16B AM. JUR. 2D *Constitutional Law* § 953 (2019). The only Amendments that have yet to be incorporated are the Third Amendment's quartering of soldiers, the Seventh Amendment's right to a jury trial in civil suits, and the Eighth Amendment's protection against excessive fines. KATHLEEN M. SULLIVAN & NOAH FELDMAN, *CONSTITUTIONAL LAW* 470 (19th ed. 2016).

83. U.S. CONST. amend. I; see *Cantwell v. Connecticut*, 310 U.S. 296, 303 (1940) ("The fundamental concept of liberty embodied in [the Fourteenth] Amendment embraces the liberties guaranteed by the First Amendment.").

84. U.S. CONST. amend. IV; see *Mapp v. Ohio*, 367 U.S. 643, 655 (1961) ("Since the Fourth Amendment's right of privacy has been declared enforceable against the States through the Due Process Clause of the Fourteenth, it is enforceable against them by the same sanction of exclusion as is used against the Federal Government.").

85. U.S. CONST. amend. II; see *McDonald v. City of Chicago*, 561 U.S. 742, 780 (2010) ("It cannot be doubted that the right to bear arms was regarded as a substantive guarantee, not a prohibition that could be ignored so long as the States legislated in an evenhanded manner.").

86. See 16B AM. JUR. 2D *Constitutional Law* § 953 (2019).

87. See, e.g., *Griswold v. Connecticut*, 381 U.S. 479, 484 (1965) ("Various guarantees [established through a number of amendments in the Bill of Rights] create zones of privacy.").

88. See, e.g., *Obergefell v. Hodges*, 135 S. Ct. 2584, 2604 (2015) ("[T]he right to marry is a fundamental right inherent in the liberty of the person."); *Loving v. Virginia*, 388 U.S. 1, 12 (1967) ("Under our Constitution, the freedom to marry, or not marry, a person of another race resides with the individual and cannot be infringed by the State.").

89. See *Roe v. Wade*, 410 U.S. 113, 153 (1973) ("This right of privacy, whether it be founded in the Fourteenth Amendment's concept of personal liberty . . . or . . . in the Ninth Amendment's reservation of rights to the people, is broad enough to encompass a woman's decision whether or not to terminate her pregnancy.").

90. See *Miller*, *supra* note 81, at 400–02.

instead needed to be “found somewhere between the lines” of the First Amendment’s “Freedoms of Speech, Religion, and the Press.”⁹¹

Despite the fact that the Court has protected unenumerated rights in the past, it has demonstrated a “hesit[ance] to extend the sphere of fundamental rights.”⁹² Whether protecting enumerated rights or extending protection beyond them, the Fourteenth Amendment is typically subject to three standards of review. Strict scrutiny—the highest standard—is applied to fundamental rights and requires a state government to demonstrate a compelling state interest to which the state’s ends are sufficiently narrowly tailored.⁹³ Intermediate scrutiny requires that government action be substantially related to furthering an important governmental interest.⁹⁴ Lastly, rational basis—the most deferential standard—simply inquires whether government action “pursues a legitimate end by rational means.”⁹⁵ Most commonly, the Court does not apply intermediate scrutiny to substantive due process rights and instead applies rational basis review if it finds that a right is not fundamental.⁹⁶

While the parental and familial rights cases help provide some insight into how the Court might view genetic modification, none of the cases explicitly tackles the issue of a parent’s right to use germline

91. Eric V. Meeker, Comment, *Termination of Parental Rights: Constitutional Rights, State Interests and the Best Interest of the Child*, 17 J. JUV. L. 82, 88–89 (1996) (stating that freedom of speech, religion, and press can be asserted regardless of a person’s status and that “[b]ased upon [parental rights’] conditional existence, it makes little sense to accord these rights preference over all other competing [state] interests”).

92. See Nancy Pham, *Choice v. Chance: The Constitutional Case for Regulating Human Germline Genetic Modification*, 34 HASTINGS CONST. L. Q. 133, 141–42 (2006) (arguing that the Supreme Court would be even less likely to find human germline genome modification a fundamental right because it is such a new and different type of reproductive technology).

93. *Planned Parenthood of Se. Pa. v. Casey*, 505 U.S. 833, 929 (1992) (Blackmun, J., concurring in part & dissenting in part).

94. Stephen G. Gilles, *Parental (and Grandparental) Rights After Troxel v. Granville*, 9 SUP. CT. ECON. REV. 69, 110–11 (2001) (explaining that “intermediate scrutiny requires a moderately close fit between ends and means”).

95. *Michael H. v. Gerald D.*, 491 U.S. 110, 131 (1989); see also Pham, *supra* note 92, at 142 (pointing out that rational basis review is a very deferential standard which requires merely that the legislation is neither arbitrary nor irrational). The rational basis standard is met even if the Court needs to “supply its own purpose to justify the statute.” *Id.* (quoting Gayle Lynn Pettinga, Note, *Rational Basis with Bite: Intermediate Scrutiny by Any Other Name*, 62 IND. L.J. 779, 787 (1987)).

96. See Gilles, *supra* note 94, at 138–39.

genome modification on a human embryo.⁹⁷ One reason may be because CRISPR, and genetic modification in general, are relatively recent technologies.⁹⁸ However, the advancement and innovation of these techniques has been rapid and the issue is likely to end up before the Court sooner rather than later.⁹⁹

Due to the lack of legal precedents on point, and because current parental rights jurisprudence leaves many unanswered questions,¹⁰⁰ a background of closely related substantive due process rights is necessary. This Section begins by examining caselaw directly related to parental and family rights. It then looks to other closely related or analogous substantive due process rights created and protected by the Court. Examining established rights from both of these perspectives presents a more complete framework, shedding light on how the Supreme Court and lower courts are likely to view the parental rights to genetically modify embryos via CRISPR.

1. *Supreme Court jurisprudence of parental rights*

In 1923, the Supreme Court decided its first case directly concerning parental rights. In *Meyer v. Nebraska*,¹⁰¹ the Court held a Nebraska law that prohibited teaching children in any language other than English unconstitutional under the Fourteenth Amendment.¹⁰² Justice McReynolds reasoned that parents had a “natural duty” to provide their children with an education and that seeking out an instructor of their choosing was well “within the liberty of the [Fourteenth] Amendment.”¹⁰³ Therefore, because Nebraska’s legislature attempted to materially interfere with

97. See generally *McDonald v. City of Chicago*, 561 U.S. 742, 780 (2010) (protecting right to bear arms); *Roe*, 410 U.S. at 113, 153 (protecting right to abortion); *Loving*, 388 U.S. at 1, 12 (protecting right to marriage); *Griswold v. Connecticut*, 381 U.S. 479, 484–86 (1965) (protecting right to the use of contraceptives as well as the right to personal privacy).

98. See Chauvin, *supra* note 6, at 304–05.

99. See Gupta & Musunuru, *supra* note 9, at 4154.

100. See Francis Barry McCarthy, *The Confused Constitutional Status and Meaning of Parental Rights*, 22 GA. L. REV. 975, 985 (1988) (emphasizing that one of those questions was whether parental rights were, at the time, even “fundamental rights at all”); see also Tandice Ossareh, Note, *Would You Like Blue Eyes with That? A Fundamental Right to Genetic Modification of Embryos*, 117 COLUM. L. REV. 729, 744 (2017) (stating that “there are currently no explicit restrictions governing genetic modification at the state or federal level”).

101. 262 U.S. 390 (1923).

102. *Id.* at 403.

103. See *id.* at 400 (emphasizing that Americans have found education and knowledge “of supreme importance” for a long time and therefore they “should be diligently promoted”).

parents' power to dictate their own children's education, the Court deemed the statute unconstitutional.¹⁰⁴

Two years later, the Court relied on its *Meyer* precedent in *Pierce v. Society of Sisters*¹⁰⁵ to reaffirm constitutional parental rights while striking down an Oregon statute requiring parents and guardians to send their children to public school during the academic year.¹⁰⁶ *Pierce* affirmed *Meyer's* central holding that a state could not “unreasonably interfere[] with the liberty of parents and guardians to direct the upbringing and education of children under their control.”¹⁰⁷ Together, *Meyer* and *Pierce* established that parents had a broad constitutional right under the Fourteenth Amendment to raise and educate their children as they saw fit, without undue interference from the state.¹⁰⁸

However, after the Court established far-reaching parental rights to raise a child as one wished, these rights eventually faced opposition. In *Michael H. v. Gerald D.*,¹⁰⁹ Justice Scalia's plurality opinion narrowed the

104. *Id.* at 401, 403. *But see* Susan E. Lawrence, *Substantive Due Process and Parental Rights: From Meyer v. Nebraska to Troxel v. Granville*, 8 J. L. & FAM. STUD. 71, 77 (2006) (positing that *Meyer* only dealt with Fourteenth Amendment parental rights in a peripheral manner and, even then, came up with an “ill-defined” right).

105. 268 U.S. 510 (1925); *see* Lawrence, *supra* note 104, at 78 (comparing the Court's Fourteenth Amendment analysis in the parental rights context in the *Meyer* and *Pierce* decisions).

106. *See Pierce*, 268 U.S. at 530 (explaining that under the law that the Court deemed unconstitutional, children would have to attend school in a district they lived in and that failure to send one's child to public school would be considered a misdemeanor).

107. *Id.* at 534–35. *But see* Lawrence, *supra* note 104, at 78 (arguing that *Pierce*, similar to *Meyer*, had not established a clear “supremacy of a parental right to control children”).

108. *Pierce*, 268 U.S. at 534–35.

109. 491 U.S. 110 (1989) (plurality opinion). While *Michael H.* is a plurality opinion, it carries more weight due to its concurring opinions. Justice Brennan and Justice White wrote separate dissenting opinions, but Justice Scalia's plurality was fully joined by Chief Justice Rehnquist and garnered more support from the concurrences of Justice Stevens and Justice O'Connor, the latter of which Justice Kennedy joined. *Id.* at 113, 132, 136, 157. Moreover, the Supreme Court and lower courts around the country still rely on the case's precedent, bolstering its weight. *Compare* Lawrence v. Texas, 539 U.S. 558, 592–93 (2003) (Scalia, J., dissenting) (citing *Michael H.* to argue against the overruling of *Bowers v. Hardwick*), *with* Fowler v. Benson, 924 F.3d 247, 261 n.8 (6th Cir. 2019) (ruling that the suspension of a license did not implicate a fundamental right because the “right of the indigent to drive—even in a car-bound society where public transit may be woefully inadequate—is not a right rooted in the traditions and conscience of our people”), *and* Jaen v. Sessions, 899 F.3d 182, 184, 190 (2d Cir. 2018) (holding that Jaen acquired citizenship at birth because his father was an American citizen and, like the father in *Michael H.*, established parentage through marriage and not a blood relationship).

Court's prior decisions in *Myer* and *Pierce*.¹¹⁰ The Court held that a biological father, whom Justice Scalia referred to as an "adulterous natural father," was not denied any constitutional rights when the state refused to legally declare him the father of his child.¹¹¹ To warrant protection, the "adulterous natural father['s]" right had to meet two specific requirements.¹¹² First, the right at issue had to be fundamental.¹¹³ Second, the right had to be "traditionally protected by our society."¹¹⁴ In other words, the right had to be "so rooted in the traditions and conscience of our people as to be ranked as fundamental."¹¹⁵

The Court also expressed its openness to allow an exception if "on any other basis [the right] ha[d] been accorded special protection."¹¹⁶ Ultimately, the plurality found no special exception and concluded that an "adulterous natural father['s]" relationship with his daughter was not traditionally protected and, in fact, was one that "our traditions have protected . . . against."¹¹⁷ Consequently, the right contested in *Michael H.* was not fundamental and the Court used rational basis analysis to review the law infringing on it.¹¹⁸

The Court's decision was not without criticism, as Justice Brennan asserted that the addition of the traditionally protected interest requirement turned the Due Process Clause into a "redundancy."¹¹⁹

110. *Michael H.*, 491 U.S. at 122.

111. *Id.* at 113–14, 120, 130 (stating that Michael H., who was found to be Victoria D.'s true father with 98.07% probability, could not attempt to petition the state to "establish his paternity and right to visitation").

112. *Id.* at 120, 122.

113. *See id.* at 122 (stating that "in isolation, [fundamental] is hard to objectify" in and of itself and thus required further analysis).

114. *See id.* (explaining that the inclusion of this second prong was "an attempt to limit and guide interpretation of the [Due Process] Clause").

115. *Id.* (quoting *Snyder v. Massachusetts*, 291 U.S. 97, 105 (1934)). Justice Scalia also asserted that case history had consistently shown a "solid recognition of the basic values that underlie our society." *Id.* at 122–23 (quoting *Griswold v. Connecticut*, 381 U.S. 479, 501 (1965) (Harlan, J., concurring)).

116. *Id.* at 124.

117. *Id.* at 120, 124, 132.

118. *Id.* at 129–31; *see also* Gilles, *supra* note 94, at 138 (2001) (pointing out that the Court has often limited its standard of review in substantive due process cases to a "choice . . . between rational basis review and strict scrutiny, with intermediate scrutiny not an option").

119. *Michael H.*, 491 U.S. at 140–41 (Brennan, J., dissenting) (arguing that this "redundancy mocks those who, with care and purpose, wrote the Fourteenth Amendment" and that the focus should be on interests that "society traditionally has thought important (with or without protecting [those interests])"). Justice Brennan goes on to state that construing the Fourteenth Amendment in Justice Scalia's manner

Justice Scalia rebutted that the Due Process Clause's "purpose [was] to prevent future generations from lightly casting aside important traditional values—not to enable this Court to invent new ones."¹²⁰ By holding that only traditionally protected societal rights would be upheld, Justice Scalia sought to limit new rights from being created simply due to a uniform societal or state consensus.¹²¹

After *Michael H.*, more than a decade passed before the Supreme Court heard another landmark case regarding parental rights.¹²² In 2000, the Supreme Court decided *Troxel*, the most recent case in the parental rights lineage.¹²³ In *Troxel*, the Court considered a

"ignores the kind of society in which our Constitution exists" because it disregards the fact that we do not live in an "assimilative, homogeneous society, but a facilitative, pluralistic one" where citizens tolerate other's different practices to ensure that those "same tolerant impulse[s] protect[] our own idiosyncrasies." *Id.* at 141. Additionally, Justice White argued that no prior cases made "the father's rights . . . dependent on the marital status of the mother or biological father" and that the Court had effectively "rendered [Michael H.] a stranger to his child." *Id.* at 157, 163 (White, J., dissenting).

120. *Id.* at 122 n.2 (adding that "traditionally protected" did not necessarily mean "an explicit constitutional provision or statutory guarantee, but it must at least exclude . . . a societal tradition of enacting laws *denying* the interest").

121. *Id.* at 126–27.

122. See *Troxel v. Granville*, 530 U.S. 57, 65–66 (2000) (plurality opinion) (discussing the history of parental rights between *Meyer*, *Pierce*, and *Michael H.* while citing *Washington v. Glucksberg*, 521 U.S. 702 (1997), *Santosky v. Kramer*, 455 U.S. 745 (1982), *Parham v. J. R.*, 442 U.S. 548 (1979), *Quilloin v. Walcott*, 434 U.S. 246 (1978), *Wisconsin v. Yoder*, 406 U.S. 205 (1972), *Stanley v. Illinois*, 405 U.S. 645 (1972), and *Prince v. Massachusetts*, 321 U.S. 158 (1944)).

123. See 530 U.S. 57 (2000) (plurality opinion); Lawrence, *supra* note 104, at 111 (positing that *Troxel* may be the "most bold parental rights case invoking *Meyer*"); Miller, *supra* note 81, at 400–01 (stating that coupling the precedents from *Meyer* and *Troxel* set a "remarkably clear and coherent statement of the basic rights of parenthood"). Similar to the Court's *Michael H.* decision, Justice O'Connor's *Troxel* opinion secured additional support from Chief Justice Rehnquist, Justice Ginsburg, Justice Breyer, Justice Souter's concurring opinion, and Justice Thomas' concurring opinion. 530 U.S. at 60, 75, 80. Additionally, even though *Troxel* is a plurality decision, Supreme Court opinions consistently cite the case, and lower courts around the nation still apply its precedent. Compare *McDonald v. City of Chicago*, 561 U.S. 742, 863 (2010) (Stevens, J., dissenting) (arguing that *Troxel* helped solidify the idea that the Due Process Clause "provides heightened protection against government interference with certain fundamental rights and liberty interests" (quoting *Troxel*, 530 U.S. at 65 (plurality opinion))), and *Obergefell v. Hodges*, 135 S. Ct. 2584, 2618 (2015) (Roberts, C.J., dissenting) (positing that the *Troxel*, among other cases, "articulated the importance of history and tradition to the fundamental rights inquiry"), with *In re Marriage of Markuson*, No. A19-0009, 2019 WL 4164899, at *1, *1, *3 (Minn. Ct. App. Sept. 3, 2019) (affirming the denial of a mother's motion to relocate her children 200 miles away from their father while citing *Troxel*), and *In re Kingston A.B.*, No. M2018-

Washington statute that allowed courts to grant visitation privileges to grandparents even if the child's parents did not want the grandparents visiting the child.¹²⁴ Justice O'Connor began by reciting a detailed history of precedent and concluded that caselaw made it clear that "it [could not] now be doubted" that the Fourteenth Amendment's Due Process Clause protected a fundamental right of parents to make decisions regarding the "care, custody, and control of their children."¹²⁵ The court found a fundamental right for parents to make decisions regarding their children and held that the Washington statute at issue infringed upon a mother's constitutional parental rights.¹²⁶

For Justice O'Connor, the crux of the case was that the Washington statute allowed "*any* person" to petition for visitation at "*any* time," while not allowing any deference to the parents' "determination of [their child's] best interests."¹²⁷ She stated that a court "must accord at least *some* special weight" to a fit parent's decisions when reviewing that parent's decision making.¹²⁸ Because the lower courts had interfered with the parents' fundamental rights while giving them "no special weight at all," the courts had gone a step too far.¹²⁹ Additionally, the Court explained that "special factors" could have adequately justified the state's interference but found that the lower courts had failed to provide any

02164-COA-R3-PT, 2019 WL 3946095, at *1, *3 (Tenn. Ct. App. Aug. 21, 2019) (stating that "[a] parent's right to the care and custody of her child is among the oldest of the judicially recognized fundamental liberty interests" to reject a father and step-mother's petition for the termination of a natural mother's parental rights).

124. See *Troxel*, 530 U.S. at 61–62 (plurality opinion).

125. *Id.* at 65–66 (pointing out that this parental liberty interest was arguably "the oldest of the fundamental liberty interests recognized by this Court"). But see *id.* at 91–93 (Scalia, J., dissenting) (claiming that *Meyer*, *Pierce*, and *Yoder* dealt with "unenumerated parental rights," which have historically resulted in very fractured decisions and had very little "stare decisis protection"). While Justice Scalia did not call for overruling those cases (because it was not requested by either side), he urged the Court not to extend its precedent to the current case and warned that doing so would "usher[] in a new regime of judicially prescribed, and federally prescribed, family law." *Id.* at 93.

126. See *id.* at 60 (plurality opinion).

127. *Id.* at 60, 68–69 (emphasis added).

128. *Id.* at 70 (emphasis added). But see Lawrence, *supra* note 104, at 111–13 (criticizing *Troxel* as a "dangerous case" because Justice O'Connor's opinion avoided the difficult issues of third-parties—like a child's grandparents—being important to the child's emotional support system while leaving the most vulnerable demographic voiceless: minor children).

129. See *Troxel*, 530 U.S. at 69 (pointing out that the lower court had incorrectly presumed the exact opposite).

such factors in their reasoning.¹³⁰ However, Justice O'Connor's opinion did not expand on what constitutes an adequate factor.¹³¹ Similar to *Michael H.*, the *Troxel* opinion was subject to a wide range of criticism from the other Justices.¹³² In his very brief concurrence, Justice Thomas pointed out that neither the plurality, Justice Souter's concurring opinion, nor Justice Kennedy's dissent "articulate[d] the appropriate standard of review" even though they all agreed that the interest at issue was indeed a fundamental right.¹³³

Troxel has spurred a range of scholarly commentary on its impact on parental rights. Professor Stephen Gilles, an accomplished constitutional law scholar, agreed with Justice Thomas's observation that Justice O'Connor's opinion never stated the level of scrutiny to which the specific case should be subjected.¹³⁴ The vagueness left from the *Troxel* decision—deciding between giving adequate "special weight" to parental decisions and protecting parents' fundamental due process rights—led Gilles to argue that future courts and Justices could argue for "any level of scrutiny."¹³⁵ In the end, he argued that the most persuasive interpretation of *Troxel* calls for the use of intermediate scrutiny,¹³⁶ not rational basis

130. *Id.* at 68.

131. *Id.*

132. *See id.* at 80–81 (Stevens, J., dissenting) (arguing that denying certiorari would have been a better decision considering all that needed to be done was for the legislature to "draft a better statute"); *id.* at 91, 93 (Scalia, J., dissenting) (positing that federal judges are not in a better position to make decisions affecting families than state legislatures and that legislatures are "able to correct their mistakes in a flash" and are "removable by the people" for making such mistakes); *id.* at 93–94, 102 (Kennedy, J., dissenting) (criticizing the lower court's conclusion "that the best interests of the child standard is never appropriate in third-party visitation cases" and arguing that the question of whether the visitation statute was constitutional should have first been addressed at the state court level).

133. *Id.* at 80 (Thomas, J., concurring) (explaining that he would have applied a strict scrutiny standard and that the State of Washington failed to show "even a legitimate governmental interest" by questioning a fit parent's choices). Justice Thomas also insinuates that the Court's prior "substantive due process cases were wrongly decided and that the original understanding of the Due Process Clause precludes judicial enforcement of unenumerated rights under that constitutional provision," but that the issue had not been raised by either party in the case. *Id.*

134. Gilles, *supra* note 94, at 123 (clarifying that one could infer whether rational basis review, intermediate scrutiny, or strict scrutiny was necessary by carefully dissecting Justice O'Connor's opinion).

135. *Id.* at 124–25.

136. *Id.* at 125–26.

review¹³⁷ or strict scrutiny.¹³⁸ Additionally, he argued that *Troxel* can, and should, be used in a manner that “extends beyond the context of visitation.”¹³⁹ Notably, others have pointed out that while the Court repeatedly recognized parental rights in *Meyer*, *Pierce*, and *Troxel*, those rights are not absolute.¹⁴⁰ Even though there exists a “private realm of family life which the state cannot enter,”¹⁴¹ a state is within its authority to regulate and infringe upon parental rights “to protect the health and/or well-being of children.”¹⁴²

Ultimately, the Supreme Court’s case-by-case approach to developing fundamental parental rights resulted in “a patchwork of decisions that leave[s] many questions unanswered.”¹⁴³ A brief discussion of closely related substantive due process rights established by the Supreme Court will provide a more robust framework.

2. *Substantive due process rights closely related to parental interests*

While many rights closely related to parental rights could affect the constitutionality of CRISPR’s use, this Comment focuses solely on those rights that might generate the strongest arguments to allow genetic modification via CRISPR. Those rights include the general right to personal privacy and the right to procreation and bodily autonomy. While these rights do not encompass all possible rights that could arguably protect the technique’s use, the protections afforded under these rights are most closely analogous to genetic modification.

137. *Id.* at 125. Gilles states rational basis review was unreasonable for two reasons. First, the standard tended to be deferential to the government, unless a specific government decision was wholly irrational. *Id.* That was not the case in *Troxel*, as the government had identified multiple rational benefits the children obtained from visitations. *Id.* Second, giving “special weight” to parental decisions intrudes on the discretion of the court “far more than rational-basis scrutiny would.” *Id.* at 124–25.

138. *Id.* at 125–26 (explaining that this “parental presumption” leaves an opportunity for a court to override a parent’s decision while not actually finding any harm to a child, which would be inconsistent with strict scrutiny because a state claiming a compelling interest without any actual harm to the child seems implausible). Additionally, Gilles points out that while Justice Thomas advocated strict scrutiny, three Justices explicitly rejected its use. *Id.*

139. *See also id.* at 123, 142 (arguing that parental right jurisprudence would benefit from integrating more of a cost-benefit analysis).

140. Grant H. Frazier, Comment, *Defusing A Ticking Time Bomb: The Complicated Considerations Underlying Compulsory Human Genetic Editing*, 10 HASTINGS SCI. & TECH. L.J. 39, 72 (2019).

141. *Id.* (quoting *Prince v. Massachusetts*, 321 U.S. 158, 166 (1944)).

142. *Id.*

143. *See McCarthy*, *supra* note 100, at 985.

One of the seminal cases that built the foundation for the rights mentioned above resulted from a coalescence of Amendments. In *Griswold v. Connecticut*,¹⁴⁴ Justice Douglas established an implied right to personal privacy through a “penumbra” of guarantees derived from the Bill of Rights.¹⁴⁵ This “zone[] of privacy” extended its protections to marital relationships because they were seen as “a bilateral loyalty, not commercial or social projects.”¹⁴⁶ Eventually, the Court’s protection of privacy interests split into two distinct branches: a right to “avoid[] disclosure of personal matters” and a right to “independence in making certain kinds of important decisions.”¹⁴⁷ The second branch of privacy, and the potential basis for a fundamental right to parental use of gene editing, was established in *Roe v. Wade*¹⁴⁸ and will be discussed later in this Section.¹⁴⁹

Courts have used Justice Douglas’s “penumbral” privacy analysis to expand privacy rights beyond the traditional marital relationship. In *Eisenstadt v. Baird*,¹⁵⁰ the Court heavily relied on *Griswold*’s penumbral privacy right to strike down a Massachusetts statute that prohibited the distribution of contraceptives to anyone other than married couples.¹⁵¹ More importantly, Justice Brennan clarified in dicta that, while *Griswold* protected marital privacy rights, those rights extended beyond that relationship alone.¹⁵² He stated that “[i]f the right of privacy

144. 381 U.S. 479 (1965).

145. *See id.* at 481–86 (holding that a Connecticut statute forbidding contraceptive use violated the marital privacy that this “penumbra” guaranteed and therefore was unconstitutional); *see also* Christine Guest, Comment, *DNA and Law Enforcement: How the Use of Open Source DNA Databases Violates Privacy Rights*, 68 AM. U. L. REV. 1015, 1035 (2019) (explaining how *Griswold*’s right to privacy came from a combination of the First Amendment, Third Amendment, Fifth Amendment, and Ninth Amendment, and how the Court used the Fourteenth Amendment to “apply this right of privacy to the states”).

146. *See Griswold*, 381 U.S. at 485–86.

147. *See* Guest, *supra* note 145, at 1035–36 (quoting *Whalen v. Roe*, 429 U.S. 589, 599–600 (1977)).

148. 410 U.S. 113 (1973).

149. *See infra* notes 155–60 and accompanying text; *see also* Guest, *supra* note 145, at 1036 n.144.

150. 405 U.S. 438 (1972).

151. *Id.* at 440–41, 450, 452–53 (striking down the Massachusetts statute on equal protection grounds because it had a “de minimis effect” on preventing fornication, its health concerns were merely a pretextual reason to prevent premarital sex, and it unreasonably discriminated between married couples and unmarried individuals).

152. *Id.* at 453 (positing that a marital relationship is not simply one entity that thinks on its own, but “an association of two individuals each with a separate intellectual and emotional makeup”).

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.”¹⁵³ Justice Brennan’s expansion of *Griswold*’s penumbral privacy rights from a marital relationship to the individual, including the declaration that the decision of whether to “bear or beget a child” was a personal decision, extended the realm of substantive due process rights even further.¹⁵⁴

Despite the previous cases’ focus on individual rights to privacy from government intrusion, *Eisenstadt*’s dicta spurred a line of cases debating a woman’s right to terminate her pregnancy. The Supreme Court dealt with the issue of terminating a pregnancy for the first time in *Roe v. Wade*.¹⁵⁵ The majority explained the history of abortion, societal and organizational views on the issue, and substantive due process rights, concluding that the idea of personal liberty was founded in the Fourteenth Amendment and was “broad enough to encompass a woman’s decision whether or not to terminate her pregnancy.”¹⁵⁶ However, the Court stated that this right was not absolute and that states maintained an important interest “in safeguarding health, in maintaining medical standards, and in protecting potential life.”¹⁵⁷ Therefore, not all pregnancy-related decisions fell squarely within the “protected sphere of liberty,”¹⁵⁸ and a number of courts had already upheld state laws that protected a mother’s “health or prenatal life.”¹⁵⁹ Furthermore, in response to the claim that a fetus was a “person” in the context of the Fourteenth

153. *Id.*

154. *Id.*

155. 410 U.S. 113, 120, 164–66 (1973) (creating a trimester framework that balanced the mother’s interest and the state’s interest while discussing the levels of regulation/intrusion allowed in each).

156. *Id.* at 130–47, 153.

157. *Id.* at 154 (claiming that “[t]he Court has refused to recognize an unlimited right of this kind in the past” in response to amici assertions that the absolute “right to do with one’s body as one pleases” should extend to the privacy rights contested).

158. See Pham, *supra* note 92, at 141 (quoting John B. Attanasio, *The Constitutionality of Regulating Human Genetic Engineering: Where Procreative Liberty and Equal Opportunity Collide*, 53 U. CHI. L. REV. 1274, 1287 (1986)).

159. *Roe*, 410 U.S. at 156 (leading the court to find “State’s determinations” in these matters “dominant and constitutionally justifiable”).

Amendment, the Court found that no amendment to the Constitution had “any possible pre-natal application.”¹⁶⁰

After *Roe* established this broad right to terminate a pregnancy, states took it upon themselves to narrow its holding.¹⁶¹ In *Planned Parenthood of Southeastern Pennsylvania v. Casey*,¹⁶² the Court ruled on another landmark abortion case.¹⁶³ Justice O’Connor unequivocally affirmed *Roe*’s central holding that a woman was within her constitutional rights when determining whether to terminate her own pregnancy.¹⁶⁴ This determination was more than just a right to make one’s own procreative choices, but also encompassed the rights to “personal autonomy and bodily integrity.”¹⁶⁵ Nonetheless, the Court declared that a state could regulate that right so long as the state did not impose an “undue burden” on a woman’s ability to obtain an abortion.¹⁶⁶ Additionally, a woman’s right was not unlimited, and a state could have an interest in protecting the “life of the unborn” from the outset.¹⁶⁷

Collectively, these cases demonstrate that parents have an established right to decide how their child is cared for, who cares for their child, and most other decisions regarding that child’s upbringing. That right remains protected so long as the defined right is engrained in the minds of people and traditions of society, making it

160. *Id.* at 157 (clarifying that nearly all occurrences of the word “person” in the Constitution could only be understood to apply postnatally).

161. *See generally* *Webster v. Reprod. Health Servs.*, 492 U.S. 490, 511 (1989) (upholding a Missouri statute that prohibited “public employees and facilities” from performing or aiding in “nontherapeutic abortions”); *Maher v. Roe*, 432 U.S. 464, 466 (1977) (upholding a Connecticut regulation that limited Medicaid funding to “medically necessary” abortions during the first trimester).

162. 505 U.S. 833 (1992).

163. *Id.* at 844, 887, 897–99 (applying an undue burden test to uphold a Pennsylvania statute’s definition of medical emergency, an informed consent requirement, a parental consent condition, and a twenty-four-hour waiting period while striking down a spousal notice requirement).

164. *Id.* at 871 (“[The right to terminate a pregnancy] is a rule of law and a component of liberty we cannot renounce.”).

165. *Id.* at 857; *see* *Pham, supra* note 92, at 139.

166. *See Casey*, 505 U.S. at 873, 876 (rejecting *Roe*’s trimester framework in favor of the undue burden test that hinged on when a fetus was determined to be viable). The Court decided to draw a line at viability for two main reasons. First, because *stare decisis* dictated that *Roe*, which the Court had reaffirmed twice, had shown to be a “reasoned statement, elaborated with great care.” *Id.* at 870. Second, because viability had proven to be the point in time when the fetus had a realistic chance of “maintaining and nourishing a life outside the womb.” *Id.*

167. *Id.* at 869.

fundamental.¹⁶⁸ Because parents are often found to have the best interest of their children in mind, reviewing courts should give parents' decisions special weight.¹⁶⁹ The cases concerning personal privacy add to this sphere of rights by creating a zone of privacy that protects married couples' relationships from government intrusion.¹⁷⁰ Courts further expanded this idea by establishing a level of individual autonomy people have when making certain types of important decisions, including whether or not to terminate a pregnancy.¹⁷¹ The right to terminate a pregnancy, while broad, includes exceptions for a state's interest in protecting the health of the mother, maintaining current medical standards, and protecting prenatal life.¹⁷² However, courts will strike down any statutory intrusion as unconstitutional if the state places an undue burden on a woman's right to obtain an abortion.¹⁷³

Taken together, all of these rights still leave one question unanswered: do parents have a constitutional right to use CRISPR technology or other genetic modification techniques to permanently modify embryos and, consequently, future generations? Part II of this Comment addresses the substantive due process doctrine discussed above in the context of parents asserting their constitutional right to genetically modify an embryo, either to fix an ailment or to enhance their future child, via the use of CRISPR technology.

II. ANALYSIS

As discussed above, germline genome modification through CRISPR enables parents to make child-rearing decisions, the effects of which reach far beyond the child they contemplate raising. Because germline genome modification via CRISPR is not a fundamental right under substantive due process doctrine, it should not be subject to strict scrutiny. This Section first explores both broadly and narrowly defined rights that parents could assert when attempting to make genetic modifications, showing that a narrow definition would be more appropriate in this context.¹⁷⁴ Next, this Section describes how CRISPR technology exceeds the scope of both *Meyer's* and *Pierce's* holdings.¹⁷⁵

168. See *supra* notes 113–15 and accompanying text.

169. See *supra* notes 127–28 and accompanying text.

170. See *supra* notes 144–46 and accompanying text.

171. See *supra* notes 156 and accompanying text.

172. See *supra* notes 157–59 and accompanying text.

173. See *supra* note 166 and accompanying text.

174. See *infra* Section II.A.

175. See *infra* Section II.B.1.

Using the Supreme Court's analysis in *Michael H.*, this Section shows courts are not likely to protect germline editing using CRISPR as a fundamentally protected right.¹⁷⁶ Additionally, this Section explains that the most recent parental rights case, *Troxel*, calls for courts to give parental decisions special consideration and apply intermediate scrutiny when considering laws restricting the right to genetically modify embryos.¹⁷⁷ Moreover, this Section explains and responds to arguments calling for either strict scrutiny or rational-basis review standards, concluding that intermediate scrutiny is the most applicable standard.¹⁷⁸ Finally, this Section considers the potential application of intermediate scrutiny and contemplates states' interests in barring CRISPR's use along with parental interests in choosing to use the technique.¹⁷⁹

A. *CRISPR Genome Editing as a Narrowly Defined Right*

Before analogizing CRISPR to previously established rights or analyzing what standard of review a court may apply, it is crucial to define the explicit right a parent would attempt to assert under these circumstances. Some of the precedential parental rights cases could lead to arguments that a broader reading should be used. Together, *Meyer* and *Pierce* created a broad right that parents could "direct the upbringing and education of children under their control."¹⁸⁰ Later, *Troxel* summarized the right and stated that "the care, custody, and control of their children" were well within the purview of parental interests.¹⁸¹ However, as previously addressed, that is not exactly what would occur if parents attempted to genetically modify an embryo.¹⁸² If a parent successfully modified an embryo's germline, the edit would not only affect their soon-to-be child but all of the child's descendants as well.¹⁸³ Therefore, using CRISPR to edit an embryo's DNA has intergenerational repercussions and is much more expansive than only having "control of *their children*."¹⁸⁴ Moreover, closely related rights could also be used to argue for a broader reading.

176. See *infra* Section II.B.2.

177. See *infra* Section II.B.3.

178. See *infra* Sections II.C.1–3.

179. See *infra* Sections II.C.4.

180. *Pierce v. Soc'y of Sisters*, 268 U.S. 510, 534–35 (1925); *Meyer v. Nebraska*, 262 U.S. 390, 400 (1923).

181. *Troxel v. Granville*, 530 U.S. 57, 65 (2000) (plurality opinion).

182. See *supra* notes 60–79.

183. *What Are Genome Editing & CRISPR-Cas9?*, *supra* note 7.

184. *Troxel*, 530 U.S. at 65 (emphasis added); see *supra* Section I.B.1.

Taken as a whole, *Griswold*, *Eisenstadt*, *Roe*, and *Casey* created a personal privacy right that extends to decisions regarding reproductive matters like whether to terminate a pregnancy.¹⁸⁵ However, asserting the “right to make decisions regarding reproduction” has been deemed a “somewhat disingenuous classification” because genetic modification of an embryo is “radically different from traditional reproduction.”¹⁸⁶ In addition, precluding a parent from genetically modifying an embryo through CRISPR would not intrude or impose an undue burden upon a woman’s right to terminate her pregnancy. A constitutional right to “bear or beget a child” is vastly different from “being able to use genetic manipulation to create a child according to one’s own preferences.”¹⁸⁷ Thus, because neither established parental rights nor established related rights provide properly framed interests, a narrower reading of the parental right being asserted is more appropriate.

When defining the right to modify an embryo’s genes, the inclusion of its generational effects is a much more accurate way to portray the interests that parents would be asserting. When contemplating human germline genome modification (HGGM), one writer succinctly stated that the right could be described as “the right to choose the genetic or physical characteristics of one’s child using alternate reproductive technology.”¹⁸⁸ However, at the time that article was written, CRISPR had not been invented and the possibility of actually making permanent, targeted changes to DNA was not a reality. Since the publication of that article, CRISPR has enabled parents to change the DNA of their children *and* future generations.¹⁸⁹ Therefore, for the purposes of this analysis, the asserted right will be defined as the right to make permanent, *heritable* alterations to the genetic makeup of one’s child.

185. See *supra* Section I.B.2.

186. See Pham, *supra* note 92, at 140 (arguing that human germline genome modification should not be a fundamental right because it is not a traditional form of reproduction). *But see* Ossareh, *supra* note 100, at 757 (claiming that genetic modification could be protected under *Lawrence*’s broadly defined privacy right because the Court “avoided such particular language” to “define[] the protection of the Fourteenth Amendment”).

187. *Eisenstadt v. Baird*, 405 U.S. 438, 453 (1972); Pham, *supra* note 92, at 138.

188. See Pham, *supra* note 92, at 140 (clarifying that the Court could still find that definition of human germline genome modification to be fundamental).

189. See Shwartz, *supra* note 44.

B. CRISPR Modification in Light of Established Parental Rights

To gain a better understanding of what level of scrutiny the Supreme Court and lower courts should apply when dealing with parental attempts to use CRISPR modification, the following Section will analogize the asserted right described above to established caselaw. Ultimately, because CRISPR genome editing does not fit neatly into any of the historically protected rights, a different standard from that applied in the following cases is required.

1. Genetic modification is broader than Meyer's & Pierce's Rulings

The first parental rights cases, *Meyer* and *Pierce*, were decided in 1923 and 1925, respectively, and did not cover the topic of genetic editing.¹⁹⁰ Together, *Meyer* and *Pierce* created precedent that a state cannot “unreasonably interfere[] with the liberty of parents and guardians to direct the upbringing and education of children under their control.”¹⁹¹ These cases affirmatively created rights to raise children, but, as mentioned previously, permanently editing the DNA of a child is certainly much broader than the *Meyer* and *Pierce* Courts even fathomed.¹⁹² Arguing that a parent could modify the genetics of a future embryo when the Court spoke directly to the “upbringing and education” of a child would be quite a stretch.¹⁹³ Additionally, parents would not only be modifying their future child’s DNA but they would effectively be permanently changing future generations’ DNA.¹⁹⁴ Consequently, the ability to affect the way in which future generations of one’s lineage are created or brought up must fall outside the purview of the rights that the *Meyer* and *Pierce* Courts considered.¹⁹⁵

190. See generally *Pierce v. Soc’y of Sisters*, 268 U.S. 510 (1925); *Meyer v. Nebraska*, 262 U.S. 390 (1923).

191. *Pierce*, 268 U.S. at 534–35.

192. See *supra* Section I.B.1.

193. *Pierce*, 268 U.S. at 534–35; see *supra* Section I.B.1.

194. See Shwartz, *supra* note 44.

195. But see Ossareh, *supra* note 100, at 756 (arguing that *Meyer* does give parents the right to genetically modify their children because modification techniques would “allow[] parents to make choices about how to establish a home and bring up children” (internal quotations omitted)). Ossareh goes on to claim that a combination of parental and procreative rights is sufficient to protect the right to genetically modify a child and “obviate[] the need to demand a separate right to genetic modification.” *Id.* at 757.

2. *CRISPR embryo modification cannot be “ranked as fundamental”*

Under *Michael H.*'s more recent ruling, modifying embryos through CRISPR would likely not fall within the recognized, constitutionally protected fundamental rights of parents. *Michael H.* established that an asserted right must be both fundamental *and* one that is “traditionally protected” to be upheld.¹⁹⁶ CRISPR technology, and genetic modification generally, have only existed for approximately forty years.¹⁹⁷ As a result, it is unlikely that this technology is old enough to be “so rooted in the traditions and conscience of our people as to be ranked as fundamental.”¹⁹⁸ In fact, multiple Pew Research surveys have found that most people are currently against the use of CRISPR in embryos.¹⁹⁹ Additionally, due to the current lack of caselaw even mentioning genetic modification, it would be extreme difficulty to argue that the technology is traditionally protected.²⁰⁰

Furthermore, the Court is unlikely to make an exception for CRISPR because, much like the interest of the adulterous father in *Michael H.*, there is no evidence that CRISPR “has been accorded special protection” under any other circumstances.²⁰¹ Justice Scalia even stated that the right in *Michael H.* was one that “our traditions have protected . . . against.”²⁰² Because the scientific community is still largely unaware of CRISPR's long-term repercussions, its use on human DNA has “long been considered off-limits,” and many have been quite critical of those who have used it.²⁰³ Moreover, Justice Scalia stated that the “purpose [of the Due Process Clause] is to prevent future generations from lightly casting aside

196. *Michael H. v Gerald D.*, 491 U.S. 110, 122 (1989).

197. See *How Does Genome Editing Work?*, *supra* note 2.

198. *Michael H.*, 491 U.S. at 122.

199. See, e.g., Cary Funk & Meg Hefferson, *Public Views of Gene Editing for Babies Depend on How it Would Be Used*, PEW RES. CTR. (July 26, 2018), <https://www.pewresearch.org/science/2018/07/26/public-views-of-gene-editing-for-babies-depend-on-how-it-would-be-used> [<https://perma.cc/7D33-ZR7Z>] (finding that 65% of adult Americans believe that “gene editing would involve testing on human embryos” and that this would take technology too far); David Masci, *Many Americans are Wary of Using Gene Editing for Human Enhancement*, PEW RES. CTR. (Aug. 26, 2016), <https://www.pewresearch.org/fact-tank/2016/08/26/many-americans-are-wary-of-using-gene-editing-for-human-enhancement> [<https://perma.cc/TP8S-DHT5>] (finding that over 68% of U.S. adults are “very” to “somewhat” worried about genetically modifying babies).

200. See *supra* notes 97–100 and accompanying text.

201. *Michael H.*, 491 U.S. at 124.

202. *Id.*

203. See Stein, *supra* note 4 (pointing out that the Center for Genetics and Society's executive director called its use in human twins an “unethical and reckless experimentation on human beings, and a grave abuse of human rights”).

important traditional values—not to enable this Court to invent new ones.”²⁰⁴ CRISPR is a new technology that enables parents to edit the genome of embryos, and, consequently, it may impact future generations and their lineage, which is exactly what Justice Scalia cautioned against.²⁰⁵ Because of its potentially far-reaching, intergenerational implications, courts should be wary of extending special protection to this nascent technique. As a result, CRISPR’s use would likely not be a fundamental right and would only be subject to rational basis review, if not for *Troxel*.

3. *Parental rights uncertainty after Troxel*

After assuming that the genetic modification of an embryo is not a fundamental right under *Michael H.*, one still needs to consider the significance of *Troxel*.²⁰⁶ Justice O’Connor stated that parents have an unequivocal right to make decisions regarding the “care, custody, and control of their children.”²⁰⁷ Similar to the *Meyer* and *Pierce* rights discussed above, applying *Troxel*’s determination to CRISPR would extend far beyond the “care, custody, and control of *their* children” because CRISPR has permanent intergenerational implications.²⁰⁸ Additionally, *Troxel*’s special weight could result in courts finding that parents get deferential treatment in decisions regarding whether to genetically modify embryos, so long as they have their child’s best interest in mind.²⁰⁹ According to *Troxel*, parents get the benefit of the doubt because, taken as a whole, they tend to have in mind their child’s best interest when making decisions.²¹⁰

However, granting parents a special weight in decision making without first considering whether the asserted right is fundamental would disregard *Michael H.*’s precedent. Justice O’Connor did briefly mention that any “special factors” given by a state could provide adequate justification for infringing on parental rights.²¹¹ While the Court never specifically enumerated exactly what some of those “special factors” could be, CRISPR, given its relative newness and potentially serious repercussions, arguably constitutes one such limiting factor.²¹²

204. *Michael H.*, 491 U.S. at 122 n.2.

205. See Shwartz, *supra* note 44.

206. See Lawrence, *supra* note 104, at 111 (highlighting various questions that arise when examining *Troxel*’s interpretation of *Meyer*).

207. *Troxel v. Granville*, 530 U.S. 57, 65 (2000) (plurality opinion).

208. *Id.* (emphasis added); Shwartz, *supra* note 44.

209. See *supra* notes 127–29 and accompanying text.

210. See *supra* notes 127–29 and accompanying text.

211. See *supra* note 130 and accompanying text.

212. See *supra* notes 2, 130 and accompanying text.

The *Troxel* Court's finding that the state should accord special weight to parental decisions creates tension with *Michael H.* because it pushes back on *Michael H.*'s "traditionally protected" rights analysis. While the Court traditionally selects between strict scrutiny and rational basis standards of review when deciding substantive due process cases, another option remains available: intermediate scrutiny.

C. *A Call for Intermediate Scrutiny*

Troxel's decision resulted in uncertainty for the parental rights analysis. Should courts automatically decide in the parents' favor because of a special weight? How should the *Michael H.* analysis factor into a court's decision making? Most importantly, among strict scrutiny, rational basis, and intermediate scrutiny, what standard should courts apply? The following analysis will consider the potential application of all three standards of review in turn.

1. *Michael H. invalidates the application of strict scrutiny*

As discussed above, the Supreme Court is not likely to find that parents have a fundamental right to use CRISPR to modify a human embryo. If the Court found such a fundamental right, the Court would apply strict scrutiny during judicial review of laws infringing on that right, and a state government would need to prove a compelling state interest to which the state's ends were narrowly tailored.²¹³ However, the Supreme Court has historically "been hesitant to extend the sphere of fundamental rights."²¹⁴ Considering that reluctance, the Court is even less likely to extend heightened protection to an advanced, nascent technology that has tremendous social and legal repercussions. Furthermore, fundamental protection is unfounded because *Troxel*'s "parental presumption" preserves an opportunity for a court to override a parent's decision without actually finding any harm to a child.²¹⁵ Accordingly, this line of reasoning is inconsistent with strict scrutiny because a state claiming a compelling interest without any *actual* harm

213. *Planned Parenthood of Se. Pa. v. Casey*, 505 U.S. 833, 929 (1992) (Blackmun, J., concurring in part & dissenting in part).

214. *See Pham*, *supra* note 92, at 142.

215. *See Gilles*, *supra* note 94, at 125–26.

to the child seems implausible.²¹⁶ Lastly, while Justice Thomas advocated for strict scrutiny in *Troxel*, three Justices essentially rejected its use.²¹⁷

On the other hand, others have argued that procreative, parental, and privacy rights all suggest the use of strict scrutiny.²¹⁸ They state that allowing genetic modification will “enhance procreative liberty” and that “part of the fundamental good of having a child is getting to raise a healthy, happy child.”²¹⁹ This line of reasoning is problematic for two reasons. First, it fails to contemplate that genetic manipulation affects more than just the birth of one child.²²⁰ Second, the analysis fails to consider recent parental rights cases when it makes these judgments on parental rights. One note arguing for strict scrutiny only briefly mentions *Michael H.*’s precedent in a footnote and ignores mention of *Troxel* altogether.²²¹ As stated earlier, both of these cases significantly affect how courts view parents’ constitutional rights and must be taken into consideration.²²² Accordingly, a court’s application of strict scrutiny in this context would be inappropriate.

2. *Rational basis standard of review is improper after Troxel*

Traditionally, a court would proceed to apply rational basis review if it found that a substantive due process right was not fundamental.²²³ Under

216. *Id.* at 125–26 & n.153 (explaining the actual “harm” to the child as involving “large, serious, potentially irreparable reductions in the child’s welfare”).

217. *Id.* at 125–26. The three Justices who rejected strict scrutiny are Justice Scalia, Justice Stevens, and Justice Kennedy. *Troxel v. Granville*, 530 U.S. 57, 80, 91, 93 (2000). While Justice Scalia rejected to apply it because he did not believe the interest at issue was an enumerated right at all, Justice Kennedy and Justice Stevens “rejected a ‘harm-to-the-child’ requirement, rather than squarely rejecting strict scrutiny by name.” *See id.* at 93; Gilles, *supra* note 94, at 125 n.152.

218. *See, e.g.,* Ossareh, *supra* note 100, at 756, 759 (stating that “choosing a future child’s genetics implicates one’s role as both a parent and a procreator”).

219. *Id.* at 756 (positing that because other choices regarding procreation are broadly categorized as procreative rights, “the choice to genetically modify an embryo fits snugly in the intersection of both of these doctrines”).

220. *See supra* note 9 and accompanying text.

221. *See* Ossareh, *supra* note 100, at 754 n.148.

222. *See supra* Section I.B.1.

223. *See* Gilles, *supra* note 94, at 138–39. While some scholars have mentioned the Court’s “rational basis with bite” jurisprudence that was limited in *Board of Trustees v. Garrett*, this line of reasoning can be distinguished from potential CRISPR substantive due process claims. Pham, *supra* note 92, at 146 (analyzing substantive due process rights in the context of human germline genome modification and not mentioning intermediate scrutiny but mentioning “rational basis with bite” and *Lawrence*’s liberty interest analysis); *see Bd. of Trustees v. Garrett*, 531 U.S. 356, 366 (2001) (reaffirming that intellectual disability does not qualify as a “quasi-suspect”

rational basis review, a court would ask whether a state's legislation "pursues a legitimate end by rational means."²²⁴ While analysis under *Michael H.* would result in applying a rational basis test, a reading of *Troxel* shows that the Court cannot apply this test when considering CRISPR's use. Giving a "special weight" to parents was controlling in *Troxel* even when the state provided rational reasons for enacting the statute at issue.²²⁵

Professor Gilles posits that this rationale argues for intermediate scrutiny and refutes the application of rational basis for two reasons.²²⁶ First, a court using rational basis review usually defers to the government, unless the court finds that a specific decision "as a whole is not irrational."²²⁷ This was not the case in *Troxel*, as the government had identified multiple benefits that children had derived from the statute.²²⁸ Second, the "special weight" that Justice O'Connor gave the parental decisions intruded on the discretion of the court "far more than rational-basis scrutiny would."²²⁹ As a result, *Troxel's* "special weight" consideration determined that rational basis review is not the proper standard of review for parental rights.

3. *Intermediate scrutiny: A proper standard of review*

Due to the confusion caused by these conflicting precedents and the *Troxel* plurality's failure to explicitly mention a standard of review, the most persuasive interpretation of *Troxel* calls for courts to apply an intermediate scrutiny standard when considering laws infringing on parental rights to use CRISPR to genetically modify embryos.²³⁰ For a law to withstand intermediate scrutiny, it must be substantially related to

classification for equal protection claims (quoting *City of Cleburne v. Cleburne Living Ctr., Inc.*, 473 U.S. 432, 435 (1985)). *Garrett* specifically dealt with Eleventh Amendment and intellectual disability distinctions as applied to the states under the Fourteenth Amendment's Equal Protection Clause. *Id.* Therefore, while people with intellectual disabilities are not deemed a quasi-suspect class, the issue of whether CRISPR's use could be subject to this level of scrutiny is still open for debate.

224. *Michael H. v. Gerald D.*, 491 U.S. 110, 131 (1989).

225. *See Troxel v. Granville*, 530 U.S. 57, 61–62 (2000) (plurality opinion).

226. *See Gilles*, *supra* note 94, at 125.

227. *See id.* (pointing out that "two overnight visits per month" could not possibly be "irrational" when the parent in *Troxel* had previously agreed that "one daytime visit per month was appropriate").

228. *See id.* (pointing out that the government had cited benefits that children obtained from a relationship with their grandparents and taking into account that there was no open conflict between the parent and grandparents).

229. *Id.*

230. *See id.* at 125–26.

furthering an important governmental interest.²³¹ As previously mentioned, some may argue that the Court does not use intermediate scrutiny in cases regarding substantive due process.²³² However, *Troxel's* inability to explicitly provide a standard of review left the door open for future courts to argue for “any level of scrutiny.”²³³ Additionally, as some scholars have identified, it has “become increasingly clear that intermediate scrutiny is also an appropriate option in substantive due process cases.”²³⁴ In fact, the Court seems to favor intermediate scrutiny with cases concerning “parental childrearing rights in particular.”²³⁵

Furthermore, expansion from visitation rights and child rearing to genetic modification is proper. Scholars have argued that *Troxel's* precedent could “extend[] beyond the context of visitation.”²³⁶ Intermediate scrutiny could account for the uncertainty between *Michael H.'s* and *Troxel's* precedents. By applying intermediate scrutiny to parents’ rights to use CRISPR modifications, a court would be able to account for both *Michael H.'s* “traditionally protected” analysis and *Troxel's* “special weight” consideration.²³⁷

4. *Potential application of intermediate scrutiny*

When applying intermediate scrutiny, a court would first look to a state’s regulation on CRISPR and determine whether the state was acting in furtherance of an important governmental interest.²³⁸ In the case of CRISPR modification, state governments are likely to assert a few different interests to justify its regulation. For example, the government could establish valid interests in “maintaining medical

231. *Id.* at 110–11 (explaining that “intermediate scrutiny requires a moderately close fit between ends and means”); *see also* *Craig v. Boren*, 429 U.S. 190, 197–98 (1976) (applying intermediate scrutiny to gender-based discrimination).

232. *See supra* note 96 and accompanying text.

233. *See* Gilles, *supra* note 94, at 124–25.

234. *Id.* at 138–39, 139 n.195 (pointing to *Planned Parenthood of Southeastern Pennsylvania v. Casey's* undue burden standard, *Stanley v. Illinois's* means-ends analysis, analogizing to the Fourth Amendment’s privacy “reasonableness” balancing test, and finally looking to Justices Souter, Kennedy, and Scalia’s opinions in *Troxel*, all mentioning parental upbringing rights as having First Amendment undertones, which sometimes applies intermediate scrutiny).

235. *Id.* at 112 (pointing out that the Court’s preference toward intermediate scrutiny is a trend with substantive due process rights in general).

236. *Id.* at 123.

237. *See Troxel v. Granville*, 530 U.S. 57, 70 (2000) (plurality opinion); *Michael H. v. Gerald D.*, 491 U.S. 110, 122 (1989) (plurality opinion).

238. *See* Gilles, *supra* note 94, at 110–11.

standards” or “protecting potential life” outlined in *Roe*.²³⁹ As stated earlier, the medical field came to a consensus long ago that genetic editing resulting in intergenerational genetic manipulations is “considered off-limits.”²⁴⁰ This consensus could serve as an argument that the government is simply attempting to “maintain[] medical standards.”²⁴¹ Additionally, the government could argue that regulating CRISPR’s use was a method by which it could “protect[] potential life” given the unknown, and potentially dangerous, repercussions of using the technology.²⁴²

The government may also argue a need to expand its interest to encompass the general welfare of society altogether.²⁴³ Because CRISPR can be used to modify an embryo to make a child smarter, taller, or stronger for nonmedical purposes, scientists have worried about opening the floodgates to the creation of “designer babies.”²⁴⁴ The proliferation of genetic modification could lead to what the executive director of the Center for Genetics and Society called “a society of genetic haves and have-nots,” where only those that can afford genetic modification can reap its benefits, potentially rendering others’ genetics obsolete.²⁴⁵ Additionally, the government has an important interest in preventing the potential long term effects that CRISPR modification could have on society’s “identity[] and economic output.”²⁴⁶ Lastly, the government would need to prove that the legislation passed was substantially related to its goal of preventing CRISPR’s use, while not being over- or under-inclusive.²⁴⁷ To do this

239. *Roe v. Wade*, 410 U.S. 113, 154 (1973).

240. Stein, *supra* note 4.

241. *Roe*, 410 U.S. at 154; Stein, *supra* note 4.

242. *Roe*, 410 U.S. at 120; *see* Stein, *supra* note 4 (noting that the scientific community worries “that a mistake could introduce a new disease that could be passed down for generations”).

243. Some have pushed back against this idea, arguing that larger societal concerns like the “unknown effects on the future gene pool,” the potential “homogeniz[ation of] the population over time in a discriminatory manner,” and the worry “that only the very wealthy will have access to these technologies,” are all “not sufficiently compelling to justify state action.” *See* Ossareh, *supra* note 100, at 763–65. However, even Ossareh concedes that “parent[s] seek[ing] to harm his or her child by intentionally modifying that child to have clearly outrageous traits” would constitute a sufficient state interest to bar genetic modification. *Id.* at 766.

244. Stein, *supra* note 4.

245. *Id.*; *see also* Sparrow, *supra* note 71, at 13.

246. Regalado, *supra* note 68, at 31.

247. Gilles, *supra* note 94, at 110–11.

effectively, a state could explicitly mention CRISPR in the statute or identify heritable genetic modifications as the scope of the legislation, ensuring that no reproductive, parental, or personal privacy rights are violated when regulating CRISPR's use.

If parents attempted to challenge the legitimacy of the state's interest in regulating their rights to modify an embryo or argued that parental rights outweighed the government's interests, a court could look to established exceptions available to states. For example, the Supreme Court found that states are within their authority to regulate and infringe upon parental rights "to protect the health and/or well-being of children."²⁴⁸ Because the potentially dangerous repercussions of germline editing are unknown, the government would have a strong argument for protecting the health of a potential life.

Furthermore, when CRISPR technology is more advanced and widely accepted, intermediate scrutiny would be flexible enough to allow for parents or state governments to argue for its use to help prevent diseases and potentially save lives. The adaptability of this standard is significant because "[s]omeday we may consider it unethical *not* to use germline editing to alleviate human suffering."²⁴⁹ Another established exception a reviewing court could use comes from *Troxel's* "special factors" that a state could use to justify its interference upon parents' rights.²⁵⁰ While the Court did not enumerate exactly what those factors could be, a reviewing court could—and should—determine that CRISPR is the exact type of factor the Court had in mind.²⁵¹ CRISPR is new and exciting, revolutionary, and provides endless opportunities for human evolution, but it also comes with many uncertainties that cannot be granted fundamental protection.

CONCLUSION

CRISPR technology developed rapidly and gave scientists the remarkable ability to make targeted, effective, and permanent edits to the human genome's germline.²⁵² Given the technology's superiority and success compared to previous techniques, it will not be long before parents are making the decision of whether they want to modify the

248. Frazier, *supra* note 140, at 72; *see also* Planned Parenthood of Se. Pa. v. Casey, 505 U.S. 833, 869 (1992) (stating that a woman's right was not absolute, and that a state's interest could include protecting the "life of the unborn" from the outset).

249. *See* DOUDNA & STERNBERG, *supra* note 31, at xix.

250. *Troxel v. Granville*, 530 U.S. 57, 68 (2000) (plurality opinion).

251. *Id.*

252. *What Is Genome Editing?*, *supra* note 28.

DNA of a potential child. While the parental desire to make a child as fit for the world as possible is understandable, CRISPR's immense powers must be used with caution and need to be reined in by the law.

While *Meyer* and *Pierce* first established a substantive parental right “to direct the upbringing and education of children under their control,”²⁵³ CRISPR germline modifications extend beyond the Court's holdings because germline edits carry with them intergenerational consequences.²⁵⁴ The uncertainty of these ramifications led the Obama Administration to warn the scientific community about germline editing's unrestricted use and its possible long-term dangers.²⁵⁵ Additionally, those that have used the science on embryos have been subjected to serious backlash.²⁵⁶

If a parent's right to use CRISPR technology on embryos is found to be a fundamental right, it will be protected under the highest scrutiny available for substantive due process rights. However, under *Michael H.*'s precedent, CRISPR modifications cannot constitute fundamental parental rights because genetic modification of embryos has not been a traditionally-protected right.²⁵⁷ The decision to grant CRISPR a fundamental classification would run contrary to most of the scientific community's call for limited use of CRISPR.²⁵⁸ Even one of the pioneers of the technique, Jennifer Doudna, essentially called for a moratorium on its clinical use in humans because the technology, while an extreme improvement over its predecessors, “occasionally cuts the genome at unintended sites.”²⁵⁹

253. *Pierce v. Soc'y of Sisters*, 268 U.S. 510, 534–35 (1925).

254. See *What Are Genome Editing & CRISPR-Cas9?*, *supra* note 7.

255. See Holdren, *supra* note 14.

256. Rob Stein, *A Russian Biologist Wants to Create More Gene-Edited Babies*, NAT'L PUB. RADIO (June 21, 2019, 5:08 AM), <https://www.npr.org/sections/health-shots/2019/06/21/733782145> [<https://perma.cc/7N4N-A7XZ>] (explaining how a Russian scientist's desire to genetically modify embryos using CRISPR technology has been criticized as “premature, unethical and irresponsible”).

257. See *Michael H. v. Gerald D.*, 491 U.S. 110, 122 (1989) (plurality opinion).

258. *Genetic Modification, Genome Editing, & CRISPR*, PERS. GENETICS EDUC. PROJECT, <http://pged.org/genetic-modification-genome-editing-and-crispr> [<https://perma.cc/72Y4-BKXQ>].

259. See Nicholas Wade, *Scientists Seek Ban on Method of Editing the Human Genome*, N.Y. TIMES (Mar. 19, 2015), <https://www.nytimes.com/2015/03/20/science/biologists-call-for-halt-to-gene-editing-technique-in-humans.html> (describing two schools of thought on human germline genome modification: one which is more practical and attempts to “balance benefit and risk” while the other “sets up inherent limits on how much humankind should alter nature”); see also DOUDNA & STERNBERG, *supra* note 31, at 211 (clarifying that the words “ban” and “moratorium” were explicitly

To make matters more complicated, *Troxel's* decision at the turn of the century called the status of parental rights into question. *Troxel* held that a “special weight” needed to be given to parental decisions, which competed against *Michael H.'s* traditionally protected test.²⁶⁰ This confusion left the door open for judges, courts, and parents to fight for “any level of scrutiny” when arguing the extent of parental rights.²⁶¹ Ultimately, when considering the narrow yet powerful right to make permanent, *heritable* alterations to the genetic makeup of one’s child, intermediate scrutiny is the most appropriate standard of review because it accommodates both *Michael H.'s* and *Troxel's* precedents while giving courts flexibility in governing decisions that have the power to “direct the evolution of our own species.”²⁶²

avoided but that “the message was clear: for the time being, such clinical applications should be off-limits”). Regardless of Doudna’s warnings, clinical trials using CRISPR started in 2016 and continue today, including a more recently approved clinical trial that focuses on modifying “therapeutic human hemopoietic stem cells . . . to treat thalassemia.” You et al., *supra* note 50, at 359.

260. *Troxel v. Granville*, 530 U.S. 57, 68–69 (2000) (plurality opinion).

261. Gilles, *supra* note 94, at 124–25.

262. See DOUDNA & STERNBERG, *supra* note 31, at xvi.