

The 14 Day Rule: scientific advances and the end of abortion rights

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Executive Summary: The 14 Day Rule, originally proposed in 1979, directs that the growth of any embryo grown *in vitro* in a research laboratory must be halted either 14 days post fertilization or at the appearance of the “primitive streak,” whichever occurs first. At least 12 countries around the world follow the rule, codified either in law or scientific guidelines. In 2017, the 14 Day Rule has again become a hotly debated topic in science, bioethics, and citizen communities following the publication of two reports from different research groups working with human embryos. For the first time, researchers kept embryos alive up to the legal 14-day limit. Herein, I use the 14 Day Rule as a springboard for considering the social implications of scientific and technological advances changing the timeline for human fetal viability. In particular, I address what it means for a woman’s Constitutional right to privacy, interpreted by the Supreme Court to include her right to an abortion, if an embryo is considered fully viable at the moment of conception. I argue that, in fact, a woman’s legal right to an abortion ceases to exist when technology has sufficiently advanced to the point that laboratory-grown embryos are as viable as naturally conceived full-term infants. Finally, I highlight some of the public policy implications of the State having a compelling interest in the life of the embryo from the moment of conception. With the assumption that the current Supreme Court holding on abortion will remain the law of the land, I conclude with a discussion of policies that must be established to address 1) the idea that the State’s interest can completely override bodily autonomy; 2) the potential patchwork of new and conflicting laws that will result if technology advances such that laboratory-grown embryos are viable as full-term infants without implantation in a woman; and 3) the responsibilities of the State towards the resulting infants, the parents, and broader society if all embryos must be brought to term, naturally or artificially.

I. Introduction and background

Scientific research on human reproductive biology is intrinsically embedded with ethical, moral, philosophical, and religious quandaries. Because the research deals directly with human embryos, the work involves questions concerning the beginning of life and the establishment of legal personhood. As such, advances in the field of human reproductive biology force scientists and the public to address the

question of when a growing cluster of embryonic cells should be considered a human being. Despite the ethical, philosophical, and religious considerations of conducting scientific research with human embryos, that research has the potential to treat disease, as well as to provide broader benefits to society. Some of the potential advances include: 1) investigating the early stages of embryonic growth to gain an understanding of early human development; 2) studying chromosomal abnormalities; 3)

developing new, safer, and more effective contraceptives; 4) determining and treating the causes of pregnancy complications and infertility; and 5) assessing the effects of toxins and teratogens on developing embryos. The public discourse on research using human embryos must weigh the potential benefits, risks, and broader social policy implications against the questions on the beginning of life and legal personhood. To that end, the 14 Day Rule, discussed in detail below, was created to allow for safe and regulated research on human embryos while still ensuring that a wide range of beliefs on the beginnings of human life are respected.

This paper does not directly address the ethics of the 14 Day Rule itself, and I make no comment on whether the rule itself is adequate or whether it should continue to be upheld. Rather, I present the history and reasoning of the Rule to place the effects of recent scientific achievements in context. I assume the development of an artificial womb and the ability to bring laboratory-grown (*in vitro*) embryos to full term is the inevitable consequence of continued advancement of research on human reproductive biology.¹ I then apply the

¹ This paper was written shortly before the publication of the *Nature Communications* report, “An extra-uterine system to physiologically support the extreme premature lamb” (Partridge et al. 2017). The “Biobag,” as the artificial womb has been dubbed, immediately created a flurry of optimistic predictions that the technology could be used in the not-too-distant future to care for premature human infants (NPR 2017a). It also generated substantial debate on the potential bioethical concerns of maintaining and developing human fetuses in laboratories. The question of what Biobags could mean for the future of abortion was also raised, including the idea that a woman terminating a pregnancy could be required to put the fetus into an artificial womb. This paper poses similar questions and hypotheticals in the context of recent progress of maintaining *in vitro* human embryos, the restrictions imposed by 14 Day Rule, and the current legal framework directly tying abortion rights to viability. The discussion here is framed around the idea that human embryos may one day be viable at the point of conception. The Biobag debate approaches the issue from a prematurity standpoint, but the advent of artificial womb technology only makes the arguments and policy discussions presented here more pertinent

resulting definition of fetal viability to the existing legal frameworks for abortion in the United States. Using current Supreme Court rulings as a guide, I include a discussion of the need to establish clear public policies on the extent of the State’s interest in the embryos, a woman’s right to privacy and bodily autonomy, and the responsibility of the State to both the infants born and to the public.

I-a. The 14 Day Rule: what is it?

The “14 Day Rule” was first proposed in 1979 by the Ethics Advisory Board (the “Board”) of the United States Department of Health, Education, and Welfare (HEW) in its report “HEW Support of Research Involving Human In Vitro Fertilization and Embryo Transfer” (U.S. HEW 1979). The Board decided that research and experimentation on human embryos was allowed—and of sufficient potential value despite the ethical considerations—up to 14 days of embryonic development.

In May 1978, the Board had agreed to consider the ethics of *in vitro* fertilization (IVF) research after a proposal on the subject received scientific approval from HEW. Shortly thereafter, in July 1978, the first infant conceived via IVF treatment was born (Hutchinson 2003). That event generated significant public interest and sparked a worldwide ethical debate on IVF technology (Deech 2008). As a result, the Board expanded the scope of its consideration beyond the single proposal on the ethics of IVF research to include the “scientific, ethical, legal and social issues surrounding human *in vitro* fertilization and embryo transfer in general” (U.S. HEW 1979). The resulting report included the 14 Day Rule, which is still in effect in 2017.

and pressing. Scientific and technological advances have extended viability from both directions, *i.e.* from maintaining *in vitro* embryos and from premature infant survival, and it is reasonable to assume that at some point these extensions in viability will meet in the middle.

Fourteen days of embryonic development was not an arbitrary time limit. The authors of the HEW report decided that 14 days after fertilization was the appropriate time to halt growth of *in vitro* human embryos because that is the point at which implantation of a naturally conceived embryo into the woman's uterus is usually complete (U.S. HEW 1979). This is relevant because at least a quarter of eggs fertilized through the normal human reproductive process do not implant (some estimates now put the embryonic loss during the first two weeks as high as 50 percent (Royal Commission 1993)). Due to the substantial number of naturally conceived embryos that are lost in the natural reproduction process, the Board reasoned that research on *in vitro* embryos up to two weeks of growth was ethically acceptable.

The 14 Day Rule was adopted in 1984 by the United Kingdom under the recommendation of the so-called Warnock Report ("Report of the Committee of Inquiry into Human Fertilisation and Embryology") (U.K. Department of Health and Social Security 1984) and recommended again in 1994 by the United States National Institutes of Health's Human Embryo Research Panel (NIH 1994). Since HEW initially proposed the 14 Day Rule in 1979, at least 12 countries including the United States, Canada, the United Kingdom, India, and China have adopted the limitation as either a law or a scientific guideline (Hyun, Wilkerson, and Johnston 2016). National and international regulatory and advisory bodies have regularly reviewed the bioethics of research on human embryos (e.g., NASEM 2010), and the 14 Day Rule has been continually maintained, including in the new 2016 guidelines for stem cell research from the International Society for Stem Cell Research (ISSCR 2016).

After publication of the 1979 HEW report, subsequent reports cited additional scientific evidence related to embryonic development to justify 14 days as a suitable cut-off point for experimentation. The most

common reason is that the "primitive streak" appears in the growing embryo by 14 days. The primitive streak is a faint banding of cells that marks the head-to-tail axis of the embryo (Hyun, Wilkerson, and Johnston 2016; Pera et al. 2015). That is, it is the first indication of directionality in a cluster of embryonic cells and is considered to be the early beginnings of a spinal cord and nervous system. Additionally, after 14 days of growth and with the development of the primitive streak, one embryo is no longer able to split in two embryos (*i.e.*, into identical twins) and two embryos can no longer fuse into one. A more metaphysical version of this reasoning holds that the embryo now possesses a unique identity as an individual.

In addition to the scientific underpinnings of its recommendations, the HEW Board in 1979 considered the moral standing of human embryos. The Board recognized that individuals hold a variety of viewpoints on when embryos attain moral status and therefore when research on them can no longer be permitted. Those viewpoints on when research on embryos is acceptable cover a wide range, from the moment of fertilization up until the point when a fertilized egg implants, an embryo demonstrates a heartbeat, feels pain, or exhibits brain activity. The Board also acknowledged that "the human embryo is entitled to profound respect" as compared with other research subjects (U.S. HEW 1979). However, it did not go so far as to hold that personhood begins at conception and so "this respect does not necessarily encompass the full legal and moral rights attributed to persons." Therefore, the Board reasoned that research on human embryos and IVF technology were both ethically acceptable if carried out under the appropriate conditions.

The 1984 Warnock Report from the United Kingdom agreed with that balance, arguing that "though the human embryo is entitled to some added measure of respect beyond that accorded other animal subjects, that respect cannot be absolute and may be weighed against benefits arising from

research” (U.K. Department of Health and Social Security 1984).

The Board’s analyses of both scientific and moral considerations regarding the use of human embryos in scientific research resulted in a strong rule that was internationally adopted and has remained essentially unchanged for almost 40 years. The longevity of the 14 Day Rule is a testament to the balance it created between scientific progress and respect for human embryos: the rule avoids extremes of allowing researchers complete freedom or prohibiting the research altogether. Proponents of the 14 Day Rule maintain that the rule was not designed to prescribe moral judgment on the moment at which an embryo becomes a person. Rather, they argue that the rule was written to create a space in which research could be conducted with agreed upon ethical boundaries. The time limitations are distinct and easily enforceable, creating a system that allows for the research process but maintains the necessary level of respect for human embryos.

I-b. Why is the 14 Day Rule being debated again?

The 14 Day Rule has been successful as a research policy tool since 1979, but now, in 2017, it is a subject of intense debate. In 2016, two different research groups, one at The Rockefeller University in New York (Deglincerti 2016) and the other at the University of Cambridge in the United Kingdom (Shahbazi 2016), separately published reports that they had grown human embryos in their laboratories for 12 to 13 days. Notably, both reports represent a significant improvement on the previous record of nine days for maintaining artificially created human embryos (Carver 2003). However, those advances of maintaining *in vitro* embryos for 12 to 13 days are not important solely because they broke the previous record, but also because they came right up to the line of what is permitted under the 14 Day Rule. In their published reports,

both groups note that their experiments were stopped due to the legal or regulatory restrictions on the research, not because the embryos stopped developing.

The ability to grow a human embryo *in vitro* up to 14 days has sparked renewed public debate of the 14 Day Rule, as well as on human embryonic research itself. There has been a flurry of articles and think pieces (e.g., Boodman 2016; Pera et al. 2015; Stokstad 2016), in addition to radio stories (NPR 2017b), podcasts (Radiolab 2016), and conferences (Petrie-Flom 2016) on the subject. Scientists, bioethicists, and concerned members of the public are debating whether the 14 Day Rule should be revisited and revised considering the recent advances. The benefits of new research must be weighed against its risks as well as the implications for what the advances could eventually mean for the definition of fetal viability.

The debate over the 14 Day Rule is not an isolated case of renewed public interest in research on human reproductive and genetic biology. In general, research directly related to the modification of humans has been gathering public attention due to the possibilities of genetic engineering promised by the CRISPR-Cas9 system (Doudna and Charpentier 2014). In January and February 2017, rat-mouse chimeras and human-pig chimeric embryos (Wu et al. 2017; Yamaguchi et al. 2017) were successfully produced, and the public debate over human modification intensified (e.g., Begley 2017; Reardon 2017; Vogel 2017). That research has sparked hope of externally-grown, transplantable organs while highlighting the ethical concerns of altering humans’ natural genetic processes. As such, the 14 Day Rule has become one piece of a larger public debate on the merits and ethics of laboratory-based human experimentation and modification.

I-c. History repeats itself

This is not the first time scientific advancement has focused public discussion on fetal viability. To a large extent, the

modern debate over the 14 Day Rule will likely involve many of the arguments that occurred with the advent of IVF technology in the 1970s and 1980s and the use of human embryonic stem cells (hESCs) in scientific research in the early 2000s (Deech 2008; Lo and Parham 2009). A central component of opposition to IVF and research with hESCs is related to the idea that human life begins at conception. Opponents of IVF and research with hESCs posit that to artificially create embryos for the purpose of experimenting on them violates human dignity and the sanctity of life. Furthermore, the IVF process creates many more embryos than can be used (Royal Commission 1993), and opponents of IVF argue that to destroy the unused embryos is to destroy human life. The argument that to create (or destroy) an embryo was the same as creating (or destroying) human life was also central in the debates on the use of hESCs. Originally, creating new stem cell lines from embryos required destroying the embryo, but techniques that preserve the embryo in the process have since been developed (Klimanskaya et al. 2006). New methods for generating hESCs that do not destroy embryos has eased some of the controversy surrounding the research, but scientists, bioethicists, philosophers, and the public must now contend with the ramifications of researchers demonstrating that embryos can be successfully grown up to the time limit under the 14 Day Rule.

Questions concerning the beginning of personhood, the sanctity and dignity of human life, and socially-responsible scientific and technological advancement were prominent in the public consciousness when IVF was a new technology and hESCs were starting to be used as research subjects. Now those same questions are resurfacing. However, the remainder of this paper is not focused on the current moral and ethical considerations of growing embryos in laboratories. Instead, I assume the inevitable result of scientific and technological progress will be that laboratory-created embryos can be brought to full term. In other words, I start

with the premise that it will eventually be possible to produce a healthy infant in an artificial womb. While scientific knowledge and technology are considerably far away from achieving this goal, given the current rate of advancement and understanding of embryology (especially considering the advantages provided by new and emerging technologies such as CRISPR-Cas9) (Doudna and Charpentier 2014), the creation of laboratory-grown, full-term infants is no longer fantasy. The April 2017 report on an extra-uterine system (the “Biobag”) capable of supporting a premature lamb is direct evidence of the field’s rapid development and highlights the need for frank and nuanced societal debate on the development of reproductive technologies (Partridge et al. 2017). The remainder of this paper assumes that technology allowing *in vitro* embryos to be brought to term artificially will eventually be fully developed for human use and places that technology in context of the current U.S. legal holding on abortion rights, concluding with a discussion on the public policy implications of the advancements.

II. Discussion

II-a. Viability and abortion rights: a legal framework

If science and technology advance far enough such that embryos become viable at the moment of conception, abortion rights in the United States will no longer exist.

In 1973, the Supreme Court decided *Roe v. Wade* (410 U.S. 113), holding that a woman’s right to privacy includes her right to an abortion. However, there were qualifications and limitations to the right. The Court specified, “the State does have an important and legitimate interest in preserving and protecting the health of the pregnant woman,” but that the State, “has still *another* important and legitimate interest in protecting the potentiality of human life.” The Court tied the State’s “compelling” interest in the potential human life to the viability of the fetus and used a trimester framework to define viability. The ruling in *Roe v. Wade*

held that a fetus can survive outside of the mother's womb (perhaps with medical aid) after 28 weeks' gestation, marking that as the point of viability. The decision also allowed the State to place restrictions or prohibitions on abortion beginning at the point of viability, but the Court prohibited the post-viability restrictions from interfering with the "life or health of the mother." Finally, the Court ruled that the State could not regulate abortion at all during the first trimester but that it could regulate abortion during the second trimester as long as the regulations were aimed at protecting the health of the pregnant woman.

The Court revisited its decision in *Planned Parenthood v. Casey* (505 U.S. 833 (1992)) and eliminated the trimester framework. The plurality opinion confirmed that a woman's constitutional right to terminate her pregnancy only extends until fetal viability, regardless of trimester. The Court determined that due to advances in medical technology, fetuses could be considered viable at 22 or 23 weeks' gestation, as compared to the 28 weeks in the *Roe* opinion. In addition, the ruling in *Planned Parenthood v. Casey* created the "undue burden" standard on the regulation of abortion, defining the new standard that any regulation that places a "substantial obstacle in the path of a woman's fundamental right to choice" violates a woman's right to privacy. Varying interpretations of what exactly constitutes an "undue burden" have allowed individual states to regulate and restrict access to abortion procedures on the grounds of interest in both the health of the mother and the State's interest in potential life, with nearly all the new laws challenged in the courts.

In *Planned Parenthood v. Casey*, the Supreme Court tied a woman's right to choose directly to the viability of the fetus. That means that once a fetus can survive independent of the mother, the State's compelling interest in the fetus immediately overrides the woman's right to privacy. That is, the woman no longer has a *right* to an abortion. As understanding of neonatal

physiology improves and technology progresses, medical professionals will become better at caring for premature infants with more precise, delicate, and powerful interventions. Thus, the ability of a fetus to survive outside the mother's womb is in large part determined by neonatal medical and technological advances. Over time, the limits of viability will be pushed toward conception. That, in turn, shrinks the window in which a woman can choose to terminate her pregnancy.

Now, with the recently reported success in maintaining an embryo through 13 days in a laboratory, we must consider what it would mean if we could keep that embryo alive past 14 days and had the ability to continue to grow it to a full-term infant. At that point, the seemingly disparate issues of a woman's right to choose and the science of growing human embryos *in vitro* will meet with profound Constitutional, ethical, and religious repercussions. If viability continues to be defined as the point at which the embryo can survive outside of the mother, including with artificial intervention, then at some point a fertilized egg will be viable. If the fertilized egg can be kept alive in a laboratory from conception until full term, a woman's Constitutional right to an abortion ceases to exist. Under current legal holdings, the State would then have an "important and legitimate interest in protecting the potentiality of human life" from the moment of conception all the way until birth.

II-b. A need for new public policy

Whether the 14-day limitation on *in vitro* human embryonic research remains in place depends on societal determination of whether the potential benefits of the research outweigh the risks. Before now, the debate was largely irrelevant because embryos could not be maintained for 14 days. Recent achievements, however, have opened opportunities for further, more controversial research. Success in human embryonic research presents exciting possibilities in

addressing infertility, treating genetic disorders and diseases, and deepening our understanding of human reproduction. However, development of technology that pushes the limits of viability also moves toward the ethically fraught fields of genetic engineering, human cloning, and designer babies. Those are critical issues and will be part of the larger societal discussion on human embryonic research which must involve physical and social scientists, ethicists, religious leaders, and the public. However, direct considerations of the benefits and risks, as well as the merits and drawbacks of the 14 Day Rule, are beyond the scope of this paper. Rather, I take the Supreme Court's interpretation of abortion rights (as outlined in *Roe* and *Casey*) to its logical conclusion in context of scientists' recently reported success in keeping *in-vitro* embryos alive up to the legal limit. From this point, I present some of the public policy issues we need to address should technology advance to enable laboratory-grown embryos to be viable, thereby removing all elective abortion rights, as stated in the previous section. We should take advantage of the renewed attention on the 14 Day Rule and use the opportunity to start discussing the public policies that will be affected if the Court's rulings on abortion rights continue to stand.

The following sections focus on a few of the most significant public policy issues that arise when the State's compelling interest in human life begins at conception. Specifically, I examine the role of the State in assessing a woman's rights, how to harmonize laws across the states, and the responsibilities of parents and the State to the infant. In each of these sections, I assume that an embryo is considered viable at conception and that *Casey* is still controlling law.

II-c. The State's interest overrides privacy

With the Court's ruling in *Planned Parenthood v. Casey*, once the fetus is viable, the ultimate authority on abortion rights lies

with the State. A woman only has a right to choose to terminate her pregnancy before viability. Beyond that point, the State's compelling interest in the life of the child outweighs the woman's right to privacy. As a matter of public policy, we must address what it will mean for the State's interest in the "potentiality of human life" to be absolute from the moment of conception. In that case, the woman's right to privacy in the matter of abortion will be wholly overwhelmed.

Because Constitutional protections will no longer grant a woman the right to choose, policymakers at the state level must decide whether to value the State's interest in the life and health of the child over a woman's privacy (and therefore her right to an abortion). If no policy is enacted, the State could prevent a woman from terminating her pregnancy. Or alternatively, the State can mandate that the fetus be brought to term in an artificial womb in a laboratory. As a society, we must have a frank conversation on whether that is an acceptable power for the State to have and set public policy accordingly. We must decide if, up to a point in a pregnancy, a woman retains her right to bodily autonomy, through her right to privacy, as current case law dictates, or if the new limits of viability mean that the State's interest in potential new life is always more compelling.

As it stands right now, the viability of the fetus is the time at which State's authority is activated because that is point at which the State has an interest in the life of a new individual in society. If viability is pushed to the time of fertilization, we will have to address the social policy of whether the embryonic cluster of cells is an individual. Ultimately, concrete and enforceable policies on the time at which an embryo attains moral standing and personhood will need to be put in place. We will no longer be able to rely on the courts to answer those difficult questions for us.

II-d. 50 states with 50 different policies

Right now, individual states *may* choose to regulate abortion services, but they are not obligated to do so. That lack of obligation has resulted in a patchwork of different laws and restrictions around the country, with the effect of making abortion services readily available in some states while nearly impossible to obtain in others. States may (and do) impose regulations and restrictions in the interest of maternal health and safety and most prohibit abortion past the point of viability (Guttmacher; Phillips 2016). Some states ban abortion at 20 weeks, although the constitutionality of those laws is debated. Based on *Roe v. Wade*, every state has at least a nominal baseline at which abortion is a right. If, however, science advances such that embryos are viable at fertilization, individual states would then have the right to completely ban abortion. Since each state has the option to set its own abortion regulations, abortion could become completely illegal in some states, perhaps with allowances for removal of the fetus if it is transferred to an artificial womb, while remaining legal in others. Regardless, a woman's Constitutional right to an abortion, which applies to the entire country, will be *de facto* dismantled.

Following that dismantling, public policies addressing the implications of having different classes of states will have to be established. Each state will decide to have different degrees of interest in the embryos, which will result in numerous conflicting laws around the country. There is substantial evidence that current restrictions on abortions disproportionately disadvantage women of color and poor women (Ely et al. 2017; Winter 2017), and the complete ban of abortion in some states, as a result of defining viability at conception, is only going to exacerbate that problem. Additionally, because *Roe* and *Casey* are the law of the land, there is no requirement that a state take the same and equal interest in every embryo. Thus, the state governments will be tasked with regulating access to abortion, but there

is no guarantee that all embryos will be treated equally. That is a slippery slope with clear eugenics overtones, not to mention racial, ablest, and socioeconomic implications. The Equal Protection Clause of the 14th Amendment only applies to people, and fetuses are not legal persons. Under federal law, even a viable fetus is not considered a legal person until birth. Regardless of each state's position on whether abortion is completely prohibited or legal with restrictions, we must demand policies that ensure all embryos in each state are treated equally.

In many ways, the new laws and policies that will be created as a result of viability being defined as at conception will result in a system that is not significantly different from the one that exists right now. Although abortion is technically legal, many states have implemented laws that have the ultimate effect of severely restricting access to abortion services. There are states now in which abortion services are widely accessible and others in which very few options remain. The new definition of viability removes the floor on which a woman's Constitutional right to choose her pregnancy rests, but in some cases the day-to-day facts of life in the United States will remain the same.

II-e. The State's responsibility vs. parental responsibility

If the individual states can ban abortion, we must create policies to address what the State's responsibility is to the resulting children. Under current laws, a woman can choose to terminate her pregnancy or if she carries the pregnancy to term, not care for the resulting infant by putting it up for adoption. However, if every conceived fetus is brought to term either *in utero* or artificially, and the woman does not wish to raise the child, what responsibility does that State have to that child? While the abortion bans based on viability can ensure that the infants are born, they cannot force someone to become a parent. It is our social

and moral responsibility to make clear policies and laws that protect the safety and well-being of children. The social services, adoption, and foster care systems must be strengthened, expanded, and adequately funded to properly care for them. Policies must be in place to ensure proper nutrition, education, and health care for the women and the infants. We must demand that if the State is going to take an interest in embryos from the time they are conceived, that interest must substantively persist past the time of birth and until the resulting people are legal adults.

Finally, if the State will have the ability to *de facto* ban abortion, it should expand its efforts to prevent unwanted pregnancies in the first place. If viability is to be defined at conception, individuals must be given legitimate opportunity and resources to prevent conception. Individual states will not want to shoulder the extra responsibility or cost of caring for the infants resulting from unintended and unwanted pregnancies. The debate over viability and abortion rights should be a springboard to expanding access to contraception and improving comprehensive sex education programs. In that way, the government can shift the debate on abortion rights back into being about issues of individual responsibility and accountability. To do that, the State needs to require that students and the public are provided with medically accurate education and information, as well as easy and affordable access to contraception. The State must write and implement policies that ensure that everyone can make informed and healthy decisions on sex and reproduction. The best way to start would be to reform the sex education requirements in middle and high schools to be complete, factual, and health- and contraception-focused. The State should recognize its responsibility to support such policies if it truly has a compelling interest in protecting every human life, however that is defined.

III. Conclusions

The study of human reproductive biology is fraught with scientific, technical, and ethical challenges. In large part, the research is problematic because we can create the earliest stages of human life in a dish. As a society, we must grapple with the distinction between when a laboratory-grown embryo is a cluster of cells and when it has moral status as a human life. Science and technology in the area human reproductive biology are rapidly advancing, moving us toward a moment when we will have to truly reconcile the point at which personhood is endowed on an embryo. As research progresses, we will be forced to continually re-evaluate the potential benefits to human health while identifying the evolving ethical quandaries of human reproductive research.

The discussion presented here places the recent scientific accomplishment of keeping a laboratory-grown embryo alive to the legal time limit in the context of current abortion laws. The ultimate result of continued human embryology research could likely be the development of an artificial womb and the ability to externally grow a human embryo to full-term. The logical consequence of that development is that viability of an embryo can now be defined as the moment of conception. As presented in this paper, that raises serious concerns about the responsibilities and compelling interests of the State as compared with the bodily autonomy of individuals. On the other hand, research on human embryos could ultimately provide critical treatments and therapies. The potential benefits must be weighed against the concerns in a way similar to the creation of the 14 Day Rule.

If the 14 Day Rule is modified or dismantled, the scenario presented here imagines a future well within the realm of possibility. As we continue down the path of research with human embryos and push the limits of maintaining them in a laboratory, it is essential that we start the public conversation on the policies discussed here, before as a society we dive in too far. Science

can promise great things, but we must be prepared for the consequences.

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