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Jessica H. Schultz

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# DEVELOPMENT OF ECTOGENESIS: HOW WILL ARTIFICIAL WOMBS AFFECT THE LEGAL STATUS OF A FETUS OR EMBRYO?

JESSICA H. SCHULTZ\*

## INTRODUCTION

Artificial womb<sup>1</sup> technology would allow conception and fetal development to occur completely independent of a woman's womb or allow a fetus to be transferred from a woman's womb to an artificial womb for the remainder of its gestation.<sup>2</sup> Both of these possibilities raise a variety of legal and ethical questions. Some commentators see ectogenesis, which is the process of the embryo or fetus developing in a device outside of the body, as a valuable medical development.<sup>3</sup> For example, ectogenesis could help those who cannot carry a pregnancy have genetic children without a surrogate and could also save the lives of premature babies.<sup>4</sup> Others assert that the development of artificial wombs will cause babies to be treated as commodities and will debase women by replacing one of a woman's most unique natural abilities with man-made technology.<sup>5</sup> The potential of this technology is fraught with legal questions, including how artificial wombs will affect the potential father's and the state's interest in the fetus; whether contracts regarding artificial wombs might be enforceable; and who would bear liability for mishaps that might occur due to artificial womb use.<sup>6</sup>

\* J.D., Chicago-Kent College of Law, Illinois Institute of Technology, 2009; B.A. Northwestern University, English Literature, 2006. I would like to thank Professor Lori Andrews and Michael Loters-stein for their insightful comments during the drafting process. I would also like to thank my husband Steven and son Aidan for their love and support.

1. Artificial womb describes the actual device that holds the embryo or fetus, while ectogenesis is the process of the embryo or fetus developing in the device outside the body. Frida Simonstein, *Artificial Reproduction Technologies (RTs)—All the Way to the Artificial Womb?*, 9 MED. HEALTH CARE & PHIL. 359, 359 (2006).

2. STEPHEN COLEMAN, *THE ETHICS OF ARTIFICIAL UTERUSES: IMPLICATIONS FOR REPRODUCTION AND ABORTION* 81 (2004).

3. See PETER SINGER & DEANE WELLS, *MAKING BABIES: THE NEW SCIENCE AND ETHICS OF CONCEPTION*, 118–19 (1985); Amel Alghrani, *The Legal and Ethical Ramifications of Ectogenesis*, 2 ASIAN J. WTO & INT'L HEALTH L. & POL'Y 189, 190–91 (2007).

4. SINGER & WELLS, *supra* note 3, at 118–19; Alghrani, *supra* note 3, at 191.

5. See e.g., Irina Aristarkhova, *Ectogenesis and Mother as Machine*, 3 BODY & SOC'Y 43 (2005); Stephen M. Armstrong, *Womb and Board: Medical Advances in Reproduction—At What Costs?*, 4 MED. TRIAL TECH. Q. (ANNUAL) 465 (1987); Julien S. Murphy, *Is Pregnancy Necessary? Feminist Concerns about Ectogenesis*, 4 HYPATIA 66 (1989).

6. There are various other legal issues with respect to access to this technology and how experi-

Part I of this note will provide an overview of the steps scientists have made towards creating an artificial womb and the obstacles that remain. Part II will discuss the balance of maternal, paternal, and state interests in an embryo or fetus grown in an artificial womb. Part III will examine the enforceability of contracts concerning embryos or fetuses in artificial wombs. Part IV will discuss potential liability issues that could arise if artificial wombs are created. Finally, Part V will propose solutions for some of the most controversial issues that would arise should an artificial womb be developed.

Exploring these questions makes it clear that the development of ectogenesis will increase, rather than resolve, the complexity of issues regarding reproductive rights and the legal status of an embryo or fetus.

### I. SCIENTIFIC DEVELOPMENTS IN CREATING AN ARTIFICIAL WOMB

Scientists have taken significant steps towards the development of an artificial womb, but have yet to overcome the obstacles necessary to produce a surviving animal or human from an artificial womb.<sup>7</sup> An artificial womb requires various components in order to successfully mimic a natural human or animal womb. There needs to be a shell to house the embryo or fetus, amniotic fluid to surround it, and a regulatory system through which the embryo or fetus can receive the proper amount of oxygen, nutrients and hormones. While some scientists have been working directly in pursuit of developing an artificial womb, scientists with other research goals have also provided significant research.<sup>8</sup> For example, research aimed at saving premature babies and research attempting to lengthen the time that embryos can survive outside of the womb<sup>9</sup> could contribute to future artificial womb experiments.

The first component that a working artificial womb requires is an ac-

ments would be conducted. However, those are beyond the scope of this note.

7. See Simonstein, *supra* note 1, at 359 (commenting that scientists have yet to close the gap between the second and twenty-second week of gestation); Yoshinori Kuwabara et al., *Artificial Placenta: Long-Term Extrauterine Incubation of Isolated Goat Fetuses*, 13 *ARTIFICIAL ORGANS* 527, 530 (1989) (discussing the death of all goat fetuses involved in the artificial womb experiment).

8. The distinction between “direct” and “indirect” research towards ectogenesis comes from COLEMAN, *supra* note 2, at 13.

9. One type of indirect research is illustrated by Dr. Teruo Fujii’s “womb-on-a-chip” experiments. In July 2007, Dr. Fujii and other researchers at the University of Tokyo reported that they have designed a “womb-on-a-chip,” lined by endometrial cells, which can hold fertilized eggs until they are ready for implantation. Studies with mice suggest that, compared to the current system where embryos are held in microdroplets, the womb chip could increase IVF success rates. Dr. Fujii next plans to test the device with human embryos. See, e.g., *Scientists Develop ‘Womb-on-a-Chip’*, TELEGRAPH.CO.UK, July 26, 2007, <http://www.telegraph.co.uk/news/uknews/1558477/Scientists-develop-womb-on-a-chip.html>.

tual shell to hold the developing embryo or fetus. Thus far, shells have been constructed both out of man-made materials and out of human cells.<sup>10</sup> Scientists have created artificial wombs for goat,<sup>11</sup> mouse,<sup>12</sup> and human embryos.<sup>13</sup> While the animal artificial wombs were constructed entirely out of man-made materials, the experimental human artificial womb was composed of actual human endometrial cells which were grown on a piece of biodegradable scaffolding shaped like a human uterus.<sup>14</sup> Scientists have successfully been able to construct artificial womb shells for both animal and human embryos, and this obstacle has already been overcome.

In addition to the shell, there must be artificial amniotic fluid to surround the developing embryo or fetus as there is in a natural pregnancy.<sup>15</sup> The amniotic fluid serves to protect the fetus from outside injury, allow for fetal movement, promote lung and musculoskeletal development, and maintain a constant temperature in the womb.<sup>16</sup> Artificial amniotic fluids have been used in both artificial womb experiments with goats<sup>17</sup> and human experiments with premature babies.<sup>18</sup> Thus, an artificial amniotic fluid

10. See Gretchen Reynolds, *Will We Grow Babies Outside Their Mothers' Bodies?*, 3 POPULAR SCI. 72, 74–76 (2005) (discussing the human cell artificial womb used in Dr. Hung Liu's experimentation as well as the acrylic artificial womb used in Dr. Yoshinori Kuwabara's experiments).

11. In 1997, Dr. Yoshinori Kuwabara of Juntendo University in Tokyo used a goat artificial womb to hold two seventeen-week-old goat fetuses; while the scientists were successfully able to incubate the goat fetuses for approximately three weeks, both goats died after being removed from incubation. See COLEMAN, *supra* note 2, at 11–12; see also F. Dolendo, *Baby Machines: The Birth of the Artificial Womb*, 2 TRIPLE HELIX 4 (2006), available at [http://www.thetriplehelix.org/documents/issues/Berkeley\\_Spring\\_06.pdf](http://www.thetriplehelix.org/documents/issues/Berkeley_Spring_06.pdf).

12. Dr. Hung-Ching Liu developed a mouse artificial womb in 2003, growing mouse embryos to seventeen days old, only four days short of the twenty-one day full gestational term. Although the mice appeared to be doing well through the early states of the development, they became deformed and died, reportedly due to the inability of their blood vessels to properly form within the artificial womb. Reynolds, *supra* note 10, at 74, 77.

13. Dolendo, *supra* note 11, at 4.

14. Embryos successfully implanted and started to grow as expected, but Dr. Liu ended the experiment after six days, to comply with federal regulations that prohibit human fetal growth in a lab past two weeks. Despite speculation that Dr. Liu could move her experiments to a country which does not limit human embryo or fetal experimentation, she has turned her attention to animal ectogenesis. Dolendo, *supra* note 11, at 4; Reynolds, *supra* note 10, at 74.

15. MedlinePlus Medical Encyclopedia, Amniotic Fluid, <http://www.nlm.nih.gov/medlineplus/ency/article/002220.htm> (last visited Oct. 27, 2009).

16. *Id.*

17. Dolendo, *supra* note 11, at 4; Kuwabara, *supra* note 7, at 527.

18. Neonatal research for the use of an artificial womb for premature babies is inseparably linked to the same type of artificial womb that could be used to gestate a fetus from its conception. In the 1996 experiment, Thomas Shaffer, a scientist at Temple University, used an oxygenated liquid in a clinical trial with thirteen infants born at twenty-three to twenty-four weeks who were not expected to survive, and seven babies were discharged healthy. Jonathan Knight, *An Out of Body Experience*, 419 NATURE 106, 106–07 (2002); see also Dolendo, *supra* note 11, at 4; Corrine Lowe Leach et al., *Partial Liquid Ventilation with Perflubron in Premature Infants with Severe Respiratory Distress Syndrome*, 335 N. ENG. J. MED. 761, 761 (1996) (documenting scientific results from Shaffer's experiment); Simonstein,

has already been developed and used in experiments and will not be an obstacle to artificial womb use.

Along with a womb structure and an artificial amniotic fluid, there needs to be some type of regulating device through which a fetus can receive the proper amount of oxygen, nutrients, and hormones.<sup>19</sup> One prominent example of a regulating device is an extracorporeal membrane oxygenator (“ECMO”) which serves to deliver blood flow and oxygen to the fetus.<sup>20</sup> While providing nutrients to the fetus, the ECMO also functions like a dialysis machine by purifying the fetuses’ blood.<sup>21</sup> In artificial womb goat fetus experiments, the ECMO devices were connected through the fetuses umbilical arteries and veins.<sup>22</sup> While these types of regulating devices have been created, they have not yet worked well enough to produce a single live animal or human offspring from an artificial womb.<sup>23</sup>

There are two distinct ways an artificial womb could be used. First, a scientist could create an embryo using in vitro fertilization (IVF)<sup>24</sup> and then insert the embryo into an artificial womb for the entire gestational period. Alternatively, a surgeon could extract a fetus from a woman’s womb and insert the partially-developed fetus into an artificial womb for the remainder of its gestation.<sup>25</sup>

In addition to the challenges of the artificial womb itself, other challenges exist in order to use an artificial womb not only for the implantation and growth of an embryo, but also for a premature baby or fetus which has been removed from its mother’s womb. First, some type of fetal extraction must be developed that would allow doctors to remove a fetus without harming it.<sup>26</sup> Advances in fetal surgery will likely make this type of fetal extraction possible. Currently, there are three types of fetal surgery: open

*supra* note 1, at 360 (citing Jack Stills, a neo-natologist who noted that this fluid would increase the survival of premature babies because “[i]t would be ideal to continue the *in utero* environment, keeping the premature infant in a warm water bath (free of infection) attached to its artificial placenta”).

19. Kuwabara et al., *supra* note 7, at 531; Simonstein, *supra* note 1, at 360, 362.

20. This device was used in Dr. Yoshinori Kuwabara’s experiments with goat fetuses. See Kuwabara et al., *supra* note 7, at 527–28.

21. *Id.* at 527–28; Simonstein, *supra* note 1, at 360.

22. Kuwabara et al., *supra* note 7, at 527.

23. *Id.* at 530 (documenting the eventual death of all goat fetuses used in the experiment); Simonstein, *supra* note 1, at 361 (observing that currently “the gap between the second and 22nd gestational week is insuperable”).

24. In vitro fertilization or IVF is “the joining of a woman’s egg and a man’s sperm in a laboratory dish.” MedlinePlus Medical Encyclopedia, In Vitro Fertilization, <http://www.nlm.nih.gov/medlineplus/ency/article/007279.htm> (last visited Oct. 27, 2009).

25. See COLEMAN, *supra* note 2, at 81; David N. James, *Ectogenesis: A Reply to Singer and Wells*, 1 *BIOETHICS* 80, 86–87 (1987) (discussing the possibility of fetal transplant technology and its implications).

26. This will likely require major surgery. COLEMAN, *supra* note 2, at 87.

fetal surgery, fetendo fetal surgery, and fetal image-guided surgery.<sup>27</sup> Open fetal surgery is the closest procedure to a fetal extraction; although surgeons do not completely remove the fetus, they open the woman's uterus, repair the fetus, and then close the uterus.<sup>28</sup> The risks associated with this procedure mirror the risks of a Ceasaran section, with the added complication that there is a significant risk of pre-term labor, requiring that doctors closely monitor the remainder of the pregnancy.<sup>29</sup> Fetal surgery, which surgeons once resorted to only to treat conditions otherwise fatal to the fetus, is now being used for disabling, but not usually fatal, diseases such as spina bifida.<sup>30</sup> It logically follows that as surgeons perform more fetal surgeries, they will develop better and lower risk techniques, some of which might be applicable to fetal extraction.

It is unclear whether a fetus that has been successfully extracted from a woman's womb would have different challenges when placed in an artificial womb as compared to an embryo which has grown in an artificial womb from implantation. However, Dr. Kuwabara was able to take goat fetuses which had been extracted from their mother's womb and successfully connect them to his regulating device for twenty-two to twenty-four days. Thus, while the need for a sufficiently safe fetal extraction method will be an additional obstacle to artificial womb use after the termination of a natural pregnancy, the two uses for artificial wombs will be born of the same technology.

Scientists are working to close the gap of time between the beginning of gestation using IVF and the twenty-second week, which is approximately the minimum number of weeks of gestation at which a child still has a chance to survive.<sup>31</sup> Scientists face several difficulties in doing so. Currently, with very premature infants, "[their lungs] collapse; their blood vessels hemorrhage easily causing damage, particularly in the brain, and infections and death are common."<sup>32</sup> On the other side of the spectrum, there is a great amount of research being done on embryo development, including how "a cell in a preembryo is 'preprogrammed' to its eventual form, functioning, and timing."<sup>33</sup> This type of research will likely play an important

27. University of California, San Fransisco Fetal Treatment Center, What is Fetal Intervention?, [http://fetus.ucsfmedicalcenter.org/our\\_team/fetal\\_intervention.asp](http://fetus.ucsfmedicalcenter.org/our_team/fetal_intervention.asp) (last visited Oct. 27, 2009).

28. *Id.*

29. *Id.*

30. Jonathan Dyer Stanley, *Fetal Surgery and Wrongful Death Actions on Behalf of the Unborn: An Argument for a Special Standard*, 56 VAN. L. REV. 1523, 1527 (2003).

31. Simonstein, *supra* note 1, at 361.

32. *Id.*

33. *Id.*

part in making ectogenesis possible, while it may not be intentionally directed towards this end.<sup>34</sup> Along with embryo development research, the application of computer science to molecular biology research is also important to the development of ectogenesis.<sup>35</sup> Such research would likely assist in developing a regulation device which would deliver the proper hormone levels to a fetus in an artificial womb.<sup>36</sup>

Even with this developing research, scientists face several difficulties in creating a functioning artificial womb. Scientists must find a way to replicate the blood flow that a mother provides for the fetus, replicating at the same time the proper amount of oxygen, nutrients, and hormones that a fetus needs, in differing amounts, throughout the gestation.<sup>37</sup> Additionally, Dr. Liu's experiments show that there are still problems with getting blood vessels to form properly within an artificial womb.<sup>38</sup>

Still, some scientists are optimistic about their plans to create functioning artificial wombs. In 2001, during an interview at the American Society for Reproductive Medicine Conference, Dr. Liu stated that her final goal is an artificial uterus that could grow a baby to full term.<sup>39</sup> She spoke of "an actual external device with this endometrium cell and then probably with a computer system simulate the feed in medium feed out medium . . . and also have a chip controlling the hormone level."<sup>40</sup> As of 2005, Dr. Liu commented that she expects to have a functioning mouse womb in five to ten years, and a human model soon after that.<sup>41</sup>

Although an artificial womb has never produced a single surviving offspring, either animal or human, there are ample reasons to address the ethical and legal ramifications before that time comes.<sup>42</sup> As legal commentator Michelle Hibbert wrote, "it is irresponsible to wait until the first child is born of ectogenesis before discussing how the law will, or should, treat that new form of assisted, and collaborative, reproduction."<sup>43</sup> We should

34. *Id.*

35. *Id.* at 362.

36. *Id.*

37. COLEMAN, *supra* note 2, at 9–10 (stable blood oxygen levels are needed); Kuwabara et al, *supra* note 7, at 531 (proper oxygenation and nutrition is needed); Simonstein, *supra* note 1, at 362 (hormone regulation is needed).

38. Reynolds, *supra* note 10, at 77.

39. Christine Rosen, *Why Not Artificial Wombs?*, NEW ATLANTIS, Fall 2003, at 67, 70.

40. *Id.*

41. Reynolds, *supra* note 10, at 78.

42. See e.g., Simonstein, *supra* note 1, at 359–63.

43. Michelle Hibbert, *Artificial Womb Technology and the Constitutional Guarantees of Reproductive Freedom*, <http://www.law.asu.edu/Programs/Sci-Tech/Commentaries/ArtificialWomb-Hibbert.aspx> (last visited Oct. 27, 2009).

address these ethical and legal issues concerning artificial wombs before they become available for use.

## II. THE DEVELOPMENT OF AN ARTIFICIAL WOMB MAY RAISE THE ISSUE OF HOW MATERNAL, PATERNAL, AND STATE INTERESTS ARE BALANCED.

As described in Part I, there are two general categories of potential artificial womb use: one type where the embryo is directly implanted into the artificial womb for the entire gestation, and a second type where an embryo or fetus is transferred from a woman's uterus into an artificial womb. These two types of artificial womb use could each have different effects on how maternal, paternal, and state interests in a fetus or embryo are balanced. In the first general category of artificial womb use, an embryo is never in utero, but rather is implanted and grows inside of an artificial womb. In this scenario, could either the potential mother or father "pull the plug?" The second general category includes cases in which a woman is pregnant and wishes to end the physical pregnancy either because she wishes to abort the fetus or because she must do so for some medical reason. When she wants to abort the fetus, could the state or the potential father prohibit her from obtaining an abortion if fetal extraction and artificial womb use is available? If the woman is choosing to have the fetus removed to an artificial womb could she later have the artificial womb unplugged? This section seeks to answer these questions.

### A. *Ex Vivo Pregnancies*

One scenario arises when a fetus is completely conceived and nurtured in an artificial womb and then at least one parent decides that he or she wants to terminate the "pregnancy." In this scenario, neither the genetic mother nor the genetic father has a greater legal right incidental to their bodily integrity (as compared to a natural pregnancy where the woman's right is recognized as outweighing the man's interest in the fetus because she is carrying the pregnancy). *Davis v. Davis* recognized that women undergo more pain and a greater bodily invasion in order to donate eggs;<sup>44</sup> however, the court held that "none of the concerns about a woman's bodily integrity that have previously precluded men from controlling abortion decisions is applicable here."<sup>45</sup>

A court might afford an embryo conceived *ex vivo* and put in an ar-

44. 842 S.W2d 588, 601 (Tenn. 1992).

45. *Id.*



tificial womb a different status than an embryo in a woman's womb or a frozen embryo. Courts have generally given greater weight in frozen embryo cases to the party who does not wish to procreate. However, it is uncertain whether this would hold true for a case where the embryo is implanted in an artificial womb. Once an embryo is implanted in an artificial womb, would either a mother or a father, either unilaterally or with mutual consent, be able to "pull the plug?" These are all issues that go to the core of how parental rights to procreate and not to procreate might be weighed should artificial wombs be used.

First, an analysis of the enforceability of frozen embryo contracts, which will be discussed in greater length in Part III, suggests that if an embryo is conceived *ex vivo* and implanted in a womb, neither party should unilaterally have the right to unplug it. An embryo implanted is different from a frozen embryo whose potential for life is static (unless it is thawed). Moreover, the state might have a greater interest in a life that is already forming in comparison to a frozen embryo. Thus, it is likely that neither party will be able to terminate a pregnancy already in an artificial womb.

### B. *In Utero Pregnancies*

#### 1. A Case Where a Woman Seeks to Abort an Embryo or Fetus

A different scenario arises when an embryo or fetus starts as an *in utero* pregnancy. There is currently no paternal right to make decisions concerning an embryo post-conception unless it is outside of a woman's womb.<sup>46</sup> Potential fathers cannot get injunctions to stop potential mothers from having an abortion, nor can they demand that the potential mother get an abortion.<sup>47</sup> The United States Supreme Court has held that a statute requiring a husband's written consent before his wife could obtain an abortion was unconstitutional,<sup>48</sup> and that it would be an undue burden to require a married woman to notify her husband before obtaining an abortion.<sup>49</sup> These cases demonstrate that the potential mother controls the decision about whether to terminate a pregnancy within her womb and the potential father, even if he is the mother's husband, does not have a legal right to

46. Mary A. Totz, *What's Good for the Goose is Good for the Gander: Toward Recognition of Men's Reproductive Rights*, 15 N. ILL. U. L. REV. 141, 148-49 (1994).

47. *Doe v. Doe*, 314 N.E. 2d 128, 130 (Mass. 1974) (denying an estranged husband an injunction to prevent his pregnant wife from procuring an abortion).

48. *Planned Parenthood of Central Missouri v. Danforth*, 428 U.S. 52, 70 (1976).

49. *Planned Parenthood of Southeastern Pennsylvania v. Casey*, 505 U.S. 833, 898 (1992).

take part in that decision.<sup>50</sup> Although some argue that the father's interests in the potential life of the fetus could sometimes outweigh the potential mother's interest in aborting their unborn children, courts have rejected these arguments and repeatedly affirmed that only the potential mother can make the decision to terminate a pregnancy.<sup>51</sup>

Some have hailed the artificial womb as a solution for the debate on abortion, thinking that the views of pro-choice and pro-life activists alike could come into agreement if a woman could choose to end a pregnancy without terminating the fetus.<sup>52</sup> A corollary to this argument is that ectogenesis could create reproductive equality between men and women.<sup>53</sup> Furthermore, some might claim that if a mother chooses not to carry the pregnancy to term, the father could still choose to have the fetus removed and grown to term in an artificial womb.<sup>54</sup> Theoretically, these statements sound promising to reaching a compromise on one of the most divisive issues in modern politics.

Along with the possibility that a father could claim a fetus unwanted by the potential mother, it is also possible that statues could mandate that unwanted fetuses be put up for a third party or the state to "adopt." A current Louisiana statue states that "a viable in vitro fertilized human ovum is a juridical person which shall not be intentionally destroyed by any natural or other juridical person or through the actions of any other such person."<sup>55</sup> Therefore, Louisiana has chosen to protect the potential lives of frozen embryos by preventing parent-donors from destroying frozen embryos that they no longer want. Similarly, an artificial womb could allow a woman to end a pregnancy while allowing the father, a third party, or the state to protect the potential life of the fetus. In this scenario, artificial wombs could theoretically promote a satisfying compromise to the debate over whether abortion should be legal.

Current abortion jurisprudence, stated in *Planned Parenthood of Southeastern Pennsylvania v. Casey* and affirmed in *Gonzales v. Carhart*, is that the state cannot impose an undue burden on a woman's right to an abortion before the fetus is viable and that, after viability, the state can

50. See e.g., *id.*

51. For an example of an argument for equal reproductive rights for men, see e.g., Totz, *supra* note 46.

52. See e.g., SINGER & WELLS, *supra* note 3, at 119–20.

53. COLEMAN, *supra* note 2, at 50–52.

54. *Id.* at 81 (discussing whether foetal transplant and ectogenesis technology should lead to a ban or more stringent limitations on a woman's ability to get an abortion).

55. LA. REV. STAT. ANN. § 9:129 (West 2001).

restrict abortions.<sup>56</sup> While *Casey* affirmed that the state cannot restrict abortions after viability without a health exception, *Carhart* upheld a statute which did not have a health exception.<sup>57</sup>

*Casey* and *Carhart* illustrate the centrality of “viability” to abortion jurisprudence. The term viability refers to a newborn’s ability to live outside of its mother’s womb.<sup>58</sup> Viability, by its definition, is not set at a specific number of weeks but “may be interpreted according to the state of the art of medicine.”<sup>59</sup> It does not mean that the newborn is able to survive without any technology, such as ventilator assistance.<sup>60</sup> Therefore, the current approach of using viability to determine abortion rights would come under challenge with a working artificial womb because a fetus would always be able to survive outside of its mother’s womb, so long as it was placed in an artificial one.<sup>61</sup>

Thus, one argument is that once artificial wombs become a realistic medical option, the state could always restrict a woman’s right to an abortion because the fetus would always be “viable” in the sense that, if removed, it could fully gestate within an artificial womb. This reasoning leads to the conclusion that the current meaning of viability and thus currently applied abortion standard could not survive once ectogenesis becomes available.<sup>62</sup>

However, this does not mean that pro-choice and pro-life advocates will immediately come together and agree that fetal extraction is a satisfactory replacement to abortion. A portion of pro-choice advocates will likely find fetal extraction unsatisfactory based on two reasons. First, fetal extraction would likely be a more intrusive surgery than an early abortion, with fetal extraction most likely resembling a caesarean section in order to transfer the fetus without injury.<sup>63</sup> This type of intrusion is not present with early abortions, which typically involve a dilation of the cervix and a suctioning of the inner walls of the uterus.<sup>64</sup>

56. 505 U.S. at 879; 550 U.S. 124 (2007).

57. 505 U.S. at 879–80; 550 U.S. 124.

58. The definition of viable is “having attained such form and development as to be normally capable of living outside the uterus.” Medline Plus Medical Dictionary, Viable, <http://www2.merriam-webster.com/cgi-bin/wwmednlm> (last visited Oct. 27, 2009).

59. *Id.*

60. Norman Fost et al., *The Limited Moral Significance of ‘Fetal Viability’*, 10:6 HASTINGS CENTER REP. 10, 10–11 (1980).

61. Hyun Jee Son, Student Scholarship, *Artificial Wombs, Frozen Embryos, and Abortion: Reconciling Viability’s Doctrinal Ambiguity*, 14 UCLA WOMEN’S L. J. 213, 215–16 (2005).

62. *Id.* at 218.

63. COLEMAN, *supra* note 2, at 81; James, *supra* note 25, at 86–87.

64. MedlinePlus Medical Encyclopedia, Abortion—Elective or Therapeutic, <http://www.nlm>.

Secondly, many pro-choice advocates believe that abortion rights are based on the right not to become a genetic mother, rather than the right to end a physical pregnancy.<sup>65</sup> For example, a woman who seeks an abortion instead of opting for adoption may seek not only to separate herself physically from the fetus, but also to rid herself of the burden of knowing that she has a child out in the world somewhere being raised by people she does not know or have reason to trust.<sup>66</sup> As philosopher Christine Overall argued, the right to an abortion consists of two potentially separate aspects: the termination of the pregnancy and the death of the embryo or fetus.<sup>67</sup> Supporting this argument, ethicist Leslie Cannold found that pro-choice women posed with a scenario of an unplanned pregnancy found ectogenesis an unappealing option.<sup>68</sup> Women who would choose an abortion over adoption generally expressed the same concern with having their child raised by strangers, and it made no difference to them that they could have it extracted at an early gestational stage rather than having to give birth to a child before giving it up. Similarly, women who would choose to keep the baby rather than have an abortion did not find the idea of ectogenesis appealing either, feeling that it would be an abandonment of their responsibility to the child.<sup>69</sup> Although Cannold's study was limited, it demonstrates that it is extremely unlikely that the abortion debate could be resolved by substituting it with fetal extraction procedures.

However, the observation that women might still prefer abortion to fetal extraction does not make a potential restriction on abortion, and its corresponding requirement of fetal extraction or full-term pregnancy, unconstitutional. Once artificial womb technology is in existence, the concept of "pre-viability" and its use in abortion jurisprudence will become unclear. Since this change will not produce the harmony promised by some in the abortion debate, this technology will either dramatically limit abortion in states that wish to limit it or, could produce a change in abortion jurisprudence where balancing the state and mother's interests will not be based on the concept of viability. Either way, the focus of abortion debates will necessarily turn from the issue of whether a woman has a right to end a pregnancy to whether a woman has a right to terminate the life of an embryo or

nih.gov/medlineplus/ency/article/001512.htm (last visited Oct. 27, 2009).

65. COLEMAN, *supra* note 2, at 72–73.

66. *Id.*

67. CHRISTINE OVERALL, ETHICS AND HUMAN REPRODUCTION: A FEMINIST ANALYSIS 68, 68–69 (1987).

68. The sample was forty-five women from Canada and was done in 1992. COLEMAN, *supra* note 2, at 66–72.

69. *Id.*

fetus.

## 2. A Case Where a Woman Does Not Want to Abort the Embryo or Fetus but the Fetus is Removed to an Artificial Womb

Another scenario is that a woman wants to continue her pregnancy but due to medical reasons it is in the best interest for her or the fetus' health to extract the fetus and put it into an artificial womb for the remainder of its gestation in order to better treat health problems of either the fetus or its mother. Could the mother later decide that the artificial womb be disconnected? Could the father? Does it depend on whether the fetus is less than twenty-four weeks old, the current standard of "viability?" If the artificial womb was disconnected, could the mother or father prevent a ventilator or other life preserving means from being administered? These questions all go to the issue of whether a fetus in an artificial womb would have the same status as a fetus in a woman's uterus.

Just as the mother's right to terminate a pregnancy would likely weaken were an artificial womb created, it is even less likely that a potential father would have the right to disconnect an artificial womb following a fetal transplant. The mother has put herself at physical risk and taken on various burdens in carrying the pregnancy as far as she has, even if she makes the decision to have the fetus transplanted to an artificial uterus. To decide otherwise would force a woman to risk her own or her fetus' safety by refusing a fetal transplant out of concern that the potential father's interest in not procreating could outweigh her interest in procreation.<sup>70</sup>

In conclusion, the state of current abortion law is based on the notion of viability and thus would allow a state to unduly burden a potential mother's choice to get an abortion. Similarly, a state could unduly burden a potential mother or father's choice to unplug an artificial womb because a state can constitutionally pose an undue burden past the point of viability. Additionally, if an embryo is never in utero but grows entirely inside of an artificial womb the same restrictions on "aborting" the fetus would apply. Thus, the status of a fetus in an artificial womb would have the same status as a fetus in the mother's womb.<sup>71</sup>

70. Unlike the previous section, there is no case law applicable to this hypothetical artificial womb scenario.

71. This of course could be altered if artificial womb technology changes abortion standards.

### III. IT IS QUESTIONABLE WHETHER CONTRACTS CONCERNING EMBRYOS IN ARTIFICIAL WOMBS WOULD BE ENFORCEABLE

One of the ways that a genetic mother and father's rights over a fetus in an artificial womb could be defined is through contracts similar to those used by IVF clinics.<sup>72</sup> A possible artificial womb contract could state that either party has the ability to end the "pregnancy."<sup>73</sup> Depending on what the laws are as to at what point the embryo or fetus can legally be aborted, the contract might state that, for example, either party has the ability to end the pregnancy before the fetus is a certain number of weeks old. Even if a contract complies with this type of law, the question remains as to whether courts would actually enforce these contracts or whether they would strike them down as against public policy. An analysis of how courts treat contracts concerning frozen embryos and how courts treat contracts regarding minor children demonstrates that it is highly likely that these contracts will not be enforceable.<sup>74</sup>

One point of comparison is contracts concerning frozen pre-embryos,<sup>75</sup> which typically state how the embryos should be disposed of in case of divorce or one of the spouse's death.<sup>76</sup> In *A.Z. v. B.Z.*<sup>77</sup> and *J.B. v. M.B.*,<sup>78</sup> courts held that contracts concerning the ownership of frozen embryos were unenforceable, citing public policy reasons.<sup>79</sup> In particular, the court in *A.Z. v. B.Z.* stressed that "forced procreation is not an area amenable to judicial enforcement."<sup>80</sup> Similarly, the court in *In re Marriage*

72. Judith F. Daar, *Frozen Embryo Disputes Revisited: A Trilogy of Procreation-Avoidance Approaches*, 29 J. L. MED. & ETHICS 197, 197-202 (2001) (discussing cases involving contracts which dictate how leftover frozen embryos should be disposed of in the case of divorce).

73. This could hypothetically be specified depending on particular circumstances or it could be a broader sweeping contract.

74. Another interesting point of comparison is surrogacy contracts, which have been enforceable and unenforceable in different cases. *Johnson v. Calvert*, 851 P.2d 776 (Cal. 1993) (holding that the surrogacy contract was enforceable); *In re Baby M*, 537 A.2d 1227 (N.J. 1988) (holding that the surrogacy contract was not enforceable). However, I will not analyze those cases here because they differ greatly in two respects. First, they involve a third party carrier, along with the intended parents. Second, the cases concerning their enforceability are centered around the rights of the surrogate birth mother in not being forced to sever her rights to the child.

75. An embryo is an egg cell fertilized with sperm which has been implanted into a woman's uterus, while a pre-embryo is an egg cell that is fertilized with sperm but not yet implanted. However, it is disputed whether this difference is meaningful other than that technicality. See Michael Mulkay, *The Triumph of the Pre-Embryo: Interpretations of the Human Embryo in Parliamentary Debate over Embryo Research*, 24 SOC. STUD. SCI. 611 (1994).

76. Erik W. Johnson, *Frozen Embryos: Determining Disposition through Contract*, 55 RUTGERS L. REV. 793 (2003).

77. 725 N.E.2d 1051 (Mass. 2000).

78. 751 A.2d 613 (N.J. Super. Ct. App. Div. 2000).

79. *A.Z.*, 725 N.E. 2d at 1057; *J.B.*, 751 A.2d at 619-20.

80. 725 N.E. 2d at 1058.

of Witten held that it would be against public policy to “enforce a prior agreement between the parties in this highly personal area of reproductive choice when one of the parties has changed his or her mind concerning the disposition or use of the embryos.”<sup>81</sup> The court thus decided that rather than balancing the interests of the divorcing parents, it would not let either party release the embryos without the other’s consent.<sup>82</sup> The courts in these cases were concerned about enforcing spousal agreements regarding reproductive choices and held these contracts to be unenforceable for this public policy reason.<sup>83</sup>

In contrast, courts in *Kass v. Kass*,<sup>84</sup> *Litowitz v. Litowitz*,<sup>85</sup> and, most recently, *Roman v. Roman*,<sup>86</sup> have held that contracts regarding frozen embryos were enforceable. The couple in *Kass* had an agreement with an IVF program designating unused embryos to be used for research.<sup>87</sup> The court in *Kass* held that the contract was enforceable after finding that the contract was clear and the couple consented to the IVF program knowing that unused embryos would be donated to research.<sup>88</sup> As part of its reasoning, the court held that the wife’s bodily integrity was not implicated, although she had undergone several operations for egg retrieval, since the embryos were not yet implanted.<sup>89</sup> Additionally, the court noted that while the agreements “may, of course, be unenforceable . . . appellant does not urge that the consents violate public policy.”<sup>90</sup> This seems to imply that the application of this case to future cases is limited, because the court might have found that the contract actually violated public policy had this issue been raised.

In *Litowitz*, a divorcing couple was arguing over the disposition of embryos fertilized with the husband’s sperm and a donor’s eggs.<sup>91</sup> The court held that a divorcing couple’s agreement with their IVF clinic was enforceable because it was a clear manifestation of the couple’s intent at the time they signed it; the agreement stated that left over pre-embryos after five years would be disposed of unless the husband and wife con-

81. 672 N.W.2d 768, 781 (Iowa 2003).

82. *Id.* at 783.

83. *A.Z.*, 726 N.E. 2d at 1055; *J.B.*, 751 A.2d at 619–20; *Witten*, 672 N.W.2d at 781.

84. 696 N.E.2d 174 (N.Y.1998).

85. 48 P.3d 261 (Wash. 2002).

86. 193 S.W.3d 40 (Tex. App. 2006).

87. 696 N.E.2d at 177.

88. *Id.* at 181.

89. *Id.* at 179.

90. *Id.* at 179–80 n. 4.

91. 48 P.3d at 262.

tracted with the clinic to continue storing them.<sup>92</sup> In *Roman*, another court held that the agreement between former spouses which provided that frozen embryos would be discarded in the event of a divorce was enforceable, stating that voluntary contracts “subject to mutual change of mind” do not violate state policy.<sup>93</sup> The common thread in these cases is that they reject or do not address the contention that public policy is against upholding contracts over frozen embryos. Thus, the agreements are seen as enforceable as long as they otherwise constitute valid contracts.

In sum, the courts have so far been divided on whether contracts determining the disposition of unused frozen embryos should be enforceable. The courts holdings do not seem to be based on any small factual differences, but instead seem to be based on what the parties have chosen to claim and whether the court chose to focus on public policy concerns or whether it chose to focus solely on the contract principles of unambiguous language and mutual consent.

Some argue that contracts determining what should happen to frozen embryos in cases of divorce or death of the genetic parents should always be enforced because this would create a bright-line rule that might motivate parties to seriously consider what they would want done with embryos.<sup>94</sup> Additionally, as shown by the above cases, some courts are already weary of couples being able to contract that, for example, embryos will be destroyed or donated in the case of divorce.<sup>95</sup> These courts are concerned not only with the parties adequately considering their choices at the time they sign the contract, but they also seem to think that even if that consideration was adequate, parties simply should have the freedom to change their minds when it comes to something as important as bringing a child into the world.<sup>96</sup>

A further point of comparison is how courts view contracts parents could try to make regarding their children. Divorcing parents cannot contract away child support to which the child is entitled on the basis that enforcing these contracts would be contrary to public policy.<sup>97</sup> Likewise,

92. *Id.* at 268–69.

93. 193 S.W.3d at 50.

94. Johnson, *supra* note 76; Laura S. Langley, *Sperm, Egg, and a Petri Dish*, 27 J. L. MED. 167 (2006).

95. *A.Z. v. B.Z.*, 725 N.E.2d 1051, 1055 (Mass. 2000); *J.B. v. M.B.*, 751 A.2d 613, 619–20 (N.J. Super. Ct. App. Div. 2000); *In re Marriage of Witten*, 672 N.W.2d 768, 782 (Iowa 2003).

96. *Witten*, 672 N.W.2d at 782–83.

97. *Dep’t of Revenue v. Green*, 983 P.2d 1249, 1251–52 (Alaska 1999) (holding that a court can only accept a custodial parent’s waiver of child support if there is proof that the custodial parent can support the child adequately); *Thompson v. Thompson*, 696 N.E. 2d 80, 83 (Ind. Ct. App. 1998); *Tilley v. Tilley*, 947 S.W.2d 63, 65 (Ky. Ct. App. 1997) (holding that courts are not bound by the parties’



parties in a divorce cannot contract to make child support provisions non-modifiable.<sup>98</sup> Also, the parties in a dissolution proceeding cannot contract regarding the disposition of minor children.<sup>99</sup> The reasoning behind these restrictions on contracting is that the rights that are being bargained do not solely belong to the parents, but also implicate minor children who, as stated by the North Dakota Supreme Court in *Toni v. Toni*, “have the most at stake as a result of such an agreement but who have the least ability to protect their interests.”<sup>100</sup>

A fetus in an artificial womb has been implanted and is in the process of developing, and in this way is unlike a frozen embryo. At the same time, a fetus does not have the same legal status as a minor child.<sup>101</sup> Also, while courts involved in frozen embryo cases are put in the position to either decide that the embryos could be potentially used, courts involved in artificial womb cases would be asked by the party wishing to end the “pregnancy” to make a decision regarding a currently developing life.

There are two types of possible contracts that could be formed regarding an artificial womb. One type of contract might say that the pregnancy must be continued under any circumstances. Another type of contract might say that termination should be allowed. This second type, a contract authorizing termination, would present greater difficulties to the courts because it requires the court to take action to terminate a developing life.

If some courts are uncomfortable enforcing a contract that affects a potential life, it is likely that a much greater number of courts will be uncomfortable enforcing a contract that affects an actual developing life rather than a potential developing life which is presently static. When a court does not enforce a frozen embryo contract it allows for the potential that the unborn life be born at some future point; when a court enforces a frozen embryo contract it ends that possibility that that frozen embryo could at some point be born. In contrast, a court’s interference with potential human life in the case of artificial wombs is more involved. If a court does not

marital dissolution agreements in the areas of child custody, support, and visitation); *Geramifar v. Geramifar*, 688 A.2d 475, 478 (Md. Ct. Spec. App. 1997); *Ruth F. v. Robert B.*, 690 A.2d 1171, 1172 (Pa. Super. Ct. 1997) (holding that the agreement that stated the husband would support the two elder children of the marriage but not youngest child was invalid).

98. *In re Marriage of Singleteary*, 687 N.E.2d 1080, 1086 (Ill. App. Ct. 1997).

99. *Truman v. Truman*, 591 N.W.2d 81, 84 (Neb. 1999); *Mitchell v. Mitchell*, 517 S.E.2d 300, 305–06 (W. Va. 1999) (holding a separation agreement about the custody of children cannot be binding because the welfare of the child controls the determination).

100. 636 N.W.2d 396, 401–02 (N.D. 2001).

101. *McVey v. Sargent*, 855 N.E.2d 324, 328–29. (Ind. App. Ct. 2006) (holding that a statute which provided for a wrongful death claim for minor children but not for unborn fetuses did not violate the equal protection clause).

enforce an artificial womb contract the court is choosing to let a potential life continue to grow; however, if a court enforces an artificial womb contract the court is actually preventing a developing life from continuing.

Additionally, the results of time delay and inaction have different effects on an artificial womb contract scenario. In the frozen embryo cases that have arisen there is one party who wants the frozen embryos to be used while the other party seeks to keep it from being used. When the court does nothing, the frozen embryos remain unused. In contrast, in a potential artificial womb case where one party wants to continue the “pregnancy” and the other wants to terminate it, the embryo or fetus is continuing to develop toward full gestation as the parties bring their case to court. The effect of the court not enforcing a contract that says, for example, that one of the parties can choose to terminate the pregnancy, is that the status quo remains and the fetus continues to grow. Thus, enforcing an artificial womb contract presents an even more active role for a court to take than enforcing a frozen embryo contract.

There is also the potential of a type of contract that stated that parties could mutually consent to discontinue an artificial womb. In such a scenario, as both contracting parties would have the same objective (discontinuing the artificial womb), the contract likely would be analyzed only to determine whether the action is legal. If the law states that a fetus in an artificial womb cannot be terminated once it is implanted, then a contract between the two parties stating that with their mutual consent they can terminate the pregnancy would likely be illegal and unenforceable.<sup>102</sup>

While artificial womb contracts concerning mutual consent would likely be enforceable or unenforceable based on the legality of what is being consented to, artificial womb contracts allowing a unilateral termination of the embryo or fetus would likely not be enforceable as they represent a more extreme version of contracts concerning frozen embryos, which are still often declared unenforceable.<sup>103</sup> Furthermore, a bright-line rule that either unilateral or mutual consent termination contracts are unenforceable is supported by both practical and public policy reasons, as will be further discussed in Part V of this note.

102. Of course, this analysis will be altered if the statute is found unconstitutional.

103. *A.Z. v. B.Z.*, 725 N.E.2d 1051, 1055 (Mass. 2000); *J.B. v. M.B.*, 751 A.2d 613, 619–20 (N.J. Super. Ct. App. Div. 2000).

#### IV. THE DEVELOPMENT OF AN ARTIFICIAL WOMB MAY RAISE VARIOUS LIABILITY ISSUES.

If human fetuses are grown to full term in an artificial womb, certain risks cannot be assessed merely by conducting animal experiments. The psychological effect of ectogenesis on a fetus developing into a child, for example, cannot be assessed in experiments on animals.<sup>104</sup> As ethicists Peter Singer and Deane Wells noted:

If it is unethical to attempt ectogenesis in humans until we have a reasonable assurance that it is safe, and we can have no reasonable assurance that it is safe until it is carried out, we seem to be in a classic 'catch 22' situation. Work on ectogenesis will remain forever unjustifiable.<sup>105</sup>

This comment raises the question of what exactly would qualify as "reasonable assurance" that use of an artificial womb is safe. It seems, however, that no matter how far the science is perfected on an animal species, this standard of reasonable assurance will not be met. Thus, the use of ectogenesis could likely be seen as incurring too many risks for too few rewards.

One possible way to circumvent this "catch 22" is by first using artificial wombs as experimental methods for very premature babies with otherwise doubtful chances for survival. As noted in one article, "research on nearly fully gestated fetuses is supported generously because it may save the lives of tiny humans," while research on embryos more than fourteen days old is banned by most countries.<sup>106</sup> Still, while these experiments would provide scientists with an idea of how, for example, an eighteen-week-old fetus would function inside an artificial womb, it would not provide them with the information of how an eighteen-day-old embryo would grow. Thus, even if this type of experimentation could be deemed permissible on very premature babies, it would likely be insufficient without experimentation at the beginning stages of an embryo or fetuses' development.

Another solution for the earlier experimental stages of artificial womb technology is to use donated embryos left over from IVF treatments, as was done by Dr. Liu in her 2002 experiments.<sup>107</sup> However, the reason given for Dr. Liu halting her experimentation soon after the embryos were implanted was to comply with IVF regulations.<sup>108</sup> Still, privately funded experimentation may circumvent regulations such as those issued by the National Insti-

104. COLEMAN, *supra* note 2, at 43.

105. SINGER & WELLS, *supra* note 3, at 130.

106. Simonstein, *supra* note 1, at 360.

107. Dolendo, *supra* note 11, at 4.

108. *Id.*

tute of Health because they only apply to federally funded research.<sup>109</sup>

So if this technology becomes a reality, without the security of knowing the results, who should be liable for potential injuries? What if, for example, there was a power outage or the wrong dose of hormones was used in an artificial womb? What if a whole generation of children was born using this technology, and it was only then discovered that such children eventually develop serious physical or psychological health problems later on in life? How would the claim of wrongful death apply? Would the clinics or the manufacturer of these artificial wombs be held liable in a class action lawsuit? Can potential parents ever assume the risk and give informed consent to using their genetic material to create a fetus which could have unknown deformities? Could potential parents ever be able to sign away the rights of their children?

The first part of this section will examine how the doctrine of negligence would apply in an artificial womb scenario, followed by how a claim for wrongful death could apply to a fetus in an artificial womb. This section will particularly address the issue of how the concept of viability would be applied to embryos or fetuses inside artificial wombs. Then, the next section will analyze how a class-action circumstance might be applied to artificial wombs. Finally, the last section will discuss whether potential parents would be able to give valid consent to whatever deformities could be incurred by their child from being gestated in an artificial womb.

*A. Applying Negligence Doctrine to Embryos or Fetuses Harmed Inside of Artificial Wombs*

The current doctrine of negligence could be applied to an artificial womb scenario where harm is caused to the embryo or fetus. In a negligence action a plaintiff must show four elements: (1) the defendant owed a duty of care to the plaintiff, (2) the defendant breached that duty by a negligent act or omission, (3) defendant's breach was the actual and proximate cause of the plaintiff's injury, and (4) the plaintiff suffered injury or damages.<sup>110</sup>

First, in a case where an artificial womb is being used, the clinic or hospital, or one of their agents, would owe a duty of care to the embryo or fetus as a patient, just as a physician has a duty of care to the fetus during a

109. Sheldon Krimsky & Ruth Hubbard, *The Business of Research*, HASTINGS CENTER REP., Jan.-Feb., 1995, at 41, 41.

110. *Jackson v. Swordfish Inv.*, 620 S.E.2d 54, 56 (S.C. 2005).

pregnancy.<sup>111</sup> As seen by the recognition of preconception torts,<sup>112</sup> an embryo does not even need to be conceived, much less viable, for negligence claims to apply in some states.<sup>113</sup> However, in these preconception tort cases, courts typically see these torts as a breach of the duty that the doctor owes to the future mother, which is extended to cover the fetus, and see the negligence as harming the fetus, and then later having the foreseeable consequence of affecting the not yet conceived child.<sup>114</sup> For example, the Illinois Supreme Court held that injury to a prematurely-born child resulting from its mother's negligent blood transfusion occurring years before the child's conception was actionable.<sup>115</sup>

In an artificial womb scenario, however, the embryo has been implanted in the lining of the artificial womb within hours or days of being inserted into the womb, making presumably all artificial womb torts post-conception torts.<sup>116</sup> Thus, going back to the duty of care, in an artificial womb scenario the physician or scientist would have to owe the embryo or fetus itself a duty, and this concept would rely more on the embryo or fetus being defined as potential human life than in preconception torts. If a doctor or scientist was not seen as having a duty to the embryo or fetus as a potential life, then the negligence tort would turn into a tort for conversion of "property" of the parents' genetic material.<sup>117</sup> However, it seems more likely that given the current duty to the embryo or fetus in addition to the mother, that the embryo or fetus growing in an artificial womb would retain that same legal right that could not be breached.

111. Being that an embryo or fetus in an artificial womb would be a separate entity from its mother the physician's duty of care to the embryo or fetus would be equal to or arguably stronger than the physician's duty of care to an embryo or fetus in a natural pregnancy where the physician has a sometimes competing duty of care to the mother. A similar analogy can be made to a physician's duty of care to a fetus undergoing fetal surgery. See e.g., Cynthia Lauriston, *Fetal Surgery and Wrongful Death: The Physician's Duty of Care to the Unborn Fetus Regardless of Its Viability*, 53 MED. TRIAL TECH. Q. 177, 190-93 (2006) (examining a physician's duty of care to a fetus undergoing fetal surgery).

112. *Bergstresser v. Mitchell*, 577 F.2d 22, 25 (8th Cir. 1978); *Jorgensen v. Meade Johnson Labs.*, 483 F.2d 237, 238 (10th Cir. 1973); *Renslow v. Mennonite Hosp.*, 367 N.E.2d 1250, 1255 (Ill. 1977); *Walker v. Rinck*, 604 N.E.2d 591, 596 (Ind. 1992); *Monusko v. Postle*, 437 N.W.2d 367, 369 (Mich. App. 1989); *Lough v. Rolla Women's Clinic*, 866 S.W.2d 851, 854 (Mo. 1993); *Graham v. Keuchel*, 847 P.2d 342, 364-65 (Okla. 1993). See also Joshua Kleinfeld, *Tort Law and In Vitro Fertilization: The Need for Legal Recognition of "Procreative Injury"*, 115 YALE L.J. 237, 237-39 (2005).

113. *Bergstresser*, 577 F.2d at 25; *Jorgensen*, 483 F.2d at 238; *Renslow*, 367 N.E.2d at 1255; *Walker*, 604 N.E.2d at 596; *Monusko*, 437 N.W.2d at 269; *Lough*, 866 S.W.2d at 854; *Graham*, 847 P.2d at 364-65. But see *Enright v. Eli Lilly*, 570 N.E.2d 198, 204 (N.Y. App. 1991) (holding that preconception torts were not recognizable); *Albala v. N.Y.*, 429 N.E.2d 786, 786 (N.Y. App. 1981).

114. *Renslow*, 367 N.E.2d at 1255; *Walker*, 604 N.E. at 595; *Lough*, 866 S.W.2d at 854.

115. *Renslow*, 367 N.E.2d at 1251.

116. *Dolendo*, *supra* note 11, at 4.

117. See generally, Jessica Berg, *Owning Persons: The Application of Property Theory to Embryos and Fetuses*, 40 WAKE FOREST L. REV. 159 (2005).

The last three elements of negligence seem to apply less controversially to artificial wombs. The second element, a defendant breaching his or her duty by a negligent act or omission, could occur in a variety of scenarios. For example, a clinic could fail to have a backup generator for a power outage or mistakenly use the wrong amount of hormones in an artificial womb. The third element, that the defendant's breach was the actual and proximate cause of the plaintiff's injury, could be proven much in the same way as in any medical malpractice case. For instance, should the artificial womb shut off for a minute, the fetus could sustain brain damage. The most significant potential difficulty with this element might be that if only 20% of fetuses come to term in an artificial womb, and the claim is brought because of a fetus that did not come to term, it might be difficult to prove that the breach of care was the reason for the fetus not surviving to term. The final element of negligence, that the fetus was actually injured, would also be provable. Thus, a negligence action could likely be brought in artificial womb scenarios where the defendant breached his or her duty and this breach caused the fetus' injury.

One potential obstacle to recovery under a negligence action would be if states considered fetuses in artificial wombs as "nonviable" up until a certain point. There is, of course, a strong argument that at any stage in its development an embryo or fetus is viable because it is outside of a woman's womb, albeit in an artificial one. However, since this type of scenario has not yet unfolded, there is nothing decisive that interprets viability this way. States have different standards as to whether a child who sustained prenatal injuries can recover when the child was nonviable at the time of the injury. Currently, however, most states recognize that there is a negligence claim, if the child is born alive, whether or not the prenatal injuries occurred before viability.<sup>118</sup>

Thus, changing the definition of viability from capable of life outside of a mother's womb to capable of life outside of any womb would be problematic for negligence claims where the injury occurred early on in the gestation. The issue of viability is also important in terms of whether a claim of wrongful death could be brought for an embryo or fetus which was "stillborn" as a result of negligence that occurred when it was inside an artificial womb.

118. See e.g., *Day v. Nationwide Mut. Ins.*, 328 So.2d 560, 562 (Fla. Dist. Ct. App. 1976); *Hornbuckle v. Plantation Pipe Line Co.*, 93 S.E.2d 727, 728 (Ga. 1956); *Daley v. Meier*, 178 N.E.2d 691, 694 (Ill. Ct. App. 1961); *Torigian v. Watertown News Co.*, 225 N.E.2d 926, 927 (Mass. 1967); *Bennett v. Hymers*, 147 A.2d 108, 110 (N.H. 1958); *Smith v. Brennan*, 157 A.2d 497, 504 (N.J. 1960); *Sinkler v. Kneale*, 164 A.2d 93, 96 (Pa. 1960); *Sylvia v. Gobeille*, 220 A.2d 222 (R.I. 1966); *Yandell v. Delgado*, 471 S.W.2d 569, 570 (Tex. 1971).

*B. Applying Wrongful Death Claims to Embryos or Fetuses Harmed  
Inside of Artificial Wombs*

For a wrongful death claim to apply to a claim of negligence, the embryo or fetus must be qualified as a "human being" under a state's wrongful death statute.<sup>119</sup> States differ on whether viability is required for a claim of wrongful death. Some states, including Idaho, Massachusetts, Oklahoma, Pennsylvania, and Washington, have held that a wrongful death action is possible when the fetus was viable at the time of injury.<sup>120</sup> Other states, including Mississippi, South Dakota, and West Virginia, have held that a wrongful death action can be brought for the death of a fetus which was nonviable at the time of injury.<sup>121</sup> For example, in *Wiersma v. Maple Leaf Farms*,<sup>122</sup> the South Dakota Supreme Court held that viability is not a sufficient criteria for determining whether parents can recover under a wrongful death claim for a fetus because viability is relative to many factors besides the actual stage of development, such as the health of the mother and child. Still other states, such as New Jersey, Iowa, Nebraska, New York, Texas, and Virginia, have held that wrongful death statutes do not apply to stillborn fetuses, regardless of their viability at the time of the injury which causes their death.<sup>123</sup> When a child is a live birth,<sup>124</sup> but then because of prenatal injuries dies after birth, most courts allow for wrongful death actions regardless of if the fetus was viable at the time of the injury.<sup>125</sup>

119. See generally, Lauriston, *supra* note 111.

120. *Santana v. Zilog*, 95 F.3d 780, 782 (9th Cir. 1996) (applying Idaho law); *Thibert v. Milka*, 646 N.E.2d 1025, 1026 (Mass. 1995) (holding that there is a cause of action if the fetus is either viable at the time of negligence or injury or born alive); *Guyer v. Hugo Pub*, 830 P.2d 1393, 1394 (Okla. Civ. App. 1991) (no cause of action for nonviable fetus); *McCaskill v. Phila. Hous. Auth.*, 615 A.2d 382, 384 (Pa. Super. Ct. 1992); *Baum v. Burrington*, 79 P.3d 456, 459 (Wash. Ct. App. 2003).

121. *Fed. Credit Union v. Tucker*, 853 So. 2d 104, 114 (Miss. 2003); *Wiersma v. Maple Leaf Farms*, 543 N.W.2d 787, 791 (S.D. 1996); *Farley v. Sartin*, 466 S.E.2d 522, 535 (W. Va. 1995).

122. *Wiersma*, 543 N.W. 2d at 792.

123. *Marie v. McGreevey*, 314 F.3d 136, 140–41 (3d Cir. 2002) (applying New Jersey law); *Weitl v. Moes*, 311 N.W.2d 259, 272 (Iowa 1981); *Smith v. Columbus Cmty. Hosp.*, 387 N.W.2d 490, 491–92 (Neb. 1986); *Raymond v. Bartsch*, 447 N.Y.S.2d 32, 34 (N.Y. App. Div. 1981); *Blackman v. Langford*, 795 S.W.2d 743, 743 (Tex. 1990); *Modaber v. Kelley*, 348 S.E.2d 233, 236–37 (Va. 1986).

124. A live birth is defined as the child having a separate and independent existence from its mother; the child must be completely removed from the mother's body, the cord must be cut, and the infant must have an independent circulation of blood. *Duncan v. Flynn*, 342 So. 2d 123, 126 (Fla. Dist. Ct. App. 1977).

125. See e.g., *Pizza Hut of America v. Keefe*, 900 P.2d 97, 101 (Colo. 1995); *Group Health Ass'n v. Blumenthal*, 453 A.2d 1198, 1207 (Md. Ct. App. 1983); *Sweeney v. Preston*, 642 So. 2d 332, 334–35 (Miss. 1994) (a cause of action only arises once their has been a live birth); *LaBello v. Albany Med. Ctr. Hosp.*, 651 N.E.2d 908, 909 (N.Y. App. 1995) (a cause of action only arises once their has been a live birth); *Nealis v. Baird*, 996 P.2d 438, 445 (Okla. 1999); *Hudak v. Georgy*, 634 A.2d 600, 602 (Pa. 1993).

These state-by-state differences in wrongful death statutes prompt the question of how embryos or fetuses growing in artificial wombs would be defined under wrongful death statutes. If a fetus' status as a "person" under a wrongful death statute depends on its viability, additional definitional problems arise with artificial wombs. Under a wrongful death statute, a fetus in an artificial womb could either be: (a) a "person" from the time of implantation into the artificial womb; (b) a "person" once it reached a certain number of weeks or stage in development; or (c) not a "person" until it is outside the artificial womb. In Part V, the proposal section of this note, I will suggest how a fetus in an artificial womb should be defined under wrongful death statutes.

### C. *Applying Class Action Doctrine to Artificial Wombs*

Clinics would most likely be liable for negligence or wrongful death claims, even on a class action basis, for problems that could occur in the development and early usage of artificial wombs. Although there is not a close equivalent to an artificial womb, a possible comparison is class action pharmaceutical suits, such as the suits involving the drug Diethylstilbestrol ("DES"), which had effects on generations removed from those who consumed the drug.<sup>126</sup> Some courts in the DES suits did not recognize strict liability claims from plaintiffs who neither ingested the drug themselves nor were exposed to it in utero.<sup>127</sup> Often these cases cited public policy reasons for confining a drug manufacturer's liability within "reasonable limits."<sup>128</sup>

However, there are various factors that could differentiate artificial womb class action liability from DES liability. First, DES cases were product liability cases, and it is unclear whether artificial womb cases would be negligence cases or product liability cases.<sup>129</sup> Additionally, one of the important factors in refusing to recognize DES suits is that the third generation plaintiff was not conceived at the time of the ingestion.<sup>130</sup> As discussed earlier, some courts do recognize preconception torts.<sup>131</sup> In artifi-

126. Center for Disease Control, What Are We Learning About DES?, [http://www.cdc.gov/des/consumers/download/learning3\\_concerns.pdf](http://www.cdc.gov/des/consumers/download/learning3_concerns.pdf) (last visited Oct. 27, 2009) [http://www.cdc.gov/des/consumers/download/learning3\\_concerns.pdf](http://www.cdc.gov/des/consumers/download/learning3_concerns.pdf) (last visited Oct. 27, 2009).

127. *In re* N.Y. County DES Litig., 589 N.Y.S. 2d 883, 883 (App. Div. 1992); *Enright v. Eli Lilly & Co.*, 570 N.E.2d 198, 202-03 (N.Y. App. 1991).

128. *Enright*, 570 N.E.2d 198 at 203.

129. *Id.* at 202-03.

130. *Id.* at 208.

131. See e.g., *Jorgensen v. Meade Johnson Lab.*, 483 F.2d 237, 240 (10th Cir. 1973); *Renslow v. Mennonite Hosp.*, 367 N.E.2d 1250, 1255 (Ill. 1977); *Walker v. Rinck*, 604 N.E.2d 591, 593-94 (Ind.



cial womb class action cases, however, this would be irrelevant because the children born from artificial wombs would almost certainly have a post-conception claim rather than a pre-conception claim.<sup>132</sup>

Also, another substantial part of the reasoning for courts not finding liability as to third generation DES plaintiffs was for the public policy reason that a drug manufacturer's liability be confined within reasonable limits so that they would keep creating and manufacturing new drugs.<sup>133</sup> Although there could plausibly be a claim that public policy should support the use of artificial wombs, it is unlikely since artificial wombs would only be used for premature babies or gestational purposes, unlike pharmaceuticals which have a much wider impact. Additionally, while courts found third generation DES claims outside of "reasonable limits," artificial womb claims, especially from first generation artificial womb babies, would likely not come to the same result.<sup>134</sup>

Although the DES arguments could be applied to avoid liability if, for example, part of a generation of children was born using artificial wombs, artificial womb use may cease, and years later all of the grandchildren of children born from artificial wombs might have some disability. However, there seems to be no obstacle for those who suffered injuries from gestating in an artificial womb to sue, even in a class action lawsuit.

#### *D. Applying Waiver of Right to A Child Born from an Artificial Womb*

There is an additional question of whether clinics or hospitals and their agents could protect themselves from liability by requiring potential parents sign a consent form. This consent form would likely describe the potential risks of utilizing an artificial womb and waive the parents' and potential child's right to sue if anything goes wrong with the gestation.

While in theory the potential risks might be explained to the potential parents, it seems unlikely that scientists would even be able to accurately anticipate and lay out the possible risks to an embryo formed from their genetic material. In such uncertain circumstances, it seems unlikely that clinics or doctors would be able to insulate themselves from liability merely by telling the participants of some of the various possible risks.

Additionally, parents should not be able to waive the rights of their

1992); *Monusko v. Postle*, 437 N.W.2d 367, 370 (Mich. Ct. App. 1989); *Lough v. Rolla Women's Clinic*, 866 S.W.2d 851, 854 (Mo. 1993); *Graham v. Keuchel*, 847 P.2d 342, 364-65 (Okla. 1993).

132. This is demonstrated by how Dr. Liu has already successfully been able to implant human embryos into an artificial womb. *Dolendo*, *supra* note 11, at 4-7.

133. *Enright*, 570 N.E.2d at 204.

134. *Id.* at 203.

child to sue later for unknown damages that the child incurred during gestation in an artificial womb. As discussed before, parents cannot generally waive a child's rights to, for example, child support.<sup>135</sup> Although parents can certainly make decisions for a child, such as deciding on a type of medical care or what type of school a child goes to, a right to sue for damages during gestation differs. Similar to the case of a parent waiving a child's right to child support where the parent is taking away the child's right to monetary support, a parent's waiver of the rights of his or her child to sue takes away the child's right to be compensated for a loss that he or she has incurred.

As repeatedly affirmed by courts in negligence actions, a parent has no right to waive a child's right to sue for the injuries that the child sustained.<sup>136</sup> Additionally, although parents can settle their children's tort suits, almost every state requires judicial approval in order bind the minor.<sup>137</sup> These cases are based both on the legal reasoning that a parent does not have the right to waive a child's own future cause of action and on the more general public policy that states should protect minors.<sup>138</sup>

In sum, the greatest area of controversy is likely to be the issue of defining embryos and fetuses in artificial wombs as viable from the time of implantation. However, defining embryos in artificial wombs as viable from the time of implantation, for both wrongful death and abortion statutes, is both a necessary and a workable definition. Additionally, class action suits concerning artificial womb technology would be permissible and parental waivers of a child's future right to sue concerning injuries sustained in an artificial womb would be impermissible.

135. *Thompson v. Thompson*, 696 N.E.2d 80, 83 (Ind. Ct. App. 1998); *Germifar v. Germifar*, 688 A.2d 475, 478 (Md. Ct. Spec. App. 1997); see *Dep't of Revenue v. Green*, 983 P.2d 1249, 1252-53 (Alaska 1999) (holding a court can only accept a custodial parent's waiver of child support if there is proof that the custodial parent can support the child adequately); *Tilley v. Tilley*, 947 S.W.2d 63, 65 (Ky. Ct. App. 1997) (holding that courts are not bound by the parties' marital dissolution agreements in the areas of child custody, support, and visitation); *Ruth F. v. Robert B.*, 690 A.2d 1171, 1172 (Pa. Super. Ct. 1997) (finding agreement that stated the husband would support the two elder children of the marriage but not youngest child was invalid).

136. *Cooper v. Aspen Skiing*, 48 P.3d 1229, 1233 (Colo. 2002); *Apicella v. Valley Forge Military Acad. and Junior Coll.*, 630 F.Supp.2d 24 (E.D. Pa. Dist. Ct. 1985); *Hawkins v. Peart*, 37 P.3d 1062, 1065-66 (Utah 2001) (state has public policy favoring the protection of minors); *Scott v. Pacific West Mountain Resort*, 834 P.2d 6, 10 (Wash. 1992).

137. See Richard L Braun & Scott T. Seabolt, *Don't Count Kids Out: Settlement By Parents on Child's Behalf Needs Courts OK to Avert Later Suit*, A.B.A. J., May 1997, at 84, 84.

138. *Id.*

## V. PROPOSALS FOR THE TREATMENT OF EMBRYOS AND FETUSES IN ARTIFICIAL WOMBS

After providing an overview of the legal areas that would most be affected by the development of artificial wombs, I will now propose solutions for a few of the most controversial issues that would arise in these areas. Each of these issues is centered in the main issue of at what point an embryo or fetus becomes endowed with the legal rights of a person. This is particularly important because of equal protection problems that would arise if a fetus in an artificial womb is considered a person with legal rights and a fetus in utero at the same point of development is not considered a person with legal rights. Thus, in each of these areas of law a fetus in utero should have the same legal rights as a fetus in an artificial womb at the same point of development.

### A. *Artificial Womb Development and Abortion Jurisprudence Based on Viability*

I would propose that there is not a sufficient replacement for the standard of viability, and that should artificial womb technology be developed, states would be able to constitutionally limit abortion under the changed meaning of viability. The possible alternatives to the viability standards are flawed and are not grounded in abortion jurisprudence.<sup>139</sup>

One alternative replacement to viability could be basing abortion rights on a right not to procreate rather than on a potential mother's interest in terminating the pregnancy, balanced with the state's interest in preserving the potential life of the fetus.<sup>140</sup> In *Davis v. Davis*, the court used the concept of a "right not to procreate" to allow an ex-husband to prevent his ex-wife from using or donating embryos created during their marriage.<sup>141</sup> Adopting this standard, it is argued, would allow a woman to terminate a pregnancy rather than be forced to undergo fetal extraction.<sup>142</sup> However, if the viability standard was replaced with a right not to procreate, it would presumably always be on the side of the mother since the fetus is still in her body. Thus, the right to an abortion would no longer be a balance between the woman's rights and the state's interest in the fetus, but instead a state would not be able to impose restrictions on a woman's ability to get an

139. See Part II for a description of current abortion jurisprudence.

140. See e.g., Son, *supra* note 61, at 226.

141. 842 S.W. 2d 588, 603 (Tenn. 1992).

142. See e.g., SINGER & WELLS, *supra* note 3, at 120 (discussing how ectogenesis would change the face of abortion debates).

abortion. This would greatly change the nature of abortion jurisprudence.

Another possible replacement for the standard of viability is specifying a set number of weeks of gestation during which a woman's right to an abortion cannot be unduly burdened by the state.<sup>143</sup> However, this standard would be contrary to the logic that the concept of "viability" is meant to recognize a being capable of being independent of the mother's womb, not a specific point at which it becomes recognizable as life. Therefore, this option is also inconsistent with abortion jurisprudence.

A third potential suggestion is that there should be one standard for in utero fetuses and an entirely different standard for ex utero. This is troublesome because, as earlier observed, this would lead to equal protection concerns because a fetus in an artificial womb would be considered a person with legal rights and a fetus in utero at the same point of development would not be considered a person and not be given the same legal rights.<sup>144</sup>

I would propose that the viability standard of abortion jurisprudence should not simply be overturned for one of these alternative standards. In my opinion, the underlying reason for the standard of viability is based on the understanding that, once an embryo or fetus can survive separate from the woman's womb, that states should be able to protect that life. Any other standard seems inappropriate, especially considering that if an alternative standard was adopted states could not impose restrictions on abortions that would otherwise result in full-term babies, albeit with medical assistance. If artificial wombs develop sufficiently and states continue to be unable to restrict what are currently pre-viability abortions, then states will be unable to protect a fetus' interest in obtaining the medical assistance that could carry it to full term. Thus, I would suggest that states would constitutionally be able to limit abortion if functioning artificial wombs were developed because there is not a satisfactory replacement to the viability standard in abortion jurisprudence.

#### *B. Enforcement of Contracts Allowing Potential Parents to Terminate an Embryo or Fetus in an Artificial Womb*

I would propose that courts not enforce contracts between potential parents that permit one or both parties to terminate an embryo or fetus in an artificial womb. First, if the previous section's proposal is taken into account, then states could restrict the termination of an embryo or fetus, both

143. See e.g., Son, *supra* note 61, at 225–26.

144. Although this issue would need to be analyzed further, it is not within the scope of this paper to describe these potential equal protection problems in-depth.

in utero or ex vivo. However, even if the state did choose to restrict the ability to terminate the “pregnancy,” there are additional reasons that courts should not enforce contracts allowing potential parents the right to terminate.

As discussed previously, some courts have already shown a reluctance to enforce contracts that couples have made governing the disposition of frozen embryos. Similar to frozen embryo contract cases, courts might feel that potential parents should not be bound by prior agreements when something as significant as a potential human life is at issue.<sup>145</sup> In contrast to frozen embryo cases, courts would most likely be even more concerned about their enforcement of a termination contract because they would have to take an affirmative action to stop a developing life.

In addition to the probable reluctance of courts to enforce these contracts, there are practical reasons why there should be a bright-line rule opposing the enforcement of these contracts. Without a bright-line rule not only would litigation increase, but there would clearly be various problems with the timing of the lawsuits. For example, if a potential parent decided at the sixteenth week of the “pregnancy” that he or she wanted to terminate the pregnancy, assuming that it was legal under state law, by the time that the court enforced the contract the fetus could have already been born or enough time could have passed that the fetus became protected under state law. Contracts allowing for termination would also be very difficult to enforce without a bright-line rule because courts might need to examine the contracts on a case-by-case basis, as demonstrated by how courts approach frozen embryo cases. Thus, contracts authorizing termination could be very difficult to enforce.

Furthermore, there are several good public policy reasons for this bright line rule. First, a bright-line rule against the ability to terminate an artificial womb pregnancy would make potential parents who have doubts about having a child think carefully about their decision to commence an artificial womb pregnancy. Likewise, if the risks of birth defects or other problems are substantial, then a bright-line rule that termination contracts will not be enforceable will deter potential parents from utilizing artificial wombs until scientists can reduce the risks.

Thus, a bright-line rule against agreements authorizing the termination of artificial womb pregnancies is consistent with both the increased legal protections that I am proposing should be afforded these fetuses, and is

145. *A.Z. v. B.Z.*, 725 N.E.2d 1051, 1058 (Mass. 2000); *J.B. v. M.B.*, 751 A.2d 613, 620 (N.J. Super. Ct. App. Div. 2000); *In re Marriage of Witten*, 672 N.W.2d 768, 780–81 (Iowa 2003).

consistent with various public policies that should be favored in light of the potential use of artificial wombs.

*C. Treatment of Fetuses in Artificial Wombs under Wrongful Death Statutes*

I would propose that an embryo or fetus should be considered viable, and thus for purposes of wrongful death actions, a "person," from the time that it is implanted in an artificial womb. As discussed earlier, the term viable is defined as capable of life outside of a woman's womb, not as capable of life without any technological assistance.<sup>146</sup> If the definition of "viable" and of "human" meant capable of living without artificial assistance, then people on life support would be technically "nonviable." Does this mean that their beneficiaries could not bring a wrongful death suit? Of course not.

One potential argument against this bright-line rule would be that there should be some minimum stage of development that an embryo must reach in order to be considered viable in an artificial womb. If artificial wombs have a relatively small success rate, with, for example, one successful birth out of every ten embryos, scientists and doctors would want to protect themselves against a large number of potential wrongful death lawsuits. However, the suing parties would still need to show that some negligence actually caused their harm, which would likely keep the number of lawsuits low. Additionally, if technology is simply too risky, negligence liability might be an effective deterrent to prevent wide use of artificial wombs. The scientists or doctors could simply decide not to offer the technology without a waiver of the child's rights to sue.<sup>147</sup>

Thus, embryos or fetuses within an artificial womb should be considered viable as soon as they are implanted. This bright-line rule will make injuries to an embryo or fetus recoverable under negligence or wrongful death statutes and would promote responsible use of this new technology.

In sum, these three proposals would work consistently with each other to increase the legal protection of embryos and fetuses as their opportunities to develop until full term increases with technology. The changed standard of viability would allow states to constitutionally limit abortion, parents would not be able to contract to allow for termination, and embryos and fetuses would be considered persons for the purposes of wrongful death statutes. In my opinion, these extended legal protections are reasona-

146. Fost et al., *supra* note 60, at 10–13.

147. Whether parents should be able to waive a child's right to sue is another issue in itself.

ble should artificial womb technology make it possible for fetuses to develop separately outside of a natural womb.

#### CONCLUSION

If ectogenesis becomes a reality, it is extremely unlikely that it would put an end to the abortion debate. Instead, ectogenesis would contribute to the complexity of debates over fetuses, such as the respective maternal and paternal rights in a fetus outside of a woman's body. Additionally, the possibility of contracts about fetuses in artificial wombs and the potential liabilities that ectogenesis might entail again raises questions about the definition of viability and the point at which an embryo or fetus becomes endowed with the legal rights of a person.