

Procreation machines: Ectogenesis as reproductive enhancement, proper medicine or a step towards posthumanism?

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Abstract

Full ectogenesis as the complete externalization of human reproduction by bypassing the bodily processes of gestation and childbirth can be considered the culmination of genetic and reproductive technologies. Despite its still being a hypothetical scenario, it has been discussed for decades as the ultimate means to liberate women from their reproductive tasks in society and hence finally end fundamental gender injustices generally. In the debate about the application of artificial wombs to achieve gender equality, one aspect is barely mentioned but is of crucial relevance from a medical-ethical perspective: whether and how could full ectogenesis be justified as a proper use of medicine? After characterizing the technology as a special form of human enhancement and as an extension of medical practice that goes beyond the traditional field of medicine, this paper critically assesses the theoretical possibilities of legitimizing this extension. We identify two ways of justification: either one argues that ectogenesis fulfils a proper goal of medicine (a justification we call *pathologization*), or one argues that the application of ectogenesis achieves a non-medical goal (which we call *medicalization*). Because it is important from a medical-ethical point of view to avoid an inappropriate instrumentalization or misuse of medicine and thus an undue medicalization of non-medical problems, a set of necessary conditions has to be met. It is doubtful whether full ectogenesis for non-medical purposes could fulfil these conditions. Rather, its comprehensive usage could be seen as a revolutionary modification of what it means to be human.

KEYWORDS

ectogenesis, gender equality, goals of medicine, human enhancement, medicalization, pathologization

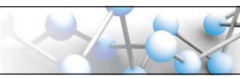
1 | INTRODUCTION

Since the 1960s, opportunities for women and men to manage, limit, prolong or augment their fertility have dramatically increased through methods such as enhanced contraception, in vitro fertilization (IVF), biobanking and 'other strategies to reorder human reproduction in the laboratory'.¹ Full ectogenesis can be considered the culmination of ge-

netic and reproductive technologies.² Although it is still a hypothetical scenario, some regard full ectogenesis to be a partially realized already,

¹Waldby, C. (2015). Banking time: Egg freezing and the negotiation of future fertility. *Culture, Health and Sexuality*, 17(4), 470–482.

²Tong, R. (2006). Out-of-body gestation: In whose best interests? In S. Gelfand & J. R. Shook (Eds.), *Ectogenesis: Artificial womb technology and the future of human reproduction* (pp. 59–76). Amsterdam, the Netherlands: Editions Rodopi. The term ectogenesis refers to the process of extrauterine gestation, while the term 'artificial womb', often used interchangeably, refers to the tool that is required for this. The same phenomenon is also referred to as out-of-body gestation, extracorporeal gestation, in-vitro-gestation or artificial womb technology (cf. Simonstein, F. (2009). Introduction. In F. Simonstein (Ed.), *Reprogen-ethics and the future of gender* (pp. 1–12). London, U.K.: Springer).



particularly in industrialized countries, constituted by IVF and other assisted reproductive technologies in combination with the continuously decreasing age of viability for preterm neonates.³ The use of increasingly sophisticated incubators and other technological advances to save fetuses born prematurely, now routinely practised in neonatology, can be called *partial* ectogenesis.⁴ However, in this paper we do not discuss partial ectogenesis, and hence the term 'ectogenesis' refers in all cases to *full* ectogenesis.⁵

The transformation in human reproduction that has been ongoing for several decades is taken to an extreme by ectogenesis. Through the application of techniques such as IVF, mitochondrial replacement, cryo-conservation, sperm donation or surrogacy, this transformation can be described as bringing about a threefold dissolution of boundaries: in the spatial, social and temporal dimensions.⁶ Spatial boundaries are dissolved as full ectogenesis moves us from a status quo in which parts of the reproductive process take place outside of human bodies (under the microscope, in petri dishes and laboratories) to a situation in which the whole prenatal period happens entirely inside a machine. This then dissolves the previous social boundaries, as this complete extra-corporealization creates a new division of labour in the process of reproduction and the possibility of new social roles and constellations. It is a shift away from the exclusive roles of two heterosexual people who are simultaneously the genetic, biological and social parents; instead, it allows for several people who may have never met in person, or who might be dead already, or who might be connected to each other in new ways, to contribute their share to the creation of a new life. Moreover, having a biological mother is no longer a prerequisite of human life. And finally, previous temporal requirements and restrictions also no longer exist, as an artificial womb could be prepared and set in motion whenever the required biomaterials are ready, including in a manner completely detached from a woman's fertility cycle, after the menopause of the egg donor, or even after the death of the biological or genetic parents.

Full ectogenesis is promoted by numerous scholars, not only as a means for helping those who for whatever reason cannot become pregnant naturally (infertile women, men, etc.), but also as the ultimate means to liberate all women from their reproductive

tasks in society and hence finally end fundamental gender injustices generally. Because it would eliminate the dependence of procreation on the female body for the first time in human history, women could be liberated from not only the burden and constraints of pregnancy and childbirth, but also from all the subsequent disadvantages that they have to endure because of this. Here, the underlying assumption is that women's exclusive role in the gestation of children is also the origin of all other gender inequalities. Referring to the influential position of Firestone,⁷ several authors⁸ make different versions of this argument for women's liberation by means of full ectogenesis in light of recent technical developments.

In order to answer the question whether full ectogenesis to achieve gender equality should be considered an undue use of medicine for achieving non-medical purposes, it is helpful to locate and classify the technique in regard to medicine as a field and profession with specific ethical characteristics and challenges. Therefore, we will first characterize the technology of ectogenesis as a special form of human enhancement and as an extension of medical practice, which goes beyond the traditional field of medicine. Then we will critically assess the theoretical possibilities to legitimize this extension. We identify two ways of justification: either one argues that ectogenesis fulfils a proper goal of medicine (a justification we call *pathologization*), or one argues that the application of ectogenesis achieves a non-medical goal (which we call *medicalization*). As it is important from a medical-ethical point of view to avoid an inappropriate instrumentalization or misuse of medicine and thus an undue medicalization of non-medical problems, a set of necessary conditions has to be met. It is doubtful whether ectogenesis for non-medical purposes could fulfil these conditions. The last part raises anthropological questions about how a comprehensive usage could revolutionize our understanding of what it means to be human.

2 | ECTOGENESIS AS ENHANCEMENT

Medically assisted reproduction has made great progress over recent decades. A wide range of technologies and procedures has been developed and advanced, enabling people who were formerly incapable of procreating, for various reasons, to have biologically and/or genetically related offspring. Such technologies intervene at very different points in the course of reproduction by replacing or increasing biological functions. This no longer happens only in cases in which a person is infertile owing to illness and aspires to

³Cannold, L. (1995). Women, ectogenesis and ethical theory. *Journal of Applied Philosophy*, 12(1), 55–64.

⁴Romanis, E. (2018). Artificial womb technology and the frontiers of human reproduction. *Journal of Medical Ethics*, 44, 751–755.

⁵Several authors hold that, because of the ongoing progress in embryonic research on the one hand and in neonatology on the other, the gap between the two is likely to be closed in the foreseeable future and ectogenesis will become a realistic option (cf. Buletti, C., Palagiano, A., Pace, C., Cerni, A., Borini, A., & de Ziegler, D. (2011). The artificial womb. *Annals of the New York Academy of Sciences*, 1221(1), 124–128; Simonstein, F., & Mashiach-Eizenberg, M. (2009). The artificial womb: A pilot study. *Cambridge Quarterly of Healthcare Ethics*, 18(1), 87–94). Remarkably, since the beginning of the debate almost a century ago, the majority of the authors expected ectogenesis to be feasible soon (e.g. Haldane, J. (1923). *Daedalus, or science and the future*. London, U.K.: Kegan Paul, Trench, Trubner; Brittain, V. (1929). *Halcyon, or the future of monogamy*. London, U.K.: Kegan Paul, Trench, Trubner). Singer and Wells claimed that the gap will be closed 'almost by accident' (Singer, P., & Wells, D. (1984). Ectogenesis. In Gelfand & Shook, op. cit. note 2, pp. 8–25, p. 10).

⁶Eichinger, T. (2013b). Entgrenzte Fortpflanzung (Unbounded procreation). In G. Maio, T. Eichinger & C. Bozzaro (Eds.) *Kinderwunsch und Reproduktionsmedizin (Wish for child and reproductive medicine)* (pp. 65–95). Freiburg, Germany: Alber [in German].

⁷Firestone, S. (1970). *The dialectic of sex*. New York, NY: Bantam Books.

⁸Smajdor, A. (2007). The moral imperative for ectogenesis. *Cambridge Quarterly of Healthcare Ethics*, 16(3), 336–345; Smajdor, A. (2012). In defense of ectogenesis. *Cambridge Quarterly of Healthcare Ethics*, 21(1), 90–103; Takala, T. (2009). Human before sex? Ectogenesis as a way to equality. In F. Simonstein (Ed.), *Reprogen-ethics and the future of gender* (pp. 187–197). London, U.K.: Springer; Simonstein, op. cit. note 2; Kendal, E. (2015). *Equal opportunity and the case for state sponsored ectogenesis*. Basingstoke, U.K.: Palgrave Macmillan; Kendal, E. (2017). The perfect womb. Promoting equality of (fetal) opportunity. *Journal of Bioethical Inquiry*, 14(2), 185–194.

typical human reproductive capacity, but also in cases of social infertility owing to age, sexual orientation or other factors: for example women who delay starting a family until after menopause for reasons related to education, professional achievements, finances, leisure activities or because they have not found a partner yet; same-sex couples; or those who are single intentionally, involuntarily or because they are widowed. A technique of that kind is surrogate motherhood, an assisted reproductive procedure that enables the intended mother to become the genetic mother of a child without her having to carry and deliver it, a possibility that is not available naturally.

Human enhancement is commonly defined as 'biomedical interventions that are used to improve human form or functioning beyond what is necessary to restore or sustain health'.⁹ Similarly, the President's Council on Bioethics, in its relevant 2003 report, defines enhancement as 'the directed use of biotechnical power to alter, by direct intervention, not disease processes but the 'normal' workings of the human body and psyche, to augment or improve their native capacities and performances'.¹⁰ Enhancement in this sense always aims at improving and expanding the natural biological human equipment or the species-typical functioning of humans through biomedical interventions. For the concept of human enhancement in the stricter sense, the direct alteration of a human body seems central, a feature that—at the edge of the field called *posthumanism*—goes as far as to promote the abolition of the body itself.¹¹ A fundamental augmentation of reproductive capacities according to this central enhancement logic consists in post-menopausal pregnancies, or even in completely new forms of how humans could procreate using their bodies: such as the project of male pregnancy, which would expand the range of capacities of the (male) human body and provide something completely new.

Ectogenesis is special here: because it is not about enabling new properties and abilities of human bodies, but about relieving (female) humans from employing their bodies and biological functions, it is rather a means for bypassing bodily reproduction than for augmenting or improving it. Apart from obtaining the still indispensable human reproductive material, sperm and oocytes, ectogenesis leaves the female body, the previous location of human reproduction, untouched and untreated. It does not alter or improve parts and functions of the human body as typical interventions aiming at human enhancement do. In this sense, ectogenesis is the culmination of an externalization of human reproduction.¹² It replaces central characteristics of human biology with technical means as it outsources the whole process of human procreation. To classify full ectogenesis as enhancement would require enhancement to

be defined not as a direct optimization of human bodies, but only as an improvement of human capacities in a broader sense (e.g. because it enables gay couples to procreate without using surrogacy). Therefore, it can be rather considered a new step in the old tradition of inventing technologies and machines that copy natural functions or capacities and take over their tasks: as for example washing machines do. Apart from retrieving male and female gametes for fertilization via IVF to feed the artificial procreation machinery, full ectogenesis is—in the gestating and birthing process—nowhere physically connected to the maternal human body. Nor is it a technology geared towards the control of bodily functions of reproduction. In sharp contrast to all other forms of assisted reproduction, ectogenesis is not designed to remove and optimize a certain link in the reproductive chain such that it can be re-implanted in the maternal body, thus facilitating a human pregnancy. It is a helpful device and artificial replica of a human function rather than an enhancing fusion of bodily biology and engineering technology under the conventional paradigm of enhancement, according to which autonomous subjects modify their bodily or mental substance in order to optimize their performance.

Hence, the purposes for which full ectogenesis could be applied are purposes of compensation or avoidance: for compensating for the (medically or socially induced) inability to become pregnant naturally, or for avoiding significant medical risks (in cases when natural pregnancies would imperil either mother or foetus), pain, suffering and other constraints involved in natural pregnancy and childbirth, or the possible gender-related societal impact. Enhancement as a purpose could then come into play only indirectly: by targeting not the subjects of reproductive action, the parents, but rather its objects, the desired children via gene editing, as has been argued by Tong.¹³ However, as this usage of artificial wombs is far from being an inevitable consequence of establishing it as a practice, ectogenesis does not necessarily enhance the body of anyone.

3 | ECTOGENESIS AS AN EXTENSION OF THE MEDICAL FIELD

As ectogenesis would likely be applied in a similar context to other already established procedures of assisted reproductive medicine, it would be performed by physicians. That entails important medical-ethical questions of justification. Since the time of Hippocrates, the practice of medicine has been special among human competencies. It is not merely the blind application of a neutral technique for any purposes, but rather a highly normative enterprise and limited field with its own ethos and a certain necessity for justification.¹⁴ Thus, every unprecedented application of medicine that is new and extends the field has to be justified in a normatively significant way. That is also

⁹Juengst, E., & Moseley, D. (2016). Human enhancement. In E. N. Zalta (Ed.), *The Stanford encyclopedia of philosophy*. Retrieved from <https://plato.stanford.edu/archives/spr2016/entries/enhancement> [Accessed Apr 15, 2019].

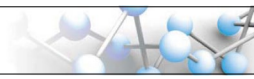
¹⁰The President's Council on Bioethics. (2003). *Beyond therapy*. Washington, D.C.: Dana Press, p. 13.

¹¹One of the most prominent protagonists of that radical view is Ray Kurzweil, who promotes a computational dualistic concept of man differentiating the mind as 'software' from the body as 'hardware'. He claims in his vision of the future that 'we will be software, not hardware': Kurzweil, R. (1999). *The age of spiritual machines: When computers exceed human intelligence*. New York, NY: Viking, p. 94.

¹²Tong, op. cit. note 2.

¹³Ibid.

¹⁴Sullivan, W. M. (2000). Medicine under threat: Professionalism and professional identity. *Canadian Medical Association Journal*, 162(5), 673–675; McCullough, L. B. (2006). The ethical concept of medicine as a profession. In N. Kenny & W. Shelton (Eds.), *Lost virtue: Professional character development in medical education* (pp. 17–28). Oxford, U.K.: JAI Press.



the case for the application of artificial wombs, which has to be considered as an extension of the medical field. Therefore, it needs to be asked how ectogenesis could be legitimized as such an extension.

In general, there are two options to legitimize new extensions of medical practice that go beyond the traditional field of medicine. Either new applications of medical knowledge and skills are justified insofar as they fulfil medical goals, or they are justified insofar as they help to achieve non-medical goals that are considered to be of great importance. In other words, the two possible ways to extend the medical field are either by shifting or by transgressing existing boundaries.¹⁵ Each of the two possibilities could be undertaken for good ethical reasons, but each nevertheless also poses serious normative challenges.

The first alternative—shifting the boundaries—invokes the core of traditional medicine: the aims are *treatment of diseases* and *restoration of health*. This is a conceptual process called pathologization: by legitimizing new medical activities and medical attention to new phenomena in this way, phenomena change their status from 'healthy', 'normal' or 'unobtrusive' to 'sick', 'pathological' or 'treatable'. Examples are behaviour and mental states such as hyperactivity, shyness or grief: conditions that can be burdensome and disturbing have been shifted from medically irrelevant to relevant.¹⁶ This way of justifying the extension of medicine's authority carries great normative weight by relying on the ethical power of the medical enterprise as it has been established and accepted already. By declaring grief as a medical matter by calling it a disease, one is giving its treatment an indisputable status derived from the status of treating a disease, thus pathologizing it.¹⁷

The second alternative—transgressing the boundaries—deliberately leaves the traditional realm of medical responsibility and claims the application of medical means for the achievement of non-medical goals outside the core area of medicine. This way of legitimizing new medical activity follows the line of 'wish-fulfilling medicine', where mere feasibility and existing demand are key criteria for the application of medical knowledge and skills to fulfil non-medical wishes, without claiming to treat or cure people.¹⁸ This process we call medicalization. Then, the challenge is to justify an application of medicine for purposes other than the traditional curing and disease-oriented ones. Examples of these non-medical goals, which are well accepted for good ethical reasons, are the use of medical competencies within the scope of criminal prosecution or in the field of reproduction, for example when physicians prescribe contraceptives or perform abortions that are not medically indicated but fulfil important non-medical

purposes and needs. Other, rather more controversial, examples of medicalizing non-medical problems and goals are cosmetic surgery, preimplantation genetic diagnosis for sex selection ('family balancing') or physician-assisted suicide.

At this point, it seems important to emphasize two points. First, our distinction between medicalization and pathologization refers to the normative question of how to justify extensions of medical practice; it is a justifying-related terminology. By contrast, in the literature, the terms and concepts medicalization and pathologization are used synonymously, without making this theoretical differentiation. Most authors use 'medicalization' or 'biomedicalization' for describing (and often condemning) the process of extending medical understanding, language, authority, interventions and power to handle problems and conditions that were not considered as medical before.¹⁹ In doing so, processes of pathologizing phenomena (commonly referred to as 'disease mongering') are often addressed as symptoms of an ongoing medicalization.²⁰ From an ethical-theoretical perspective, however, it is of crucial importance whether this extension should be justified as a new case of following the old aims (pathologization) or as setting a new aim (medicalization): the first requires a discussion about the disease concept and the pathological significance of a certain condition, whereas the latter leads to the question whether medicine should be used for purposes other than medical. Whereas the first claims new diseases, the latter claims new goals. The second important remark on the conceptual pair of medicalization and pathologization and its use here is the fact that medicalization in the strict justifying sense could indeed have pathologizing effects in concrete real-life cases by habituation. Even if the medical means are applied initially for clearly non-medical aims, namely for handling conditions that are not regarded as pathological, it could happen that by treating these conditions medically, using medical language, knowledge and personnel, the perception shifts step by step and the non-pathological, medicalized condition obtains an unhealthy and diseased appearance.²¹

4 | ECTOGENESIS AS A PROPER GOAL OF MEDICINE?

These preceding considerations allow us to formulate the central question, which is whether and in what way the application of ectogenesis could be justified as a proper aim of medicine from a medical-ethical perspective. The justification of ectogenesis as a legitimate aim of

¹⁵Eichinger, T. (2013a). *Jenseits der Therapie. Philosophie und Ethik wunscherfüllender Medizin (Beyond therapy. Philosophy and ethics of wish-fulfilling medicine)*. Bielefeld: transcript (in German). <https://www.transcript-verlag.de/978-3-8376-2543-1/jenseits-der-therapie/>

¹⁶Scott S. (2006). The medicalisation of shyness: From social misfits to social fitness. *Sociology of Health and Illness*, 28, 133–153; Sadler, J. Z., Jotterand, F., Lee, S. C., & Inrig S. (2009). Can medicalization be good? *Theoretical Medicine and Bioethics*, 30(6), 411–425.

¹⁷Bandini, J. (2015). The medicalization of bereavement: (Ab)normal grief in the DSM-5. *Death Studies*, 39(6), 347–352.

¹⁸Buyx, A. M. (2008). Be careful what you wish for? Theoretical and ethical aspects of wish-fulfilling medicine. *Medical Health Care and Philosophy*, 11, 113–143; Eichinger, op. cit. note 15.

¹⁹Clarke, A. E., Shim, J. K., Mamo, L., Fosket, J. R., & Fishman, J. R. (2003). Biomedicalization: Technoscientific transformations of health, illness, and U.S. biomedicine. *American Sociological Review*, 68, 161–194; Conrad, P. (2007). *The medicalization of society*. Baltimore, MD: John Hopkins University Press.

²⁰Cf. Moynihan, R., Health, I., & Henry, D. (2002). Selling sickness: The pharmaceutical industry and disease mongering. *BMJ*, 234, 886–890. Another example is Purdy, who determines medicalization from a feminist perspective as 'medicine's tendency to define normal events in women's lives [...] and natural states [...] as pathological and requiring medical attention': Purdy, L. (2001). Medicalization, medical necessity, and feminist medicine. *Bioethics*, 15(3), 248–261, p. 249.

²¹Maio, G. (2006). Die Präferenzorientierung der modernen Medizin als ethisches Problem (Preference orientation in modern medicine as ethical problem). *Zeitschrift für Medizinische Ethik*, 52(4), 339–354 [in German].

medicine could take one of two alternative routes. First, via pathologization: is the use of artificial wombs covered by one of the established goals of medicine? Second, via medicalization: does ectogenesis fulfil a goal that is non-medical but important enough to legitimize the application of medicine, and thereby create a new but proper medical goal?

4.1 | The pathologization argument

Making the case for ectogenesis as following an established proper goal of medicine implies that its application falls under the therapeutic paradigm and thus is oriented towards the treatment (or prevention) of diseases. Artificial wombs do not treat or cure a pathology, but rather avoid a biological process in its entirety.²² However, one cannot deny the fact that the processes of natural gestation and delivery are often and typically linked with risks, as well as with (time-limited) pain and suffering. And isn't the removal and relief of these bothersome states of pain and suffering a precedented and proper goal of medicine? One of the most prominent and internationally respected sources for a formulation of these goals is the Hastings Center project of the 1990s. The outcome of this project lists besides 'the care and cure of those with a malady' and 'the promotion and maintenance of health' also 'the relief of pain and suffering' as one of the four basic goals of medicine.²³ According to this influential and widespread formulation, relieving pain and suffering represents one of the oldest and most fundamental tasks of medicine. However, what is remarkable about this is the additional specification that the relief of pain and suffering is at the core of the mission of the medical enterprise only when it is 'caused by maladies'.²⁴ This means that physicians are not self-evidently responsible for alleviating every kind of suffering, nor even for eliminating every type of physical pain. Instead, in order for pain or suffering to become an issue of medical treatment, it has to have some causal connection to a state of illness or disease. If painful and distressing conditions have such a pathological root, they are legitimate objects of medical intervention. But the cause of pain and suffering that ectogenesis aims to eliminate is clearly the fact of being pregnant and giving birth—states that do not count as diseases or pathological conditions and events. Therefore, pregnancy-related pain and birth pangs would not be a case for proper application of medicine, at least not due to illness.²⁵

It is not universally held, though, that the unpleasant parts of the gestation and birth experience have no pathological features

themselves. Various concomitant effects in the prenatal, the perinatal and the postnatal phases of a normal gestation and birth process—and not only of exceptional cases where things go wrong and medical help clearly is needed and justified—have been described and conceptualized as medical conditions in the past decades, that is as pathological ones.²⁶ This opens a way to justify treating them in a traditional sense by medical means. However, apart from 'ontological' doubts as to whether conditions such as 'Postnatal Stress Disorder', 'Maternal Anxiety and Mood Imbalance', 'Antenatal Depression' and 'Postnatal Depression' really exist as pathologies, it seems unclear what benefits these illness labels could bring for the diagnosed parents. As generally with the redefinition of normal human experiences as health issues, this process 'is not so much about rendering people ill as about casting them into the role of powerless and helpless individuals'.²⁷ Regarding the understanding of the condition itself, a physician offering a medical solution for a phenomenon with the authority of the professional is a very strong affirmation that the condition in question is not normal but rather really problematic and needs to be eliminated. Therefore, one could speak of a reductionistic and devaluing view if focusing on the negative aspects only. Framed by medical labels and terms, such a pessimistic view is enforced even more by the weight and objectivity of the scientific gaze. Similar concerns raised by Lee relate to the subtle objectifying power of illness labels, the effect of which is not only that 'people become more passive and less able to act in relation to their problems and their lives' but also that they 'tend to give a permanence to these feelings, which are likely temporary, transitory states'.²⁸ Medicine's claim to be professionally concerned with these normal experiences, rather than to help and empower the parents-to-be in handling them by themselves, risks causing uncertainty and dependence, thus the opposite of empowerment and help. Moreover, along with the overemphasis on unpleasant emotions and experiences, pathologizing these states would take a considerable toll in the form of a devaluation of pregnancy and childbirth, as it would strengthen a negative idea focused on restrictions, losses and disadvantages. And even if one tries to differentiate in theory between a normal—and non-pathological—state on the one hand and its burdensome side effects on the other, which are in some way pathological and treatable, this will not be maintainable in practice. Classifying all concomitant effects and every symptom of a condition as unpleasant, avoidable and medical relevant could lead to a shifted perception of the cause itself as pathological. After all, a very clear and one of the most common formulations of a bodily or mental state as negative is its ascription as a disease. As Lee points out, pathologizing single elements of motherhood could function as part of a comprehensive ideological stance where 'becoming a mother needs to be viewed as an ordeal that victimizes women'.²⁹

²²Of course, artificial wombs could also be used in cases of medical infertility, as a means to realize a natural capability that is not available owing to bodily reasons; this kind of infertility is sometimes classified as pathological, and full ectogenesis therefore could be justified as treatment or therapy. However, we do not address this case here, as it would require a discussion about the status of infertility as a disease or not. Instead, our argument concentrates on the application of full ectogenesis by fertile women with the aim of reaching gender justice and full equality.

²³Hanson, M. J., & Callahan, D. (1999). *The goals of medicine*. Washington D.C.: Georgetown University Press.

²⁴Ibid.

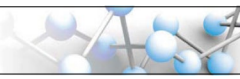
²⁵That nowadays the use of epidural anaesthesia during the delivery process is common is no contradiction. Following our theoretical distinction between a pathologizing and a medicalizing way of justifying medicine, this kind of pain alleviation follows a medicalizing rationale.

²⁶Cf. Lee, E. (2006). Medicalizing motherhood. *Society*, 43(6), 47–50.

²⁷Furedi, F. (2008). Medicalisation in a therapy culture. In D. Wainwright (Ed.), *A sociology of health* (pp. 97–114). London, U.K.: Sage, p. 111.

²⁸Lee, op. cit. note 26, p. 49.

²⁹Ibid.



4.2 | The medicalization argument

If pregnancy and childbirth as well as the accompanying unpleasant and sometimes painful and suffering experiences are not to be classified as diseases or pathological conditions, the application of full ectogenesis would target non-medical goals. Accordingly, it would present rather a case of medicalization of procreation, where medicine is applied for non-medical purposes including socio-political goals such as gender equality. Applications of medicine for non-medical reasons can be ethically justified in certain cases.³⁰ However, the requirements for justification must in these cases become especially high in order to avoid degradation of the medical profession as an ethical institution into an 'accomplice' of non-medical and maybe morally dubious enterprises, undermining its own ethos and people's invaluable trust in physicians and their work.³¹

An alternative way of avoiding a problematic misuse of the medical profession for the sake of non-medical ends could be to delegate the performance of assisted reproductive services to non-medical personnel. What may seem to be a practical and effective solution at first, though, creates even bigger problems. Allowing people who are not licensed physicians to carry out activities such as medical treatment and the prescription of medicines would lead to the sacrifice of the benefits and safeguards of the medical ethos. This would involve the sacrifice of basic ethical principles, because the performance of medical operations would become a purely technical job within another service industry following the law of supply and demand, as well as of commercial criteria rather than health-oriented ethical ones.

Hence, to avoid an inappropriate instrumentalization or misuse of medicine and thus an inappropriate medicalization of non-medical problems, we propose the following four conditions as necessary. It has to be shown (1) that these problems are severe and the targeted non-medical goals are of collective importance and plausibility as well as of shared ethical value which goes beyond an individual preference; (2) that the non-medical problems could be solved by no means other than by medicine—or at least that they could not be solved by other means at comparable expense and safety; (3) that the risks and negative side effects of the medical means in question are especially low (even more than in cases involving medical goals); and (4) that the application of medical knowledge and skills does not endanger important achievements and values as a side effect. An example where these conditions are fulfilled is the use of medicine for contraception: here the non-medical goal to gain reproductive freedom and autonomy is clearly collectively shared and the consequences of not doing so are severe enough; it can be best reached by contraceptives, while bearing very low risks.

In the case of arguing for full ectogenesis to achieve gender equality, the problems that should be solved by it seem to fulfil the severity condition (condition 1). Gender inequality, from the unequal distribution of childcare responsibilities, via gender pay gaps through to the still-existing oppression of women, is a human rights concern and a socio-political

deficiency that is unambiguously unacceptable and clearly to be overcome. However, the critical point here is whether and how this complex problem actually results from the biological fact that only women can gestate and bear children. The view of some authors in favour of ectogenesis as a gender equality tool leaves no doubt here; for example, Smajdor expresses her feminist hopes on the liberating effect of artificial wombs: 'Only by thus remedying the natural or physical injustices involved in the unequal gender roles of reproduction can we alleviate the social injustices that arise from them.'³² One could question this basic assumption that pregnancy and childbirth per se are the main cause of women's subordinated status and label this view as a distortive reduction.³³ That leads to reasonable doubts about condition (2), namely whether the abolition of the necessity of female pregnancies via medical means would really solve the problem of gender inequality. As these are caused by, and occur under, so many different social, personal, juridico-political and cultural circumstances, it seems more likely that measures that directly target the various manifestations of gender inequality and are designed with these differing circumstances and environments in mind would be more effective and appropriate.³⁴ Scholars such as Limon raise the issue of an insidious change in perceptions caused by replacing natural female pregnancy and childbirth with ectogenesis, which leads to a '(hyper)medicalization'³⁵ of pregnancy. Questioning the approach to the solution as such, more generally one could ask whether it is female biology that should be adapted by technical means to face problematic societal circumstances, or whether it ought to be the other way round. As in other biomedical topics, the concept of medicalization raises the question of where to locate a problem: whether it should be located in women's bodies and bodily capacities or rather in social, political and environmental conditions such as workplace structures that sideline women before, during and after childbirth. Furthermore, as the full application of artificial wombs is currently far from being completed or tested, it is highly unclear what kind of risks and side effects the technology would entail for the children-to-be and how these could be minimized (condition 3). Yet in order to develop ectogenesis as a functioning procedure, it would be necessary to conduct embryonic research, raising separate problems that are already known and highly disputed.³⁶ Moreover, the systematic and comprehensive deployment of ectogenesis could lead to potential losses of fundamental and irreplaceable parts of human identity and self-understanding, excess risk that may disqualify the medicalization of procreation via ectogenesis under condition (4). The challenge to our systems dealing with interpersonal and intergenerational relations, threatening concepts such as family, parenthood, childhood, ancestry,

³²Smajdor, op. cit. note 8, p. 337.

³³Limon, C. (2016). Reproductive justice and equal opportunity in neoliberal times. *Australian Feminist Studies*, 31(88), 203–219.

³⁴C.f. e.g. Purdy, op. cit. note 20; Woolfrey, J. (2006). Ectogenesis: Liberation, technological tyranny, or just more of the same? In Gelfand & Shook, op. cit. note 2, pp. 128–139; Murphy, T. F. (2012). Research priorities and the future of pregnancy. *Cambridge Quarterly of Healthcare Ethics*, 21(1), 78–89.

³⁵Limon, op. cit. note 33, p. 213.

³⁶Cf. the current debate regarding the extension of the 14-day rule in the U.K. (Cavaliere, G. (2017). A 14-day limit for bioethics: The debate over human embryo research. *BMC Medical Ethics*, 18(1), 38; Harris, J. (2016). It's time to extend the 14-day limit for embryo research. Retrieved from <https://www.theguardian.com/commentisfree/2016/may/06/extend-14-day-limit-embryo-research> [Accessed Aug 17, 2018].

³⁰Parens, E. (2013). On good and bad forms of medicalization. *Bioethics*, 1, 28–35.

³¹Little, M. O. (1997). Suspect norms of appearance and the ethics of complicity. In I. de Beaufort, M. Hilhorst & S. Holm (Eds.), *In the eye of the beholde*. (pp. 151–167). Oslo, Norway: Scandinavian University Press; Wijsbek, H. (2000). The pursuit of beauty: The enforcement of aesthetics or a freely adopted lifestyle? *Journal of Medical Ethics*, 26, 454–458.

heritage, solidarity and so forth—all developed over centuries—would be unassessable but likely to be severe and disruptive.³⁷

5 | ECTOGENESIS AS A STEP TOWARDS POSTHUMANISM?

Whether it is justified via medicalization or pathologization, the use of artificial wombs entails severe implications for the status and value of fundamental female attributes. Would an established practice of ectogenesis overshoot the target of gender equality and instead lead to opposite effects? Most of the authors arguing in favour of ectogenesis see being pregnant and giving birth as painful, risky, burdensome, and restrictive, and some even equate it with a disease. However, is such a focus on the downsides and risks of the natural capacity and gift of pregnancy and childbirth a useful and even accurate view? What kind of view and valuation of women and their biology is implicated in a risk-focused and burden-dominated perspective on specific female qualities and abilities? Critics endorse the claim made by certain feminists that women's biology, pregnancy, birth and motherhood are valuable and potentially inherently empowering for women in many ways.³⁸ From this perspective, ectogenesis is an objectionable technology because it devalues the cultural significance of female biology and nature, and reduces the power of women as mothers. A corresponding goal would be not to change women's biology by relying on ectogenesis, but to 'revalue women-centered pregnancy and birth'.³⁹ The very idea of ectogenesis as a means to liberate women could instead yield the opposite result, fostering unwanted paternalistic traits by ignoring or even delegitimizing the fact that many women enjoy the experience of being pregnant.⁴⁰

On the other hand, from a gender equality perspective it could be asked whether ectogenesis is based on a one-sided concept of being equal. How should equality and its causing factors be interpreted in this context? Could and should reproductive equality be reached by a convergence of the genders whereby women get conformed to men by being freed from reproductive work? Why is it not even mentioned in the debate that, from a logical point of view, equality could also be reached by enabling men to task reproductive capabilities that so far have been confined to women? It seems that setting the goal of ending women's role as 'the sole risk takers in reproductive enterprises'⁴¹ lacks the corresponding goal of expanding men's range of bodily capabilities by the option of carrying a child to full term.

³⁷Rosen, C. (2003). Why not artificial wombs? *New Atlantis*, 3, 67–76; Tong, op. cit. note 2; Sander-Staudt, M. (2006). Of machine born? A feminist assessment of ectogenesis and artificial wombs. In Gelfand & Shook, op. cit. note 2, pp. 109–128.

³⁸Cf. Rowland, R. (1984). Reproductive technologies: The final solution to the woman question. In R. Arditti, R. Duelli Klein & S. Minden (Eds.), *Test-tube women. What future for motherhood?* (pp. 356–370). London, U.K.: Pandora Press; Rowland, R. (1987). Of woman born, but for how long? In P. Spallone & D. L. Steinberg (Eds.), *Made to order. The myth of reproductive and genetic progress* (pp. 67–83). Oxford, U.K.: Pergamon Press; Sander-Staudt, op. cit. note 37; Murphy, T. F. (2012). Research priorities and the future of pregnancy. *Cambridge Quarterly of Healthcare Ethics*, 21(1), 78–89.

³⁹Sander-Staudt, op. cit. note 37, p. 116.

⁴⁰Murphy, op. cit. note 38.

⁴¹Smajdor, op. cit. note 8, p. 337.

An even deeper and bigger question—that can only be raised here, far less answered—is how the anthropological consequences of a revolutionary project such as ectogenesis could be considered as encompassing as possible and in a reasonable way. One cannot rule out the possibility that the use of artificial wombs could fundamentally affect more deeply rooted aspects of humanity than gender equality. Full ectogenesis could eliminate one of the most basic dimensions not only of motherhood but also of being human: the bodily genesis of one human being out of another. This consequence often seems to be neglected in the discussion regarding ectogenesis as a means to liberate women from their reproductive burdens: the future children, nurtured and born by cold and insensitive machines. Isn't that a prospect that posthumanists dream of?

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CONFLICT OF INTEREST

The author declares no conflict of interest.

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