

The Implication of Ectogenesis for Human Dignity and Bioethics

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ABSTRACT

Ectogenesis, developing and nurturing a fetus outside the human body, represents a significant shift in reproductive technologies. It offers several potential benefits, including advancing prenatal medicine, improving neonatal intensive care, and providing a novel pathway toward biological parenthood. This paper scrutinizes the moral and ethical dimensions of Ectogenesis, particularly within the context of Catholic bioethics. It also provides a historical context for Ectogenesis, discussing its development and current state of research. This paper also addresses the potential risks and concerns associated with Ectogenesis, and the ethical implications of Ectogenesis are thoroughly examined, including questions of autonomy, equity, justice, and disability discrimination. The social and legal implications are also explored, including the impact on reproductive choices and the need for regulatory frameworks to address complex ethical questions raised by this technology.

Keywords: Ectogenesis, Human Dignity, Bioethics, Ethics, Artificial womb, Procreation, Respect of human life, Gift of Life

INTRODUCTION

Background of the Study

“Human life is sacred because from its beginning it involves the creative action of God and it remains forever in a special relationship with the Creator, who is its sole end. God alone is the Lord of life from its beginning until its end: no one can under any circumstance claim for himself the right directly to destroy an innocent human being.” [1]

Children are gifts from God; Psalm 127:3 says, “Behold, children are a heritage from the Lord; the fruit of the womb is a reward. They are not only gifts but a natural result of the sexual expression of marriage. This naturalness is reinforced by God’s command to Adam and Eve to procreate (Genesis 1:28). Because of the value of children and the mandate given to the first parents, and it is no surprise that marriage and procreation are tightly linked.

Marriage allows two people who genuinely love and care for each other to wholly give themselves to each other and become “one flesh” (Genesis 2:24). This unity is achieved with or without children. It allows two people to serve God together as one unit. If God leads a couple not to have children, He will provide other means to shape them into the people He wants them to be. The validity and selflessness of marriage without children are especially evident in couples who want children but cannot. If childlessness from infertility can be condoned, each couple should carefully and prayerfully consider what God would have them do.

Ectogenesis has been a topic of discussion for many years, with scientists and researchers experimenting with various techniques to develop embryos and fetuses outside the human body.

In recent years, advancements in ART have made Ectogenesis a more realistic possibility, and some experts predict that it could become a mainstream option for reproductive healthcare in the future [2].

Definition of Terms

Bioethics is from the Greek bios, “life”; ethos, “moral nature, behavior.” Catholic bioethics is concerned with a broad range of issues, including social justice and the right to health care, the duty to preserve life and the limits of that duty, the ethics of human reproduction, and end-of-life decisions. Fundamental to Catholic bioethics is a belief in the sanctity of life and a metaphysical conception of the person as a composite of body and soul.

Roman Catholic bioethics comprises a complex set of positions that originated in scripture, the writings of the Doctors of the Church, papal encyclicals, and reflections by contemporary Catholic theologians and philosophers. Informed by scriptural exegesis and philosophical argument, Catholic bioethics is rooted in faith and reason. During Vatican II (reformation council held in the early 1960s), Catholics were directed to read the “signs of the times” in applying the teachings of the Church to the contemporary situation, in other words, to remain attuned to the progressive revelation of Christ through history [3].

Catholic bioethicists have recently resisted several new reproductive technologies, such as artificial wombs, cloning, in-vitro fertilization, surrogacy, and artificial donor insemination. End-of-life concerns include advance directives, palliative care, pain management, suicide, euthanasia, refusing or stopping ineffective therapies, organ donation, and the definition of death are also matters of concern. Catholic bioethicists have added to the conversation about the right to healthcare, which is seen as a civic and governmental obligation. They have generally approached this discussion using social justice concepts.

Ectogenesis refers to developing and nurturing a fetus outside the human body, typically within an artificial womb or ex-utero environment. The term was first coined by British scientist J.B.S. Haldane in 1924 and has since become the subject of extensive research and ethical debate [4]. Ectogenesis or using artificial womb technologies (AWT) is defined as the “development of a mammalian embryo in an artificial environment.” In 2019, a team of researchers claimed that their prototype ex-vivo uterine environment therapy, designed to reduce the risk of morbidity and mortality for extremely preterm infants born at the border of viability, represents a feasible therapy in late preterm human babies.

Neonatal technology defines complete Ectogenesis as creating a human child without any gestation period in a woman’s body. Full Ectogenesis requires in vitro techniques, and the resulting embryo must be placed in an artificial uterus. Partial Ectogenesis means some gestational period is spent outside the maternal womb. Such a womb could serve as an incubator for preterm babies, specifically those delivered before approximately 24 weeks of gestation, the minimum for viability with current incubators.

This technique can potentially revolutionize human reproduction, allowing people unable to conceive naturally to have children. However, it raises important ethical and moral questions about the implications of creating babies through ART and the potential impact on human dignity. This synthesis paper will explore the various perspectives on Ectogenesis and its implications for bioethics [5].

Individuals focused on Ectogenesis typically argue that this process has three purposes: (1) a medical treatment to support further gestation of premature fetuses in an artificial environment; (2) an elective ART (assisted reproductive technology), in which an embryo is created through in vitro fertilization and is gestated externally; and (3) a viable “solution” to the abortion debate [6].

Objectives

This paper aims to know what Ectogenesis and the use of an artificial womb to produce a baby out of

Technological advancement, to appreciate the importance of life from the moment of conception until its natural death, and to invoke the Church's teaching about the sacredness of life and the right to life of a human being from birth to natural death.

RESEARCH METHOD

Background and Definition of Ectogenesis

Ectogenesis is the complete development of a mammalian fetus in an artificial uterus [7]. This process is thought to be decades away from fruition, but a breakthrough in medical and neonatal technology brings it closer to reality. The earliest known proposal for an Ectogenetic process comes from 16th-century occultist Paracelsus. Paracelsus's formula involved creating a "homunculus" by sealing semen in a horse's womb and allowing it to "putrefy for forty days" on a diet of human blood. The process's success rate has never been documented but seems dubious [8].

In addition, Modern biotechnology is increasingly close to enabling extra uterine gestation. On July 25, 1978, Louise Brown was born the first child of in-vitro fertilization (IVF), a process by which an egg is fertilized outside the mother's uterus and then implanted [9]. On June 15, 1993, the United States Patent Office granted a patent for a placental chamber-artificial uterus. The proposed device is a life support system for a premature baby in which the baby remains attached to its placenta through its umbilical cord". It could support a fetus after as little as ten weeks of in-utero gestation [10].

Moreover, another new biotechnology was proposed last December 9, 2022, in a video clip that visions of promulgating life through the artificial womb facility "Ectolife." Ectolife, the 'world's artificial womb facility, is just a concept for now, which offers a way for parents to produce customized babies. The concept is the brainchild of Belin-based Hashem Al-Ghaili, a producer, filmmaker, science communicator, and molecular biologist that state the 'Elite Package' would allow people to choose their baby's level of intelligence, height, hair, eye, color, physical strength and even skin tone [11].

The facility, which would run on renewable energy, plans to house 75 labs, each equipped with up to 400 growth pods and is designed to provide the same environment inside a mother's womb. Parents can keep track of their baby's growth and development through a screen on the pods that showcase real-time data. This data can also be monitored via an app on the phone [12]. The artificial wombs could provide a solution for cancer patients who've had their uterus removed, they could reduce pregnancy complications, and the pods will help countries experiencing population decline, such as Japan, Bulgaria, and South Korea.

Overview of Artificial Womb Technology

Artificial womb technology (AWT) is designed to replicate the conditions and function of the human uterus so that the developing person can continue to gestate. The emerging technologies related to AWT require that the fetus be submerged in artificial amniotic fluid in a sealed plastic bag. In an artificial uterus, circulation is maintained by the newborn's heartbeat, assisted by an oxygenator and catheters, imitating umbilical cord access. In other words, AWT helps the human fetus with the bodily functions necessary for survival in the external environment. AWT attempts to continue the process of gestation ex utero [13].

Scientists predict safe, reliable, and complete Ectogenesis will be available within thirty years. Under exceptional circumstances, such as when abortion might be suggested to save the mother's life, partial Ectogenesis might represent a viable solution to keep the baby's and mother's lives by transferring the fetus to an artificial womb. The emerging reproductive technologies raise moral and theological questions [14].

Psychological and emotional implications for parents and offspring

The psychological and emotional implications of Ectogenesis for both parents and offspring are another area of concern. The bonding process between a mother and her unborn child during pregnancy is an essential aspect of human development, and the absence of this bond in Ectogenesis raises questions about its potential impact on parent-child relationships [15].

Furthermore, children born through Ectogenesis may face social stigma or feelings of alienation, as they may be perceived as “unnatural” or “artificial.” It is essential to consider the psychological well-being of artificially gestated individuals and provide appropriate support and resources to address potential challenges [16].

Social consequences of widespread ectogenesis adoption

The widespread adoption of Ectogenesis could lead to significant social consequences. It may exacerbate existing inequalities, as access to this technology could be limited to those with financial means, further widening the gap between the rich and the poor. Additionally, it could contribute to societal fragmentation, as traditional family structures and norms surrounding pregnancy and childbirth are disrupted [17].

Moreover, concerns about overpopulation may arise as Ectogenesis becomes more accessible, leading to increased strain on resources and the environment. Developing policies and regulations that mitigate these potential consequences and ensure that Ectogenesis is used responsibly is crucial.

Ethical Considerations of Ectogenesis

Ectogenesis raises ethical questions about the commodification of human life, as the process of creating life outside the human body could lead to a perception of children as “products” rather than individuals with inherent dignity and value. This perspective may have significant implications for societal attitudes toward human life and the responsibilities of parenthood [18].

Ectogenesis presents various ethical considerations that must be addressed to ensure this technology’s responsible development and implementation. These considerations include human dignity and the sanctity of life, parental rights and responsibilities, genetic engineering and designer babies, access to ectogenesis technology, and the role of governments and regulatory bodies.

In addition, Ectogenesis raises questions about human dignity and the sanctity of life. The process of gestating a fetus outside the human body challenges traditional beliefs about the nature of human reproduction and the role of the mother. In order to uphold the dignity of human life, it is essential to ensure that Ectogenesis is used for the betterment of individuals and society and not to devalue or commodify human existence.

Moreover, Ectogenesis also raises questions about parental rights and responsibilities, as the traditional roles of mother and father may be altered significantly. The development of artificial wombs could lead to disputes over custody and the legal definition of parenthood. Policies and legislation must be developed to address these concerns and ensure that the rights and responsibilities of parents, both biological and non-biological, are protected [19].

Furthermore, as ectogenesis advances, concerns about the potential use of genetic engineering and the creation of “designer babies” arise. The possibility of selecting specific traits for offspring, such as intelligence, appearance, or abilities, raises ethical questions about the value of human diversity and the potential for discrimination based on genetic makeup. It is crucial to establish guidelines and regulations

that prevent the misuse of Ectogenesis for eugenic purposes and maintain respect for human diversity.

The traditional way of giving birth for a mother to her child shows sacrifice and love; the mother experiences childbirth as a meaningful physical and psychological process.

But Ectogenesis prohibits this kind of experience by removing the biological burden of gestation from women.

Legal Aspects of Ectogenesis

The legal aspects of Ectogenesis are complex and require careful consideration to ensure that the rights and welfare of all parties involved are protected. This section examines existing legal frameworks for artificial reproductive technologies, challenges defining legal parenthood and custody, rights and protections for artificially gestated offspring, and international legal perspectives and potential harmonization [20].

Current legal frameworks for artificial reproductive technologies, such as in vitro fertilization (IVF) and surrogacy, offer a starting point for addressing the legal aspects of Ectogenesis. However, Ectogenesis presents unique challenges that may require modifications or expansions to these frameworks. For example, using an artificial womb complicates traditional notions of motherhood, typically based on gestation and childbirth.

In addition, Ectogenesis raises questions about how legal parenthood and custody should be defined. In traditional pregnancies, the woman who gives birth is usually considered the legal mother, while the biological father is the legal father. With Ectogenesis, the woman who provides the egg may not be the one who gestates the fetus, complicating the determination of legal parenthood [21].

Moreover, Ectogenesis may lead to disputes over custody between the individuals who provided the genetic material, the individuals who commissioned the artificial gestation, and other parties involved in the process. Legal frameworks must be updated to clarify the rights and responsibilities of all parties in ectogenesis cases and ensure the child's best interests are prioritized [22].

Furthermore, the rights and protections for artificially gestated offspring must also be established. These children should be granted the same legal rights and protections as those born through natural or assisted reproduction methods. It includes the right to a legal identity, access to healthcare and education, and protection from discrimination based on their mode of conception.

RESEARCH AND DISCUSSION

Biblical Foundations

Genesis 2:7 states, "Then the Lord God formed a man from the dust of the ground and breathed into his nostrils the breath of life, and the man became a living being." The Greek word behind "inspire" here means "to breathe or blow into." The rich Hebrew word for "spirit"—*ruah*—is the "mighty wind" hovering over the abyss at creation, as well as God's "breath of life" breathed into humanity in Genesis 2:7. Cyril explicitly identifies the "breath of life" in Gen. 2:7 as the Holy Spirit [23].

The ensoulment of Adam took place before God breathed into him the breath of life. Yet it is the breath of life that makes Adam alive. At another point, Cyril paraphrases Genesis 2:7 to mean that the "Spirit put life into the one who had been formed." Adam, therefore, did not receive life by being ensouled but by receiving the Holy Spirit [24]. It is a profound theological insight that challenges our very notion of "life." Christians today think of life as a human attribute (or, more broadly, a creaturely attribute). It is a gift from God, to be

sure, but it belongs on the creature's side of the Creator/creature distinction [25].

For Cyril, by contrast, life (which also entails incorruptibility) is a divine attribute. That is why Cyril can describe Genesis 2:7 as giving humanity a "good that is above its nature." It is why he can say that when God breathed into Adam's face, he made him a "partaker of his own nature." Creatures have life only by participating in God [26].

It is not only the case for human beings but also for all living things. In the comments on John 1:4, Cyril gives the following explanation of the Son's involvement in creation:

The Son not only gifts creation by calling it into being, but he also holds it together through himself once it has come into being. He mixes himself in, so to speak, with those things that do not have eternal being by their nature, and he becomes life to those things that exist so that once they have come into being, they may remain and be preserved, each one according to the definition of its nature.

Cyril's understanding of Gen. 2:7 holds the key to what he means by divinization. We have seen above that life is a divine attribute and that when God breathed life into Adam, he gave humanity "a good that is above its nature." [27]

Magisterial Teaching

On its part, the Magisterium of the Church offers human reason in this field to the light of revelation: the doctrine concerning man taught by the Magisterium contains many elements illuminating the problems faced here. From the moment of conception, the life of every human being is to be respected in an absolute way because man is the only creature on earth that God has "wished for himself," and the spiritual soul of each man is "immediately created" by God; his whole being bears the image of the Creator.

Human life is sacred because, from its beginning, it involves "the creative action of God," it remains forever in a special relationship with the Creator, its sole end. God alone is the Lord of life from its beginning until its end: no one can, in any circumstance, claim for himself the right to destroy directly an innocent human being.

Human procreation requires the spouses' responsible collaboration with the fruitful love of God; the gift of human life must be actualized in marriage through the specific and exclusive acts of husband and wife in accordance with the laws inscribed in their persons and their union [28].

At the Second Vatican Council, the Church, for her part, presented once again to modern man her constant and particular doctrine according to which: "Life, once conceived, must be protected with the utmost care; abortion and infanticide are abominable crimes." More recently, the Charter of the Rights of the Family, published by the Holy See, confirmed that "Human life must be absolutely respected and protected from the moment of conception."

Thus the fruit of human generation, from the first moment of its existence, that is to say, from the moment the zygote has formed, demands unconditional respect morally due to the human being in his bodily and spiritual totality. The human being is to be respected and treated as a person from conception; therefore, from that exact moment, his rights must be recognized, among which, in the first place, is the inviolable right of every innocent human being to live.

This doctrinal reminder provides the fundamental criterion for the solution of the various problems posed by the development of the biomedical sciences in this field: since the embryo must be treated as a person, it must also be defended in its integrity, tended and cared for, to the extent possible, in the same way as any

other human being as far as medical assistance is concerned [29].

Donum Vitae (“The Gift of Life”)

The gift of life which God the Creator and Father has entrusted to man calls him to appreciate the inestimable value of what he has been given and to take responsibility for it. This fundamental principle must be placed at the center of one’s reflection to clarify and solve the moral problems raised by artificial interventions on life as it originates and the processes of procreation [30]. Thanks to the progress of the biological and medical sciences, man has ever more effective therapeutic resources at his disposal. Still, he can also acquire new powers, with unforeseeable consequences, over human life at its beginning and first stages.

Various procedures now make it possible to intervene not only to assist but also to dominate the processes of procreation. These techniques can enable man to “take in hand his destiny.” Still, they also expose him “to the temptation to go beyond the limits of a reasonable dominion over nature.” They might constitute progress in the service of man, but they also involve serious risks.

Many people are therefore expressing an urgent appeal that in interventions on procreation, the values and rights of the human person be safeguarded. Requests for clarification and guidance are coming from the faithful and those who recognize the Church as “an expert in humanity ” with a mission to serve the “civilization of love” and life.

In 1987 the sacred congregation for the Doctrine of the Faith issued a document known as *Donum Vitae*, which addressed the morality of many modern fertility procedures. The document should have judged the use of technology to overcome infertility as wrong. It concluded that some methods are moral, while others — because they do violence to the dignity of the human person and the institution of marriage—are immoral [31].

Donum Vitae reaffirmed an obligation to protect all human life when married couples use various technologies to try to have children. It teaches that if a medical intervention helps or assists the marriage act to achieve pregnancy, it may be considered moral. Still, if the intervention replaces the union act to engender life, it is not moral [32].

Respect for Human Life in its Origin and the Dignity of Procreation

On March 10, 1987, the Vatican responded to the recent developments in reproductive technologies by issuing a 40-page’ document called “Instruction on respect for human life in its origin and on the dignity of procreation.” This instruction was aimed at influencing Roman Catholics’ decisions and intended to influence national legislation worldwide on biomedical issues.

The document opposed all technological interventions into the process of human reproduction. More specifically, the document condemned artificial insemination and embryo transfer, in vitro fertilization, and surrogate motherhood under all circumstances. It also opposed experimentation of embryos when such experiments were not therapeutic to benefit the fetus and amniocentesis (product used to detect fetal defects) when done to decide whether or not to abort the fetus [33].

The moral basis for these pronouncements is familiar in Roman moral teaching. Official Roman Catholic teaching maintains that human life begins at conception. From this claim, follow the following moral judgments: a fetus or an embryo must be respected and treated as a human person with dignity and rights, including the right to life. Amniocentesis for genetic screening is morally objectionable because abortion is wrong.

Similarly, the experimental use of embryos is condemned because it violates human dignity, reducing embryos to objects and instruments of scientific knowledge.

Artificial womb and artificial insemination, in vitro fertilization, and surrogate motherhood are immoral because they involve sexual acts that are procreative but not unitive. And rightful conception must respect the inseparability of the two meanings of the sexual act. In response to the suffering of infertile couples who want to have children, the document says that couples do not have the right to a child, claiming that such a right would make the child an “object of ownership.” Childless couples that avail themselves of these reproductive techniques are said to violate a more necessary right of the child, the right to be conceived, carried in the womb, brought into the world and brought up within marriage [34].

Hermeneutics

The Catholic Church proclaims that human life is sacred and that the dignity of the human person is the foundation of a moral vision for society. This belief is the foundation of all the principles of our social teaching. We believe that every person is precious and that the measure of every institution is whether it threatens or enhances the life and dignity of the human person.

Genesis 2:7 states, “Then the Lord God formed a man from the dust of the ground and breathed into his nostrils the breath of life, and the man became a living being.” The Greek word behind “inspire” here means “to breathe or blow into.” The rich Hebrew word for “spirit”—*ruah*—is the “mighty wind” hovering over the abyss at creation, as well as God’s “breath of life” breathed into humanity. Pope John Paul II the document reads, “Each human person, in his unique singularity, is constituted not only by his spirit but by his body as well. Thus, in the body and through the body, one touches the person himself in his concrete reality. To respect the dignity of man consequently amounts to safeguarding this identity of the man ‘*corporate et anima unus*.’ It reminds us that the rush, or God’s breath of life, is a gift for us; he is only the Creator of humankind. But the topic of Ectogenesis does the opposite; scientists can produce a baby with technology.

Secondly, the CCC 396 states that “God created man in his image and established him in his friendship. A spiritual creature, man can live this friendship only in free submission to God. The prohibition against eating “of the Tree of the Knowledge of good and evil” spells this out: “for in the day that you eat of it, you shall die. “The “tree of the knowledge of good and evil” symbolically evokes the insurmountable limits that man, being a creature, must freely recognize and respect with trust. Man is dependent on his Creator and subject to the laws of creation and the moral norms governing freedom because humans want to be God on their own and do not submit themselves to God, being dependent on him.

Thirdly, Pope Benedict XVI publicly reemphasized the Catholic Church’s opposition to in vitro fertilization, claiming it separates the unitive, procreative actions that characterize the sexual embrace. In addition, the Church opposes in vitro fertilization because it might cause the disposal of embryos; Catholics believe an embryo is an individual with a soul who must be treated as such. In addition, when it comes to embryos, cryofreezing them for later use is frowned upon by the Catholic Church because it is considered immoral.

Fourthly, the document of *Donum Vitae* states that “Homologous artificial fertilization, in seeking a procreation which is not the fruit of a specific act of conjugal union, objectively effects an analogous separation between the goods and the meanings of marriage.” In simpler terms, this implies that IVF separates the goods (here, we mean children) of marriage from the marital act, which is the natural means of bringing new life into the world. The idea here is that a child has the right to be the fruit of a loving, conjugal act between spouses, not the product of some medical lab procedure.

This doctrine, often expounded by the Magisterium of the Church, is based on the inseparable connection

established by God, which man, on his own initiative, may not break between the unitive and procreative significance, which are both inherent to the marriage act. The reason is that the fundamental nature of the marriage act, while uniting husband and wife in the closest intimacy, also renders them capable of generating new life—which is a result of laws written into the actual nature of man and woman. And if each of these essential qualities, the unitive and the procreative, is preserved, the use of marriage fully retains its sense of true mutual love and its ordination to the supreme responsibility of parenthood to which man is called. We believe that our contemporaries are particularly capable of seeing that this teaching is in harmony with human reason.

Fifthly, the doctrine of natural law, articulated by Thomas Aquinas in the 13th century, views human life as an essential good that cannot be made subject to utilitarian estimation. Life is the basis and necessary condition of other goods, and human beings have an innate desire to seek these goods, such as sexual reproduction, social life, and knowledge. Our inborn human tendencies provide the basis for our moral obligations and fundamental human rights. The Catholic tradition also holds that human life and personhood begin prenatally. Therefore, although the Canadian Criminal Code takes birth as the point at which a legal person comes into existence, Catholic ethics presumes a human fetus to be, at every stage, a person possessing a right to life.

CONCLUSION

Only God is the Creator of humankind; Ectogenesis disrupts or redefines traditional family structures and relationships, so the Church would need to consider the ethical implications of such technology carefully. A basic understanding of Catholic bioethics can help physicians understand their Catholic patients' needs and aspirations. It is also helpful to appreciate that some issues, such as matters concerning reproduction, are controversial even within Catholic bioethics. Underlying the Catholic stance on specific bioethical questions is a metaphysical conception of the person as a composite of body and soul. As long as there is a living body, even if mental capacities are reduced or absent, a person is still present. A human being is considered a person from conception to the death of the whole.

In addition, this paper has explored the history of Ectogenesis, its potential benefits and risks, ethical considerations, legal aspects, and a balanced approach to bioethics. Potential benefits include medical advantages for high-risk pregnancies, promoting gender equality, and reducing the environmental impact of human reproduction. However, Ectogenesis also presents challenges, such as technological limitations, psychological implications for parents and offspring, social consequences, and the commodification of human life.

Furthermore, ethical considerations involve human dignity and the sanctity of life, parental rights and responsibilities, genetic engineering, and designer babies, access to ectogenesis technology, and the role of governments and regulatory bodies. Legal aspects include defining legal parenthood and custody, rights, and protections for artificially gestated offspring, and international legal perspectives and potential harmonization.

Every child should be conceived via loving sexual intercourse between a faithfully married husband and wife. We know that many children are not conceived in that manner. So we further recognize that every human being, regardless of their circumstances of conception, is a beloved and invaluable precious person created in the image of God. We mustn't use technology to replace the part of husband and wife in the marital act, nor use it to treat another person as an object of research, commerce, or personal gratification.

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