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Challenges of sexing in preimplantational genetic diagnosis: limits of autonomy, diversity and identity from a bioethical and legal perspective[1]

Desafios da sexagem no diagnóstico genético pré-implantacional: limites da autonomia, diversidade e identidade na perspectiva bioética e legal

Desafíos del sexaje en el diagnóstico genético preimplantacional: límites de la autonomía, diversidad e identidad desde una perspectiva bioética y jurídica

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Abstract

This study aims to discuss the use of assisted human reproduction (AHR), with a specific focus on pre-implantation genetic diagnosis (PGD). The main objectives are to investigate technological advancements that have enabled the identification not only of potential diseases in offspring but also of the embryo's sex. Additionally, it seeks to analyze, through a deductive approach, the ethical landscape surrounding the application of this technique within the Brazilian context. To achieve the proposed objectives, a methodology based on literature review and legislative analysis was adopted. Through an extensive survey of scientific literature, relevant data and perspectives on PGD, its applications, and ethical implications were collected. Furthermore, an analysis of pertinent legal and regulatory norms in the Brazilian context was conducted. The analysis revealed that PGD presents a dual potential: the identification of hereditary genetic diseases and the determination of the embryo's sex. However, this latter application raises ethical questions, particularly in light of a consumerist and immediate culture. The discussion around individual autonomy in relation to this technique is central, highlighting the possible threat to gender identification freedom and the risk of population bias. Based on the obtained results, it is evident that there is a significant regulatory gap concerning the limits of PGD usage. While its application for therapeutic purposes has ethical and legal support, determining the

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embryo's sex without genetic preventive justification raises serious concerns. Such practice can compromise autonomy, foster unwanted population control, and threaten diversity, identity, and human dignity.

Keywords: autonomy; bioethics; pre-implantation genetic diagnosis; assisted human reproduction; sexing; legal regulation.

Resumo

Este estudo tem como objetivo discutir a utilização da reprodução humana assistida (RHA), com foco específico no diagnóstico genético pré-implantacional (DGPI). Os objetivos principais são investigar os avanços tecnológicos que permitiram a identificação não apenas de possíveis doenças nos descendentes, mas também do sexo do embrião. Além disso, busca-se analisar, por meio de uma abordagem dedutiva, o cenário ético que envolve a aplicação dessa técnica no contexto brasileiro. Para alcançar os objetivos propostos, adotou-se uma metodologia baseada em revisão bibliográfica e análise legislativa. Por meio de um levantamento de literatura científica, foram coletados dados e perspectivas relevantes sobre DGPI, suas aplicações e implicações éticas. Além disso, procedeu-se análise das normas legais e regulatórias pertinentes no contexto brasileiro. A análise revelou que o DGPI apresenta um duplo potencial: identificação de doenças genéticas hereditárias e determinação do sexo do embrião. No entanto, essa segunda aplicação levanta questionamentos éticos, especialmente à luz da cultura consumista e imediatista. A discussão em torno da autonomia do indivíduo em relação a essa técnica é central, destacando a possível ameaça à liberdade de identificação de gênero e o risco de viés populacional. Com base nos resultados obtidos, é evidente que há uma lacuna regulatória significativa em relação aos limites de uso do DGPI. Enquanto sua aplicação para fins terapêuticos encontra respaldo ético-legal, a determinação de sexo do embrião sem fundamentação genética preventiva levanta sérias preocupações. Tal prática pode comprometer a autonomia, fomentar o controle populacional indesejado e ameaçar a diversidade, a identidade e a dignidade humana.

***Palavras-chave**: autonomia; bioética; diagnóstico genético pré-implantacional; reprodução humana assistida; sexagem; regulação legal.*

Resumen

Este estudio tiene como objetivo discutir la utilización de la reproducción humana asistida (RHA), con un enfoque específico en el diagnóstico genético preimplantacional (DGPI). Los objetivos principales son investigar los avances tecnológicos que han permitido la identificación no solo de posibles enfermedades en descendientes, sino también del sexo del embrión. Además, se busca analizar, a través de un enfoque deductivo, el escenario ético que rodea la aplicación de esta técnica en el contexto brasileño. Para lograr los objetivos propuestos, se adoptó una metodología basada en revisión bibliográfica y análisis legislativo. A través de un extenso relevamiento de literatura científica, se recopilaron datos y perspectivas relevantes sobre el DGPI, sus aplicaciones e implicaciones éticas. Además, se llevó a cabo un análisis de las normas legales y regulatorias pertinentes en el contexto brasileño. El análisis reveló que el DGPI presenta un doble potencial: la identificación de enfermedades genéticas hereditarias y la determinación del sexo del embrión. Sin embargo, esta última aplicación plantea cuestiones éticas, especialmente a la luz de la cultura consumista e inmediatista. La discusión en torno a la autonomía individual en relación con esta técnica es fundamental, resaltando la posible amenaza a la libertad de identificación de género y el riesgo de sesgo poblacional. Basándonos en los resultados obtenidos, es evidente que existe una brecha regulatoria significativa en relación con los límites del uso del DGPI. Si bien su aplicación con fines terapéuticos cuenta con respaldo ético-legal, la determinación del sexo del embrión sin justificación genética preventiva plantea serias preocupaciones. Esta práctica puede comprometer la autonomía, fomentar un control poblacional no deseado y amenazar la diversidad, la identidad y la dignidad humanas.

Palabras clave: autonomía; bioética; diagnóstico genético preimplantacional; reproducción humana asistida; determinación de sexo; regulación legal.

1 Introduction

Bioethics emerged as an important milestone after World War II and the Holocaust,

when the global community witnessed the horrors of scientific atrocities in the name of progress. In the face of these dark experiences, bioethical thinking began to develop, with the aim of establishing ethical guidelines for research and medical practice. This historic milestone highlights the importance of moral and ethical considerations when advancing the field of medicine and biotechnology.

The theoretical framework of this study is based on the premise that, in the absence of specific legislation, biolaw and bioethics are fundamental starting points. However, it is essential to understand that these points should not be treated as final destinations in the regulation of complex issues such as assisted human reproduction (RHA) and preimplantation genetic diagnosis (PGD). These fields provide an ethical foundation, but the regulatory framework must evolve to address contemporary nuances and challenges.

In addition, the study recognizes the historic impact of the birth of the first girl conceived through assisted human reproduction, Louisse Brown, born in Great Britain, on July 25, 1978. This event marked a significant advance in the history of reproductive techniques, opening doors to previously unimaginable possibilities.

Today, with the advent of the 4th Industrial Revolution and the use of new technologies, combined with the continuous flow of information, scientists have obtained much faster discoveries and with the use of new, more assertive techniques.

In this sense, assisted human reproduction has made it possible for thousands of people suffering from some type of infertility, or other specific pathology related to the reproductive system, to reproduce using techniques that can be minimally invasive or complex, such as *in vitro* fertilization (IVF). The manipulation of gametes in order to promote fertilization has made the gestation procedure faster, whose technique, although increasingly used in our society, is still not very widespread among the population.

The reproductive success rates by these methods are not absolute, but they provide relevant annual results. However, apparently, it is an exclusively medical issue, in which the uses of such methods are deployed in purely ethical-moral and legal contexts, since the issue of reproduction touches on these areas of knowledge.

IVF is the technique that provokes the most heated discussions. It is through this procedure that it is possible to carry out preimplantation genetic diagnosis (PGD), which initially consists of the possibility of identifying possible genotypes with diseases. However, despite being prohibited by the Federal Council of Medicine, this diagnosis opens up the possibility of identifying embryonic sexing, which may, in the future, be a step towards allowing the choice of the sex of the future child.

Is questioning this process of sexuation, still in the implementation phase, in the face of a consumerist and myopic society, venturing against parental autonomy or safeguarding gender identity and diversity?

The proposed discussion aims to bring relevant topics surrounding this topic, identifying the positive points and visualizing the potential dangers that can be caused by the misuse of the technique.

From this perspective, using the deductive method, using the methodological procedures of bibliographic and legislative review, the objective is to demonstrate what has been the legal treatment given to assisted human reproduction, specifically with regard to the use of PGD, as well as to point out its ethical and legal dilemmas.

To do this, it is first necessary to address legal aspects related to assisted human reproduction techniques, which will be done next.

2 The assisted human reproduction technique and its legal aspects

The assisted human reproduction technique emerges as an innovative and promising field in the field of health, which offers new possibilities to couples and individuals who face reproductive challenges. In fact, with the advancement of medicine and the development of technologies, RHA has become a viable alternative to overcome obstacles that previously seemed insurmountable.

From this perspective, "digital connectivity made possible by *software* technologies is profoundly changing society" (Schwab, 2016, p. 15) and providing, especially in the field of health, the enhancement of significant advances in the field of health. Over the years, problems that were once considered insurmountable have obtained impressive solutions. In this sense, the RHA is one of the commendable advances, especially because it has the power to open the possibility of generating life, when for some reason there is an impediment.

Assisted human reproduction (RHA) is the set of techniques that has the function of helping to solve human reproduction problems, facilitating the procreation process. These techniques can be used in the social and/or oncological preservation of gametes, embryos and germ tissues (Araújo; Araújo, 2018, p. 218).

Currently, there are several methods used as RHA techniques. Among them, we can highlight: intrauterine insemination (IUI), *in vitro* fertilization (IVF) and intracytoplasmic sperm injection (ICSI) (Araújo; Araújo, 2018, p. 223).

> Intrauterine insemination (IUI) is a simple, non-invasive and cost-effective procedure that consists of introducing semen previously processed in the laboratory into the uterine cavity. Most of the time, this procedure is performed after controlled ovarian hyperstimulation (HOC), with the goal of increasing the potential for success. It is the option for infertile couples selected before resorting to more complex and expensive medically assisted reproduction treatments such as *in vitro* fertilization (IVF) or intracytoplasmic sperm injection (ICSI) (Sousa, 2017, p. 1).

IVF refers to a technique by which an oocyte is fertilized with a sperm in a beaker, and the resulting embryo is subsequently implanted in the uterus of a woman, usually the mother (Álvares, p. 2015, p. 101).

> ICSI is an assisted reproduction technique, in which fertilization also occurs *in vitro*, however, it does not occur spontaneously. Gamete micromanipulation: this technique makes use of a microscope and micromanipulators. ICIS consists of injecting the sperm directly into the egg, this procedure is performed in the laboratory, by an embryologist (Sousa, 2016, p. 7).

It is important to note that, although these types of techniques are used in several countries, the way in which they are regulated has peculiarities from one country to another, so there is greater flexibility or greater restriction from one to another, especially with regard to the ethical contexts that involve the issue. Since these procedures aim to allow the formation of families, depending on the legislation and cultural aspects of each nation, the use of the RHA technique can converge or diverge with ethical dilemmas.

It is important to mention that, although these techniques are becoming increasingly popular in Brazil, however, there is no regulation provided for by law, and the matter is only regulated by the Federal Council of Medicine (CFM) through Resolution No. 2.320/2022.

Despite the importance of the issue, what can be appreciated is the inertia of the Legislative Branch in such a complex issue, especially because it addresses procreation techniques that involve health rights, civil responsibilities and extremely sensitive social aspects.

According to data extracted from the latest Report of the National System of Embryo Production (SisEmbrio) of 2022:

> In 2022, 284,210 embryos were frozen for use in Assisted Human Reproduction (RH) techniques, 58.98% more than in 2021 (178,764), and in 2020 there were 97,312. The states that froze the most embryos were São Paulo (17,445), Minas Gerais (2,418) and Rio de Janeiro (2,350). In this scenario, 14,250 "transfers" were recorded through RHA techniques, a reduction of approximately 53.05% compared to the number of transfers that occurred in the previous year (30,355) (Brasil, 2022, p.3).

From the data mentioned above, it is possible to see that the use of RHA is a growing trend in Brazil, which demonstrates its relevance and leads us to the need to implement legal

norms that can effectively support this social fact.

There are several bills related to the regulation of RHA that have stalled in Congress, many of them drafted years ago, such as Bills (PL) 1135/2003, 1184/2003, 5624/2005, 492/2012 (Carvalho, 2020, p. 55). However, because this is a minority-specific issue, such bills are not scheduled to be voted on.

With respect to the Federal Council of Medicine, which, in the absence of specific legislation, has been trying to regulate the treatment of RHA in the most ethical way possible, through Resolution No. 2.320/2022, this council provides guidance on what principles should govern RHA techniques, who can be subjected to this procedure, rules on gamete or embryo donation, cryopreservation, etc.

It is also important to mention that CFM Resolution No. 2,320/2022 brought a relevant change in terms of the ethical rules for the use of RHA, specifically with regard to the limitation of the number of embryos to be transferred. As can be seen from the aforementioned resolution:

> 7. As for the number of embryos to be transferred, it is determined, according to age: a) women up to 37 (thirty-seven) years old: up to 2 (two) embryos; b) women over 37 (thirty-seven) years of age: up to 3 (three) embryos; (c) in the case of euploid embryos at the time of genetic diagnosis, up to 2 (two) embryos, regardless of age; and d) in oocyte donation situations, the age of the donor at the time of collection is considered (Brasil, 2022, p.4).

In view of the fact that RHA is not a procedure that is absolutely successful, and in certain cases several attempts are necessary, such a change may represent an obstacle for people who intend to procreate in this way.

In the meantime, it is important to mention that there is currently the intersection between HRA and Artificial Intelligence (AI) introducing a new dimension to the search for reproductive solutions. AI has been highlighted as a valuable tool in the medical field, including RHA, for its ability to analyze large data sets and identify subtle patterns that can influence conception success. The use of AI can contribute to a more accurate selection of viable embryos, increasing the chances of success and possibly reducing the number of attempts required (Intelligence[...], 2022). According to Dimitriadis, Zaninovic, Badiola, & Bormann (2022, p. 189), AI is used to select the embryo with the highest implantation capacity for each case and to optimize the results of the AHR. However, this approach also raises ethical questions, such as transparency in algorithmic decision-making and the possibility of widening socioeconomic disparities in access to AI-optimized RHA treatments.

The quality of the embryos is the most critical factor for the success of IVF, but there

> is still a lack of methods to accurately judge the quality of not only the embryos, but also the sperm and eggs. Therefore, it is difficult to predict the likelihood of a successful pregnancy for each patient and to fully understand the cause of each failure. AI-based procedures in reproductive medicine could become a solution to the current impasses. The main driver for the development of these applications is the desire to improve the treatment and prognosis of patients with infertility, using the large amount of data provided by complex diagnostic and therapeutic modalities (Cambiaghi, 2022, p.1).

Therefore, the introduction of artificial intelligence in RHA adds a new angle to the complexity of the legal and ethical aspects surrounding this practice.

It is essential to carefully explore how this convergence impacts regulation, people's autonomy, and equity in access, ensuring that technological innovations are employed in a way that is ethical and beneficial to all involved.

Literally, it is a matter of probability, in which quantitative limitations have a direct impact on the possibility of failure of the technique, given its own complexity and the psychological, economic and social problems surrounding the treatment, factors that constitute the basis for the CFM to seek, in some way, to fill the gaps derived from the absence of a specific law.

3 Bioethical principles

RHA is guided by principles that define what ethical aspects must be followed. These principles provide a guiding framework for the practice of RHA, ensuring that moral and ethical considerations are at the heart of clinical and technological decisions. By adopting an approach based on bioethical principles, assisted human reproduction seeks to balance scientific and technological advances with respect for the rights and dignity of the people involved.

In fact

> the term "Bioethics" emerged in the 1970s when biologist and oncologist Van Rensselaer Potter published: Bioethics: The Science of Survival and Bioethics: A Bridge to the Future. The works sought to show that ethical values cannot be separated from biological facts. With the advance of medicine, especially biomedical technology, new problems were posed to man, and Potter defended the need for an ethics of life to be present beyond the universities, having to be closer to the achievements of science that affected human life (Facco; Schnaider.; Silva, 2010, p.1).

As mentioned elsewhere, science has moved in record time, hitting human relationships hard. In this compass, the preservation of ethics is the point of balance between science and human issues.

One of the fundamental principles guiding RHA is the principle of autonomy. This

principle recognizes the importance of an individual's ability to make informed decisions about their health and their body. In the context of RHA, autonomy implies that people must be properly informed about the procedures, risks, and benefits involved, allowing them to make decisions in accordance with their personal values and desires. This also involves informed consent, ensuring that participants fully understand the implications of the techniques used.

The principle of autonomy, the most common name by which the principle of respect for people is known, implies respect for free will, the acceptance that people govern themselves or be autonomous, either in their choice or in their actions (Santos, 2019, p. 77).

In fact, it is possible to visualize two sides: on the one hand, there is the autonomy of the will of the patient who undergoes HR, which must be respected within her individualities, and, on the other hand, it is possible to bring to the debate the autonomy of the child who will be generated, who may suffer interference in the case of PGD.

> The principle of autonomy, whose roots lie in Kantian philosophy, is one of the pillars of contemporary bioethics. Its relevance to today's culture is indisputable, since this principle is related to the ethical cause of the emancipation of the subject towards his or her self-determination, a cause that, ultimately, concerns the affirmation of citizenship (Santos, 2019, p.1).

The exploration of the principle of autonomy is of fundamental importance, as it relates to the right of each individual to make decisions that must be respected. Medical procedures, by nature, often involve complexities, as in the case of RHA, where patients not only share intimate aspects, but also expose their vulnerabilities. This principle is crucial to guide the doctor-patient relationship, with the aim of preventing rights violations and, in many cases, mitigating ethical challenges that may arise.

In addition, it is relevant to highlight the principles of beneficence and non-maleficence, whose main objective is to safeguard the integrity of the patient. These principles dictate that physicians, before proceeding with any intervention on their patients, should be careful to conduct a thorough evaluation of the potential risks and benefits associated with the procedure.

> Thus, it is evident that both principles of beneficence and non-maleficence are interconnected and that both aim only at doing what is best for the patient, as determined by the Hippocratic Oath, and are not absolute, and can be mitigated when there is the possibility of such and adequate medical information for the necessary consent to the patient (Silva; Rangel, 2017, p. 1).

It should be noted, by way of example, that, in the event that the patient is at risk of death, with certain procedures that can cause harm, but, at that time, it is the only possibility of preserving his life, the principle of non-maleficence can be relativized.

Another principle that is considered fundamental in bioethics is that of justice, which

can assume several aspects, either in the provision of equal care or in the fulfillment of rights considered fundamental such as access to health, among others.

The principle of justice demands equity in the distribution of goods and benefits with respect to the practice of medicine or the area of health. A person is a victim of injustice when he is denied a good to which he is entitled and which, therefore, is due to him (Santos, 2019, p. 80).

This involves ensuring that treatments are equitably available and that there is no discrimination in the selection of patients based on characteristics such as gender, sexual orientation, ethnicity, or socioeconomic status. The pursuit of justice also encompasses consideration of the legal and regulatory aspects that ensure that all parties involved have access to adequate information and that their rights are protected.

The bioethical principles that guide RHA reaffirm the importance of a humanized, informed, and ethical approach in this area. As technology continues to advance, adherence to these principles remains essential to ensure that HRA practices are aligned with the fundamental values and rights of individuals and society as a whole.

In this context, the relevance of addressing preimplantation diagnosis (PGD) in the field of HAR arises. This technique, which allows the selection of healthy embryos before implantation, stands out as an emblematic example of the application of bioethical principles in medical practice.

PGD not only illustrates the importance of autonomy, in which parents have the ability to make informed decisions about embryo selection, but also emphasizes the pursuit of beneficence rather than maleficence. Through careful evaluation, healthcare professionals are committed to maximizing the chances of success of the procedure, while minimizing potential risks to the future health of the developing individual. In this way, the analysis of PIGD in RHA not only illustrates the practical application of ethical principles, but also reinforces the importance of balancing technological innovation with constant concern for human well-being.

4 Preimplantation diagnosis in Brazil

In the context of the various RHA techniques, IVF emerges with special prominence. Not only because of its high complexity and the considerable associated costs, but also because it provokes debates of great relevance.

IVF stands out as a technique that has revolutionized assisted conception, offering hope

to couples facing fertility challenges. However, its progress does not occur without posing ethical and legal dilemmas. The manipulation of the conception process outside the human body and the subsequent selection of healthy embryos for implantation raise questions about the possible choice of genetic traits and the possibility of discrimination based on genetic predispositions.

Therefore, critical analysis of the ethical and legal implications of IVF becomes essential to balance technological advances with the fundamental principles of dignity, equality, and freedom of choice. Corroborating, Eler, Ramos, and Oliveira (2019, p. 12) prescribe:

> In the context of assisted reproduction techniques, there is preimplantation genetic diagnosis (PGD), a technique used mainly by couples with high reproductive risk. Prior genetic knowledge allows corrective actions that are exercised in two ways. It is possible to identify the genotype of the embryos (which will be implanted) and, through personalized treatments, prevent the expression of enzymes or proteins that generate an unwanted gene, thus avoiding certain diseases with genetic predisposition. Similarly, it is also possible to study the genotype of several embryos in advance and choose only those that present the desired characteristics, thus selecting the genes that determine the characteristics of preference of the parents, using some of the embryos and discarding the others.

It turns out that, although the purpose of preimplantation diagnosis is theoretically aimed at identifying possible diseases and even taking corrective actions, this procedure opens the possibility of choosing the sex of the embryo, which is prohibited by the CFM. RHA techniques cannot be applied with the intention of selecting the sex (presence or absence of the Y chromosome) or any other biological characteristic of the future child, except to avoid diseases in the possible offspring (Eler; Branches; Oliveira, 2019, p. 12).

When one visualizes the scientific potential of such a procedure, the lack of specific legislation becomes even more absurd, since it is not only a matter of joining gametes, but of going beyond performing fertilization, but of identifying possible genotypes that, in theory, are outside the "standard". The advancement of science is something laudable, but it clearly needs to be regulated, so that rights are preserved and duties are established. This genetic modification in embryos is frowned upon in much of the world and, in Brazil, there is an express provision in Article 6, III, of the Biosafety Law (Law 11.105/2005), which prohibits the practice of genetic engineering in human germ cells, human zygotes and human embryos (eler; branches; oliveira, 2019, p. 12).

The mere availability of an illegitimate technology, and all its forms of use, must be carefully evaluated in the first place so that the fundamental rights of current and future generations are not violated.

> Preimplantation genetic diagnosis may be suggested for couples with a family history of genetic alterations and risk of transmitting these abnormalities to their descendants. Selective transfer and implantation of unaffected and selected embryos in IVF prevents unwanted abortions and miscarriages. Despite encountering ethical, moral and cultural barriers, the use of PGDI is still indicated, as it is one of the main means for screening for potentially harmful genetic diseases such as inborn errors of metabolism (cystic fibrosis, glycogen storage disease type IV, mitochondrial DNA diseases, for example) (Eler; Branches; Oliveira, 2019, p. 13).

What can be seen is that, for the medical community, the use of PGD is a mere prevention tool. For those who have been taught to heal, having in their hands the possibility of preventing the disease from occurring is much more relevant.

> Analyzing Brazilian legislation and, above all, the ontological norms of the Federal Council of Medicine, being more specific to the case, it is verified that it is possible to choose embryos, through preimplantation diagnosis, without the genetic alterations that cause diseases. It should be noted that the text speaks only of diseases, without specifying what type of hereditary disease and what is the severity, leaving to the parents the decision whether or not to implant the *embryo in vitro* (Vandresen; Spander; Martins, 2020, p. 42).

The issue itself is not based on the need to abolish the use of the technique, but to act with caution so that the solution does not become an irreversible problem. The sensitivity of the issue is explicit and must be treated with the due attention it deserves. The question is based exactly on what the future of humanity will be like, given the possible choices regarding the use of the embryonic choice technique, so it seeks to reflect on ethics in relation to the developments of PGD.

5 Ethical reflection on the developments of the DGPI

Although there is no permission to date to use PGD for embryonic sex choice, the mere fact that it is possible is already a reason to raise this issue. It must be taken into account that society is extremely dynamic and this process has become more and more intense.

What today, for one generation, is considered totally foolish, tomorrow may take a new cartridge, due to technological advances in the service of science. The flow of information is extremely fast and has led to changes in human behavior patterns.

Today, society is predominantly oriented by "having" rather than "being," and this orientation is not limited only to possessing, but also to the speed with which one accesses what one desires. Information arrives in seconds, *fast foods*, fast means of transport, etc. The impact derived from new technologies means that the current generation is experiencing an increasingly automated world, in which the power of choice is increasingly wider.

It is true that a large part of the population does not have extensive knowledge about topics related to RHA, but probably, over time, such information will become more and more widespread. Strong proof of this is the growing number of people seeking this type of procedure. It is important to think about what society's thinking will be about the possibility of choosing the sex of your child with the use of PGD.

The discussion on this topic requires special attention, because it is through the scientific community that the multidimensional look at the subject will be given, because for medicine the genetic aspect has more strength, while for other areas of the human sciences, the deployment brings together many issues, in which psychological issues are addressed, ethical, philosophical, moral, etc.

It is true that technology has brought fundamental advances for the development of humanity, but, at the same time, it was the scene of great destruction, such as the atomic bomb, when humanity also began to fear science.

In the light of this reflection, it is possible to identify four aspects that converge in the use of PGD: autonomy, gender identity, eugenics, and population control.

The power of choice of parents over the sex of the child before the implantation of the embryo in the uterus gives rise to discussions about a future projection on the freedom of choice of the future individual. In a future in which the choice of embryonic sex is allowed, this reality clashes head-on with the discussions that, at the present time, are extremely heated, about the freedom of gender identification.

Now, would sexing be the exercise and strengthening of the autonomy of the parents?

The ability to decide the sex of the future child raises complex and profound questions about parental autonomy in relation to the formation of the child's gender identity. On the one hand, it can be argued that allowing the choice of the sex of the embryo is an example of reproductive freedom, an extension of the individual autonomy of parents in planning the formation of their families, as provided for in article 1 of the Family Planning Law, No. 9,263, of January 12, 1996. However, this same choice can be seen as a reflection of today's society, in which gender expectations are projected from the beginning of life. In this way, embryonic sexing could reinforce pre-existing gender stereotypes, limiting the diversity of experiences and gender identities.

The possibility of choosing embryonic sex strengthens the feeling of power over the other's body, which can bring even more complications in family relationships.

According to Alves (2023, p. 15) "the freedom to be oneself affirms the excellence of each person, and not only that of the system (as in Hegel). This freedom would be destroyed

by genetic modifications, along with the distinction between the spontaneous and the artificial."

The impression one has is that such power brings the aspect of objectification of the self, because the interference in the natural way of existing, by allowing the choice of sex, makes one reflect that one is in front of the application given the tangible things that the human being can buy, when one is confronted with such diverse values.

> Genetic programming interferes in some way with the normative self-understanding of the programmed individual in such a way that he cannot understand himself as the sole author of his life project, but rather as a life project limited by the subjective preferences of others (in general, his parents). The kind of attitude exemplified by eugenic practices could only be exercised on things and not on people. Here Habermas seems to resort to the formula of Kantian humanity and its correlative distinction between a "thing" and a "person". For Kant, a person is endowed with dignity while a thing can be instrumentalized. That is, a thing can be used "only as a means" (Feldhaus, 2005, p. 315).

Kant (2011, p. 129) argues that human beings have intrinsic value and should be treated as ends in themselves, emphasizing their inherent dignity. In this regard, it is worth recalling the teachings of Habermas, who in his work *The Future of Human Nature*, is "dedicated to the question of human dignity and the dignity of human life, especially the prepersonal human life of the embryo used in modern biotechnological research", raising the question of gene therapy on the admissibility or not of using embryos exclusively for research (Habermas, 2004, pp. 57-65).

On the other hand, one is faced with an already existing reality, the use of RHA to prevent diseases in the possible offspring which, at first, sounds fantastic, but when taken to the field of reflection, one wonders whether or not one is in disguised eugenics.

> The shadow of eugenics hangs over all current debates about genetic engineering and breeding. Critics of genetic engineering argue that human cloning, genetic enhancement, and the search for custom-made children are nothing more than "privatized" or "free market" eugenics. Proponents, on the other hand, counter that freely made genetic choices are not eugenics, at least not in the pejorative sense of the term. To eliminate the coercion aspect, they argue, is to eliminate what makes eugenics repugnant (Sandel, 2013, p. 30).

The possibility of choosing the sex of the embryo raises concerns about the advance of a eugenicist mentality, in which parents seek to mold their offspring according to criteria of "perfection" established by society. This pursuit of perfect sex selection can potentially lead to rigid conformity to established standards, diminishing acceptance of individual differences and restricting the expression of one's true identity.

More than that, it is a real possibility of intervening in the autonomy of the person's will that will be the result of the use of this PGD technique.

> Some claim that cloning is wrong because it violates the child's right to autonomy. By choosing the child's genetic characteristics in advance, the parents would confine the child to a life in the shadow of someone who once existed and thus deprive the child of the right to an open future. The autonomy objection applies not only to cloning, but also to any form of bioengineering that allows for the choice of genetic traits. According to this objection, the problem with genetic engineering is that "design children" are not completely free; even desirable genetic improvements (for example, musical talent or aptitude for sports) would lead the child to this or that life option, harming their autonomy and violating their right to choose their own life project (Sandel, 2013, p. 33).

If, on the one hand, freedom of choice has never been as discussed as it is today, the power granted by the DGPI allows interference in the rights of those who have not yet arrived in this world. Of course, as far as the choice of sex is concerned, it is a future possibility, but genetic interference to avoid diseases is already part of the present, what is questioned is how long we will have to wait for the regulation of objective limits, in order to avoid ethical problems.

> Although discussions about the origin of life and the nature of the embryo seem, at first, more related to the biomedical sciences, and it is not up to the jurist to say what the embryo is, on the other hand, the legislator, by omission, cannot allow for the use and manipulation of artificial human reproduction techniques with a eugenic coefficient. even discrediting the diversity of the genetic heritage and the naturalness with which life manifests itself (Sandel, 2013, p. 35).

Avoiding diseases in the lives of those who have not even been born is dazzling, but what is the limit? Nothing in life can be observed from a one-sided perspective. If prevention is better than cure for medicine, there are contexts beyond merely physical conditions.

Technology has sparked a revolution by making it possible for individuals who previously could not reproduce due to circumstances beyond their control to now conceive. However, science is inherently dynamic, and its frontiers have expanded further by offering the option to select the healthiest embryo. In this context, an inevitable reflection arises: what will be the next step in this scientific progress?

The search for perfection is not "something new under the sun", on the contrary, the cult of the body has never been as latent as it is today, unattainable standards of aesthetics, standards of success, standards of nutrition, we are surrounded by an immense horizon of infinite standards.

> However, it is necessary to question the influence of genetic modification on being modified. Would the genetically modified individual see himself in the same way as the naturally generated individual? What is the influence on your consciousness when you know that a third party initiated the choices for you? Could the genetically modified individual be considered superior or inferior to naturally generated individuals? (Eler; Branches; Oliveira, 2019, p. 12).

Humanity's quest to overcome its vulnerabilities can inadvertently result in the creation of new fragilities. In addition, the rejection of diversity can further strengthen the pre-established standards that are being challenged. It is indisputable that the use of medicine to prevent serious diseases that compromise a person's health and dignity is not in dispute here. However, the crux of the matter lies in the ethical limits of this intervention.

At the same time, embryonic sexing also raises concerns about population control. In scenarios where the preference for a certain sex predominates, the possibility of choosing the sex of the embryo could lead to a demographic imbalance, as is already the case in some regions of the world. This could have important social, economic and cultural consequences, reinforcing the importance of regulating the use of this technology in an ethical and responsible manner.

In effect, PGD paved the way for embryonic sex selection, raising the possibility that, if legalized at some point, this choice could be exploited as a tool of social control. While it may seem speculative to anticipate this possible reality, it is important to note that in some countries where sex-selective abortion based on gender preference is permitted, there has been a significant reduction in the rate of female births. This underscores the complexity of the social and ethical implications associated with this technology. In this area,

> A new study points out that the demographic imbalance between men and women has been perpetuated in the world since the 1970s. The main cause is selective abortion in Asian countries, where families prioritize the birth of male babies. The preference of families for sons has caused 23.1 million women to be unborn in the last 50 years. This is the conclusion of a study carried out at the National University of Singapore, published this month by the journal "Proceedings of the National Academy of Sciences" (PNAS) (RFI, 2019, p.1).

According to Cai (2022, p. 3-4), "concern about the imbalance of the sex ratio at birth is a phenomenon that is largely attributed to gender-selective abortion and the predominant culture of preference for sons." Although sex selection for non-medical reasons has been made illegal by law since 1994, the practice persists (UNFPA, 2007, p. 01). This has directly led to an increase in the number of sex-induced abortions and consequently has resulted in an increase in sex disproportion at birth.

Demographic trends and changes in population policy, for example in China, attract the attention of the global media, which they call a "demographic crisis", and scholars from various disciplinary backgrounds analyse their wide-ranging impacts.

> So far, analyses and reflections on the change in population policy in China have focused on four main areas: (1) the justification for political changes, i.e. the

> demographic crisis; (2) the effectiveness of policy interventions in terms of increasing fertility; (3) the broader economic and social impacts on growth, workforce composition, and family structure; and more specifically (4) the impacts on human rights, women's rights, and gender equality (Cai, 2022, p. 2).

The historically claimed idea that women are incapable of making responsible decisions about their own bodies, in the biopolitical sphere, has been culturally accompanied by the imperative of motherhood as the ultimate goal of femininity (García, 2023, p. 22). This paradigm has contributed to the current demographic consequences, including issues related to selective abortion and gender selection. This context underscores the critical need to examine the implications of PGD technology and its potential contribution to the perpetuation of these gender inequalities and selection biases.

These are not mere speculations, but events that have a high probability of repeating themselves if sexing is legalized under any circumstances. This question underscores the seriousness of the matter, which will continue to develop over the years. Scientific evolution, of course, cannot and should not be interrupted, but, on the other hand, humanity must follow these advances responsibly and ethically.

In this coordination of ideals, Hans Jonas' ethics of responsibility also plays an important role in the dimension of the use of new technologies. Inspired by Hans Jonas, he reflects on respect and fear, considering "fear as an obligation that, together with trembling, constitutes the source of an ethics of responsibility that would be necessary for technologically advanced societies", arguing that human heritage must be kept similar to what it is and kept intact (Hans, 2006, p. 353).

In this perspective, Hans Jonas' ethics of responsibility also plays a fundamental role in the dimension of the use of new technologies. The inspiration in Hans Jonas leads to reflection on respect and fear, considering "fear as an obligation that, together with trembling, constitutes the source of an ethics of responsibility that would be necessary for technologically advanced societies" (Hans, 2006, p. 353).

Thus, ultimately, the discussion around embryonic sexing refers directly to the principles of autonomy, gender identity, eugenics, and population control. Society must carefully weigh the benefits and risks associated with this practice, ensuring that decisions made in the present do not compromise the freedom and dignity of future generations.

Therefore, the Law must be attentive and committed to the new demands, because, as Bauman (2001, p.1) said, instability, uncertainty and rapid change characterize contemporary society, which is highly consumerist and immediate.

It is imperative that legislation is adapted and updated to effectively address the challenges posed by new technologies. The complexity of the ethical and legal issues related to RHA, especially in the context of PGD, requires a careful and balanced approach. The balance between scientific advancement and respect for fundamental human values is crucial to ensure that these technologies are used responsibly and that they do not perpetuate inequalities and violations of individual rights. A permanent dialogue between science, bioethics and law is necessary to ensure that the pursuit of progress does not compromise the dignity, identity and diversity of all human beings.

6 Final considerations

RHA techniques have always been the subject of intense debate, as they deal with legal, health and ethical-moral issues. Science, when applied correctly, has brought remarkable advances to humanity, being for many families a watershed in the realization of the dream of reproduction.

However, as in any scenario, it is not only conscientious and ethical people who are present. The power vested in practitioners of these techniques should be regulated to mitigate potential problems and prevent breeders' influence from exceeding acceptable limits.

It is observed that the Federal Council of Medicine has tried to regulate the dilemmas derived from the advance of RHA, dilemmas that have not been adequately addressed by the legislator. Often, bills are presented that are out of touch with reality, while crucial issues, such as those discussed here, remain neglected.

The central concern lies in the delay in clearly and comprehensively regulating PGD procedures, with the aim of avoiding social problems, such as indiscriminate sexing, which generates concern for diversity and gender identity in the face of parental autonomy. The establishment of limits is not intended to make the use of the techniques unfeasible, but to guarantee rights and provide broad protection to those who may not be aware enough to protect themselves.

The study of genetics brings numerous benefits, but the line between good and harm is tenuous, requiring greater attention to prevent errors of considerable magnitude against humanity. The theoretical framework is based on the premise that, in the absence of specific legislation, biolaw and bioethics are starting points, but they should not be treated as final

destinations in the regulation of these complex issues.

However, it is questioned and emphasized: what would humanity be without differences? Perhaps the greatest trait of humanity is precisely the peculiarities of each being, the fact that each one carries within him a universe, which cannot be measured by external characteristics, nor by weaknesses so inherent to the human being. While it is widely acceptable, morally and legally, to use the PGD procedure for therapeutic purposes, ethical questions arise when it is employed in the sex selection of embryos and in the excessive pursuit of genetic excellence.

These approaches may encounter significant obstacles in their integral feasibility, as they raise concerns not only about the preservation of health, but also about autonomy in gender self-definition. In addition, there is a legitimate concern that such practices may inadvertently open the door to unwanted population control.

Thus, it is concluded that the questions about the sexing process do not go against the autonomy of the parents, since in the face of a consumerist and immediatist society it is essential to regulate the issue, as well as legal parameters that create ethical limits, observing the responsibility that conscious family planning demands, safeguarding diversity and gender identity. also ensuring a plural society.

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