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Bioethical Aspects of Human Geneticization

Bioetyczne aspekty genetyzacji człowieka

Marcin Leźnicki
Institute of Philosophy, Nicolaus Copernicus University in Toruń, Poland
ORCID: https://www.orcid.org/0000-0002-0855-146X • lemahr@umk.pl
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Abstract: Human geneticization, discussed in the following text, is usually associated with the bio-medical practices aimed at human improvement, with the use of genetic enhancement, also understood as genetic improvement or genetic correction. Despite the wide range of benefits claimed by scientists (including biotechnologists and geneticists), these practices undoubtedly generate a number of ethical and legal problems. They concern, among other things, the legitimacy of conducting research in the field of biotechnology or genetics, including reprogenetics, its possible direction, projections related to the development of the research, as well as the methods and means used to control the aforementioned research, or even the problem of both the legislative and moral validity of its further practical implementation. This can be seen, for example, in the ongoing discussion on the geneticization of human life, and in the broader context of its progressive biomedicalization. In view of the considerable breadth and complexity of the issue of geneticization, this text focuses primarily on a closer examination of the possibilities that genetic enhancements, supported by the potential which genetic engineering might bring, followed by due consideration of selected bio-ethical dilemmas that may arise from the application of such enhancements.

Keywords: geneticisation, reprogenetics, genetic enhancement, biopower, germ-line therapy

Streszczenie: Genetyzacja człowieka łączy się z praktykami biomedycznymi, mającymi na celu ulepszanie ludzi poprzez zastosowanie wzmocnień genetycznych, nazywanych także udoskonaleniem genetycznym lub korekcją genetyczną. Pomimo szerokiego wachlarza deklarowanych przez naukowców (w tym biotechnologów i genetyków) korzyści, jakie wynikają z zastosowania wspomnianych praktyk, generują one bezspornie szereg problemów natury etyczno-prawnej. Wątpliwości dotyczą m.in. zasadności prowadzenia prac badawczych w obszarze biotechnologii czy genetyki, w tym reprogenetyki, ich możliwego kierunku, prognoz związanych z rozwojem badań, celowości stosowanych metod i środków kontroli oraz słuszności legislacyjnej i moralnej ich dalszego praktycznego wdrażania. Tego rodzaju wątpliwości potwierdza dyskusja wokół genetyzacji życia ludzkiego, która w szerszym kontekście dotyczy jego postępującej biomedykalizacji. Z uwagi na szerokość i złożoność zagadnienia genetyzacji, w artykule skoncentrowano się przede wszystkim na bliższym prześledzeniu możliwości, jakie mogą potencjalnie przynieść wzmocnienia genetyczne, wsparte potencjałem inżynierii genetycznej. Analizie poddano także wybrane dylematy bioetyczne, które łączą się z wykorzystaniem tego rodzaju wzmocnień.

Słowa kluczowe: genetyzacja, reprogenetyka, wzmocnienie genetyczne, biowładza, terapia linii zarodkowej

Introduction

The rapid scientific and technical progress that is currently being made in the biomedical sciences is clearly directed towards the elimination of diseases or health dysfunctions on the one hand, and increasingly towards improving human genetic potential in the areas of human productivity and activity on the other hand. Some of the gene therapies and genetic enhancements currently available have the potential to contribute to a noticeable improvement in the psychophysical condition of the human being by, among other things, increasing human fitness, cognitive abilities, memory and, last but not least, appearance, so important for the contemporary culture.

Nevertheless, it should be noted that every new technology, including human biotechnology supported by the potential of bioengineering sciences, which affects human life from conception to its end, on the one hand tempts us with more and more sophisticated solutions and benefits offered by bioscience, yet, on the other hand, raises numerous questions and doubts related, for example, to the uncertain balance of profits and losses that will undoubtedly have to be borne as a result of their further practical implementation (Hayashi 2002). For example, using the knowledge of biomedicine, bioengineering and biotechnology, including the use of genetic enhancements, the possibility of creating children with a precisely defined and preferred catalog of traits considered to be socially expected has been discussed for a long time. The Gattaca Project, modelled on the Huxley visions of the brave new bio-world, which many researchers believe is not only realistic, but increasingly close to becoming a reality, can serve as a reference point for scientific projects involving the optimization of human psychophysical potential (Kirby 2000; Kirby 2004; Cooke 1983). Considering the achievements of biomedicine over the last 20 years, one cannot help but notice the unstoppable progress that has been made, especially in the field of reprogenetics, the "showcase" of which is the research work on reproductive cloning, as well as advanced experiments on genetic modifications of, e.g. children, with the use of cytoplasmic transfer into the human germ line (Raz 2009; Silver 2000; Knowles and Kaebnick 2007; Parens and Knowles 2003; Melo-Martin de 2017). As a result, for the first time ever there have been children born with genes coming from three biologically related parents, i.e. a man and two women (Callaway 2014).

The scientific experiments carried out by both biotechnologists and geneticists have in turn contributed to the questioning of the direction in which reprogenetics should go, including the possible consequences of having genetic traits borrowed from several different people, indicating at the same time the unpredictable nature or course of genetic manipulation. This in turn triggered a discussion among researchers interested in the possibility and admissibility of genetic manipulation on embryos and unequivocally proved that dynamically developing biomedical sciences are exploring more and more deeply and intensively the successive stages of human life, starting with the initial one, while geneticization is becoming a fact.

1. Geneticization – an outline

The ultimate definition of the term of geneticization, as well as the strict formulation of an non-exceedable catalog of issues within its area, presents researchers with many difficulties resulting from, among other things, the fluidity of the definition of the term itself, and thus its openness. This, in turn, is attempted to be overcome by specifying certain forms or types of geneticization, as well as indicating the areas in which genetic enhancement is possible (Hedgecoe 1998; Lippman 1991; 1992; 1993; Chadwick and Levitt 1998; Collins 1991).

Before discussing this typologization, it is worth adding that, despite the heterogeneous definition of the notion of geneticization,

and perhaps because of this, it is analyzed, among other things, within the framework of sociology of medicine, philosophy (in particular, bioethics), anthropology (e.g. humans and medicine), law (as a biolaw), or biopolitics, especially in the context of the phenomenon of biopower, which geneticization would ultimately serve (Raman and Tutton 2009; Coleman and Grove 2009; Rabinow and Rose 2006). This is because the so-called biopower, using the achievements of biomedicine (including the potential of contemporary genetics), could start to subjugate areas of human life that have so far been beyond the authentic interest of biomedicine, simultaneously considered as problems of biomedical nature, i.e. as a disease or a health dysfunction. Linking the notion of biopower with the phenomenon of geneticization, or understanding it in the biopolitical context outlined above, may give rise to negative associations and anxiety about the too far-reaching influence of biomedicine, which has begun to define and explain phenomena from the field of non-medical and non-biological sciences, as is already the case, among other things, in determining the category of normality and abnormality and, consequently, standard and deviation, or anomalies or dysfunctions and the like (Crawford 1980; Conrad and Schneider 1980; Conrad 1992; Illich 1975; Rose 2007). This, in turn, may give the impression that biomedicalization of human life supported by the potential of genetics, i.e., geneticization is of a total character (Domaradzki 2012; Arribas-Ayllon 2016). It may concern not only the biological life of a human being from the earliest stage, but also social life. It is worth adding at this point that the above mentioned concerns may be considered legitimate, provided that we could establish beforehand what rationale or goals are pursued by scientists who promote geneticization. This is because they can demonstrate, as they do, that their goal is to improve human health through the use of technical solutions from the field of genetics.

The above statement, however, raises some doubts and requires an appropriate explanation, for what does it mean to improve the psychophysical condition of a person and what does it come down to?

Two fundamental issues can be examined in this context, i.e., on the one hand, the possibility and legal and moral acceptability of the use of gene therapies, and on the other hand, the use of genetic enhancements at an early stage of human life. It is this distinction that has led to the question of what differences exist between the above mentioned medical biopractices, assuming they exist at all. In the opinion of a large group of scientists examining the above mentioned division, the main distinction comes down to the difference in the aims of gene therapy and the confidence placed in the use of genetic enhancements. In the case of gene therapy, it is primarily the therapeutic value that is being emphasized, i.e., the treatment of diseases, as opposed to improvement or genetic correction, which is mainly intended to strengthen the psycho-physical or the genetic constitution of an organism that is initially healthy in order to maximize its productivity or fitness. Secondly, it is also pointed out that while gene therapy is intended solely to restore the natural abilities of the organism, which have been lost as a result of the disease, or to maintain them permanently (in view of the possible deterioration of the organism's health), genetic enhancements are intended to improve human nature. Thirdly and finally, with reference to the distinction proposed by scientists dividing the functions of medical practices into therapeutic (as in the case of gene therapy) and non-therapeutic (in the case of genetic enhancements), the extent of their medical availability as well as their legal-moral acceptability has become increasingly apparent. Thus, the admissibility of gene therapies and the inadmissibility of genetic enhancements, which, in the opinion of some researchers, will serve to violate human nature and ultimately redefine it again, has begun to be considered.

However, it should be stressed again that the meaning of the terms: genetic enhancement, improvement or human correction are still not clear. They are understood, on the one hand, as any action that may serve to eliminate genetically defective embryos in order to prevent the birth of an individual with certain congenital defects (within the framework of negative eugenics projects), and, on the other hand, as a targeted action for the creation of carefully designed human beings, with well-established psycho-physical characteristics (within the framework of the concept of positive eugenics). In the maze of flexible directions and ambiguity, there have been calls for the introduction of clear and precise regulations defining the scope of possible actions in the area of reprogenetics, instead of the questionable or even controversial reproductive freedom.

2. Geneticization – typology and the opportunities it provides

Moving on to discussing the typology of geneticization, it should be emphasized that it basically comes down to identifying possible types of genetic enhancements that can contribute to the improvement of the psychophysical condition of a person following the implementation of projects to improve specific human characteristics. Optimization of productivity, whether at the level of an individual or population, is in turn achieved by either eliminating genetic diseases in subsequent generations or by genetic enhancement of characteristics particularly desirable in healthy people, in order to maximize their productivity, fitness, intelligence, or even attractiveness. In the case of geneticization, the key concepts are biomedical ones that refer to the possibilities offered by modern reproductive biotechnologies.

In order to make matters simpler, however, the wide range of genetic enhancements currently under debate should first be explained. The literature on genetic enhancement usually lists three forms of human improvement, namely (McConnell 2010; Harris 2007; Savulescu, ter Meulen, and Kahane 2011):

a. physical – they are associated with the improvement of certain physical properties of the human being, including height, complexion, posture, increase in muscle mass and, more recently, what will be emphasized, e.g. by transhumanists and post-humanists, increase in life expectancy (Bostrom 2005).
b. intellectual – aimed at multiplying the level of human intelligence, or even increasing memory capacity. It is worth adding that more and more often scientists indicate alternative ways of achieving this goal, e.g. by using cognitive training.
c. behavioral – basically aimed at eliminating aggression and dealing with neurological dysfunctions, as in the case of ADHD for example.

For the sake of clarity, it is worth adding that while discussing the above mentioned traits that we intend to modify (i.e. genetically improve), geneticists point to three types of traits, i.e. monogenic, multi-genetic and multifactorial, that we are dealing with as a result of interaction of many genes, as well as non-genetic factors. The vast majority of the socially desirable traits listed above have a largely multifactorial basis, which is virtually impossible to be genetically corrected. While even physical predisposition is the result of our genetic equipment, other traits, including intellectual or behavioral ones, will not be determined solely by the genes, but will be conditioned, among other things, by the environment in which we live. We should then speak about the correlation of the genotype with the phenotype.

It is worth noting, however, that over the last dozen or so years, scientists have intensified their research in order to detect diseases that are caused by defective genes, which would certainly need to be removed or corrected during the treatment process. For example, gene therapy used to treat

Daltonism in adult monkeys has shown that it is possible to reconstruct color vision, which in turn would indicate that such therapy could also be used in human ophthalmology (Acland et al. 2001; Mancuso et al. 2009). The genetic mutation used by cattle farmers to exclude the gene responsible for the production of myostatin, followed by rapid growth of muscle tissue, could be successfully used not only to diagnose a human disease that causes muscle hypertrophy by nearly 40% more than normal, but also to treat patients with muscular atrophy, or finally in athletics and bodybuilding for those who are probably interested in this form of gene performance enhancement (McPherron and Lee 1997; McPherron, Lawler, and Lee 1997; Schuelke et al. 2004; Chyrowicz 2004; Haisma and de Hon 2006; Baoutina et al. 2007; Fedoruk and Rupert 2008; Schjerling 2008). Research is also currently underway to improve memory processes in the human brain using selected genes taken from genetically modified mice. The result of this work is a noticeable improvement in the functioning and performance of the brain, the stimulation of which led to the growth of nerve fibers, and ultimately to solving many neurological problems related to memory (Weicker, Villringer, and Thöne-Otto 2016). What is more, genetic enhancements can be used in projects aimed at improving human appearance, including, among other things, to assist in the fight against obesity (using the leptin-coding OB gene), in projects aimed at skin rejuvenation (by introducing a gene for telomerase in liposomes), or even during the transfer of genes responsible for faster nail or hair growth. Another project concerns the genetic reduction of the need for sleep, which, as shown in the works carried out on mice and hamsters, is probably stimulated by two genes, which together with the chemicals present in the brain can not only transform the current demand for it, but also change the sleep cycle itself (Chyrowicz 2004). It can be added that research is also currently underway to identify the genes responsible for life processes, including life expectancy (Kraj 2010). The aim behind this is not to lengthen it in the first place, although undoubtedly it is also the case, but first and foremost, to gain knowledge about diseases associated with the aging process of the human body.

None of the above mentioned projects is futuristic, but can be implemented, even if not today, then in the near future. However, it would be necessary to explain the statement left unaddressed that biomedical reproductive concepts are crucial for geneticization. This is primarily because the concepts of human genetic improvement are usually linked to modern reproduction techniques. These, on the other hand, provide many opportunities for manipulation at the level of the human genome.

For example, they include the predicted reproductive cloning, or possible in vitro fertilization, as one of them, giving scientists the chance to select female and male gametes in a deliberate, i.e. targeted manner, so as to produce a child with strictly defined physical and genetic properties (Leźnicki 2017; Wilkinson 2010). So far infertile couples can already use semen and egg banks, where unknown gametes donors are properly catalogued in terms of their defining characteristics, such as race, height, eye color, hair color, education, IQ, medical history, addictions, etc. In this way, although misleadingly we start to decide on the genetic predisposition of the future child. However, one can go a step further. Thus, at the end of the 1970s, the Nobel Prize winners' semen bank was established, bringing together eminent personalities from the fields of science, art and culture, whose semen was to enable the interested couples to have a child with an outstanding intelligence quotient (Bokek-Cohen 2016; Valerius 2011; Plotz 2006; Hertz 2006). The reality turned out to be different from expectations; the children brought to life in this way did not always (despite precisely selected genetic features) imitate their genetic parents. What is more, it soon

turned out that the environment in which they grew up undergoing a gradual process of socialization, rather than the mentioned genetic heritage, had a greater influence on who they gradually became.

Another example of geneticization carried out on the basis of modern reproductive techniques concerns the problem of infertility. Every year it affects millions of people around the world, becoming at the same time a profitable market for biomedical services. The progress made in biomedicine provides the opportunity to perform genetic diagnosis at an early embryonic stage. It allows genetic testing on early embryos to detect developmental dysfunctions, including possible genetic and chromosome defects. Pre-implantation genetic diagnosis (PGD) is usually performed after a few days (3-4) from insemination through biopsy of a six-cell embryo. This includes taking one cell and performing a genetic diagnosis (Cimadomo et al. 2016; Liss et al. 2016).

If a defective gene is detected, the embryo with the genetic disease is eliminated and a healthy equivalent is selected for implantation. The most questionable issue in this case is the identification and cataloguing of developmental diseases, including defects leading to a possible disability. This in turn would make it possible to apply embryonic selection transparently. However, many communities are opposed to such procedures, explaining that such actions aim at eugenics in its pure sense, giving rise to a possible elimination of individuals with genetic dysfunctions, regardless of their type or severity. Ultimately, such actions could lead to the realization of recommendations of genetic eugenics.

When discussing geneticization, it is impossible not to mention the inheritable genetic modifications (IGM), the purpose of which is to transform the gene in an egg cell, sperm or embryo. Thanks to this modification, the change of genotype takes place not only in one individual, but because of its irreversibility it will accompany the next generations. Gene germ line therapy, which should be added, is a complicated and technically more difficult procedure than e.g. somatic cell therapy because the interactions between genes are multifaceted depending on their location in a given chromosome. Currently, research using human genetic material seeks to repair and replace the harmful gene. The problem arises, however, when, for example, a disease occurs in an embryo containing a pathogenic gene and thus considered medically defective and qualified for elimination. Moreover, even if hereditary genetic modification is considered a good solution because it will allow the defective gene to be repaired, the technique is at considerable risk, while at the same time it is impossible to fully estimate both the losses and benefits of its application. It is impossible to predict how the modified genotype will function in adult people and in the next generations. This in turn, as many researchers note, would have to be associated with the acceptance of uncertainty by people currently living (e.g. parents) about the fate of those who do not yet exist (future generations, children) (Rasko, O'Sullivan, and Ankeny 2006). The project related to hereditary genetic modification is eugenic germ-line engineering of a targeted character, i.e., serving the realization of anticipated and designed modifications of human genetic material by e.g. parents wanting a child with strictly defined characteristics or predispositions. However, it should be clearly stated that the above mentioned germ line therapies are now legally prohibited (Kraj 2010; Robertson 2001).

3. Geneticization – the bioethical perspective

The issue of geneticization undoubtedly belongs to the group of problems discussed in the scientific community, both medical and non-medical, including bioethical. The main difficulty in conducting a discussion on the above topic is the balance of future consequences resulting from its use, which is ultimately difficult to predict. On the other

hand, the decisions are dependent on the antagonistic scientific community, in which the issue of geneticization is discussed.

In the case of the studies on geneticization conducted in the field of bioethics, the main axis of the dispute is between personalistic Christian bioethics, referring to the category of God – creator of all life and its ultimate Modifier, and utilitarian bioethics, which, when considering controversial ethical issues, including those concerning the question of geneticization, does not refer to the figure of God, but to the human being who makes choices regarding his or her life, as well as the life that can exist through human activity within the framework of the preferences we express. Thus, it should be added that while the advocates of the first type of bioethics will, in principle, reject any experiments on humans that are contrary to God's will as fundamentally unnatural, the proponents of the second type will see in the said genetics the possibility of improvement of the psychophysical, including the genetic constitution of man, often burdened with health dysfunctions. What is more, when evaluating human life, the former will indicate the equal axiological status of all people, including the existing ones, as well as the non-existent ones, while the latter will point to the axiological non-sameness of the life of an adult, fetus or embryo, thus emphasizing the progressive importance of human life. In the face of what has been said, it can be assumed that while the proponents of personalistic Christian bioethics will not consent to a geneticization that not only contradicts the will of God but also violates the dignity of the non-existent, as well as that of the "early human being" that God wants or will want for himself, the representatives of utilitarian bioethics will see the benefits of this type of research, which must, they add, be subject to medical and legislative analysis.

Moving on to the most sensitive and at the same time detailed issue in the discussion on the possibility of either allowing or rejecting geneticization, it is worth mentioning that it essentially concerns the possibility of implementing permanent germ-line genetic enhancements. If there is even a group of researchers who will stress that any genetic modification on a human being should be banned from the outset, there will certainly be those who will opt for its admissibility (Resnik and Vorhaus 2006). Those, in turn, will see this method as an opportunity for parents wishing to provide their children with a better life (Stock 2003; Singer 2009).

This argument has been meticulously discussed, which gives us an insight into the basic concerns that should be associated with the practical implementation of genetic enhancement within the framework of geneticization. Starting with the most general doubts, Michael Sandel, among others, notes that genetic enhancements are not ordinary medical therapies used to cure diseases, but biotechniques that are supposed to contribute to the increase of our psychophysical abilities that we want to enhance (Sandel 2007). Thus, they do not serve to restore the patient's health, but go far beyond the treatment process. This, in turn, may raise the question of whether their admissibility should be justified only by the purpose for which they are to be used.

Another difficulty relates to the problem of (human reproductive) freedom, which is raised by, e.g. parents and the problem of consent to take medical action by future people or those who do not exist yet. In the case of this freedom, opinions are divided. On the one hand, it is noted that in a situation where parents will decide on the child's strictly defined genetic heritage, including the future predispositions of the child of their choice, and thus on the desired traits that they believe are the best, reproductive freedom should be limited or even abolished (Sandel 2007). For, in the opinion of opponents of genetic modification, it violates the dignity of the future person and his or her freedom and may also be dangerous for the genome (Sandel 2007; Fukuyama 2002; Kass 2002). People modified by their parents will have

a limited possibility to make their own free choices (McConnell 2010/2011). Moreover, they will have a limited and predetermined personal and professional future, instead of the right to pursue an unknown future. Thus, the parents' choice of strictly defined characteristics will make it impossible for such a person to pursue a particular hobby or profession. Thirdly and finally, such genetic modifications may be an expression of escalating parental expectations and requirements (Resnik and Vorhaus 2006). On the other hand, the supporters of genetic correction and the right to reproductive freedom will emphasize that parents who decide on possible genetic modifications of their potential children intend to provide them with an optimal start in life by eliminating undesirable genetic traits that may burden the child's organism. What is more, they emphasize that this technology will not unduly disturb the child's future. Today, it is still the state and the rule of law that play the greatest role in the regulation of reproduction.

As to the issue of the impossibility to express either the current consent by a potential (i.e., non-existent at present) person or an implied consent, the researchers agree that such consent will not be obtained from future persons, who do not exist yet (Guderson 2008). The implied consent also fails in the case under consideration and cannot be applied, because it is difficult to object to a given medical procedure (including genetic modification) without prior awareness of its existence, as is the case with individuals subjected to genetic modification.

The other arguments mentioned in the discussion on the possibility of allowing the geneticization of human life included:

a. the futuristic vision, proclaimed by some scientists, of the future birth of a caste system, where genetic heritage would determine the belonging to a given social group. In this system, on the other hand, there would be social disproportions and discrimination, not so much of an economic nature, but resulting from the genetic predisposition of social groups.
b. the fear expressed by e.g. Peter Kass, of the progressive commercialization of genetic modification technologies, while depreciating the value of life of "planned children" (Kass 2002). The possibility of choosing the genes of children could lead parents to treat their offspring as a product, evaluated in terms of genetic equipment. These fears could thus be associated with the advent of genetic reductionism and the evaluation of life based on certain quality characteristics (Ramsey 1970). On the other hand, however, as Nick Bostrom points out, it could be quite the opposite, and it is the enhanced children that would meet with greater love on the part of parents who are aware of the health dysfunctions that burden such children, as opposed to healthy children (Bostrom 2003; 2005).
c. the fear that the child (after genetic modification) will have to follow the path of life that was set by the parents in advance . In this situation, the child's personal identity may eventually be disturbed. This argument was quickly accepted, however, by supporters of genetic enhancement, indicating that there are many examples where parents determine their children's future without genetic modification, including sending them to certain lessons or courses at an early age. However, this does not change the fact that a child can follow his or her own "life path" of choice, without violating a person's personal identity which is not reduced to genetic identity alone (Leźnicki 2017).

Conclusion

To sum up, it should be emphasized that both the final compromise and

the consensus in the discussion on the phenomena of geneticization, including the genetic enhancement of people, have not yet been reached. The nature of the debate is similar to that of scientists analyzing the legal and moral admissibility of in vitro methods or reproductive cloning not so long ago. However, while the problem of in vitro fertilization is becoming increasingly familiar to us, and cloning seems to remain in the remote perspective of scientific solutions, the problem of genetics and related genetic interference with the use of embryos is very far from being realized. It is not a matter of lack of scientific possibilities, but of resistance on the part of the bioethicists cited in the work, on the one hand, and the laws that prohibit this type of research, on the other. Even though the genetic therapies cited in the article are of continued interest, there is concern about the biomedical interventions that some scientists would like to start applying in the initial phase of human life, in particular by using new biotechnologies for the non-medical improvement of the human being.

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