

Ethics and Responsibility in Genetics

GENETİKTE ETİK VE SORUMLULUK

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Summary

Advances in biotechnology, especially in DNA manipulation, have given rise to highly relevant ethical issues, which has required from society, and from medical professionals in particular, an adequate reflection concerning the use of these techniques. This text discusses the ethics of responsibility, according to Hans Jonas, Karl Jaspers, Edgar Morin and Emmanuel Lèvinas in view of the use of DNA manipulation techniques, such as Gene Therapy. This discussion also concerns the attitudes of physicians in the City of Londrina, PR, Brazil, in relation to knowledge, acceptance and the ethical limits of gene therapy and disease diagnosis through DNA analysis. The results of the present research, analyzed in the light of the "Social Representations Theory", point out that these physicians are mainly concerned about the adequate allocation of health resources and the use of these new techniques only for therapeutic purposes. These physicians' need to update their knowledge in this area becomes apparent.

Key Words: Biotechnology, Gene Therapy, Bioethics, Ethics of Responsibility, DNA Manipulation

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Özet

Biyoteknoloji, özellikle de DNA manipülasyonu alanındaki gelişmeler toplumun, özellikle de tıp profesyonellerinin bu tekniklerin kullanımı üzerinde uzun uzun düşünmesini gerektiren etik problemler ortaya çıkartmaktadır. Bu yazı Hans Jonas, Karl Jaspers, Edgar Morin ve Emmanuel Levinas'a göre "sorumluluk etiği"ni, gen tedavisi gibi DNA manipülasyon tekniklerinin kullanımı özelinde tartışmaktadır. Bu tartışma aynı zamanda Brezilya'nın Londrina şehrindeki DNA analizi ile hastalık teşhisi ve gen tedavisinin etik sınırlarının kabul edilirliliğini de içerecektir. "Sosyal Temsil Teorisi" ışığında analiz edilen bu çalışmanın sonuçları göstermiştir ki, bu hekimler esasta sağlık kaynaklarının uygun dağıtımını ile ilgilenmektedir ve bu yeni teknikler yalnızca tedavi amacıyla kullanılmaktadır. Bu hekimlerin bilgilerini güncelleştirmeye olan ihtiyaçları da aşıkardır.

Anahtar Kelimeler: Biyoteknoloji, Gen Tedavisi, Biyoetik, Sorumluluk Etiği, DNA Manipülasyonu

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Humanity has experienced moments of great transformation, and for that reason, has always had to renew concepts and values. Some of the revolutions that occurred in the last century can be mentioned as examples: the Manhattan Project brought the feeling of power to destroy the whole planet, whereas the Apollo Project opened the perspective of man's inhabiting other planets.

During the 20th century, a real genetic revolution was witnessed. When Mendel published his first works at the beginning of the previous century, it was unimaginable that, in 1944, Avery Macleod & McCarty would demonstrate that the

DNA was the genetic material or that a few years later, 1953, Watson & Crick would propose the tridimensional structural model for the DNA.

Since those events, genetics has undergone extremely fast developments. The modulation of gene expression by regulatory circuits has been demonstrated, the genetic code has been elucidated, an enormous development in recombinant DNA technology has been observed and transgenic organisms have appeared, oncogenes and proto-oncogenes have been discovered, genetic methods and concepts have been more and more frequently used in Medicine and Agriculture, projects for the

sequencing of various genomes, including the human genome, have arisen and animal cloning became a reality.

DNA manipulation technology, which began in 1970 with the isolation of the first restriction enzyme by Smith, presently imposes, 30 years later, diagnoses of genetic diseases, *in-vitro* fertilization and embryo freezing. Human cloning, the sex and other characteristics of embryos are already under consideration in addition to eugenic abortion (1). The use of recombinant DNA, either in the therapeutic or reproductive route, however, has been presented to society without the necessary ethical reflection.

Therefore, it is clear that the transformations proposed by the Human Genome Project are deep indeed, since they allow the immersion in the micro-dimension of our biological existence. Many tend to reduce the human being to exclusively the biological dimension or even to gene expression, which, nevertheless is far from clarifying the true complexity and subtleties of human behavior.

Advancement towards the knowledge of the human genome, DNA sequencing, gene interaction, gene regulation mechanisms and the unveiling of genomes lead to an important development which would represent the possibility of more complex interventions in the essence of biological life, the DNA.

A result of human DNA manipulation, gene therapy arises as a therapeutic proposal for diseases stemming from genetic inheritance as well as for those that are highly prevalent, such as the Acquired Immuno-Deficiency Syndrome (AIDS) or cancer. Defined in 1998 as the "treatment of genetic or non-genetic diseases through the introduction into patients' specific cells of gene copies with therapeutic purposes" (2) and in 2001 as "a new form of treatment, cure or prevention of diseases through the change of an individual's gene expression" (3), this therapy could be performed in both somatic and germ cells. In the "gene therapy of germ cells" (GTGC), alterations are transmitted to future generations. That does not occur with the "gene therapy of somatic cells" (GTSC), in which

there is the need to periodically repeat the procedure, depending on the type of disease. In both techniques, the new gene is inserted into the body by means of a vehicle called "vector", which conducts the therapeutic gene to the interior of the patient's cell. The first broadly used vectors were viruses. However, even after manipulation, such vectors can cause toxicity or an inflammatory immune response and even the individual's death as occurred to Jesse Gelsinger in September, 1999 (4). At present, there are alternatives to viruses, such as a DNA complement with lipids and proteins and the introduction of the 47th chromosome (which would exist autonomously), as well as pure DNA (biobalistic and injection). Furthermore, there are 175 approved protocols, of which 125 (25 marking and 100 therapeutic protocols) in the United States, 48 in Europe, 1 in China and 1 in Japan. Of these 175 protocols, 22 are related to the genetic diseases of nine different pathologies. Three are related to cardiovascular and/or rheumatic diseases and, finally, various protocols for the treatment of different cancer types. Also, protocols for the gene therapy of 18 genetic diseases are being developed in addition to another 5 for the Acquired Immuno-Deficiency Syndrome and 42 for various parts of neoplasias. A total number of 1,024 patients have already been submitted to this type of treatment (3).

While this scientific advancement brings hope for a better quality of life, it also awakens a number of ethical contradictions.

The approach of such issues by Bioethics enables the establishment of reflections concerning this new frontier of knowledge and approximates scientists and philosophers.

Scientists must be more attentive to the philosophical reflection as philosophers must enlarge their knowledge concerning the technical bases of the origin of life and of the possible outcomes of gene therapy. The dialogue between philosophers and researchers will enrich the discussion of themes like the ones presented, thus enabling a more universal acceptance of biotechno-scientific advancement.

Ethical issues resulting from scientific progress are discussed by Karl Jaspers, Hans Jonas, Edgar Morin, Emmanuel Lèvinas, among other contemporary thinkers.

Karl Jaspers and Hans Jonas defend the thesis of an ontological foundation for ethics. In this perspective, humanity's moral conscience is deepened and supported on the being's original conscience as well as on the responsibility in relation to it.

This demand for radical thought emerges diffusely, particularly at the end of the World War II. Jaspers emphasizes the contradiction represented by the atomic bomb, a weapon that enabled some governments to decide about human survival. As this unsolved contradiction remains, another challenge is presented, which is represented by the technological unification of the world, since the techno-scientific project determines the possession of knowledge and the possibility of actions that can transform the planet. However, this project unifies without uniting for if, on one hand, it represents a conquest for the whole human race, on the other, techno-science advancement is used as an instrument of domination of some individuals upon others. In a lucid fashion, Jaspers does not forget to point out how science and technology are induced to serve not only warlike purposes, but also projects of economic expansion, thus managing without any ethical values. (5)

To Hans Jonas, the future of life is in serious risk, thus becoming the priority object of moral conscience and of the actions stemming from it. He admits that the only possibility of salvation lies on the careful attention to unfortunate forecasts. He considers that the source of knowledge must be solidly based on the "heuristics of fear", that is, he proposes that the first basic obligation of ethics is to assume the fear of misfortune. That philosopher understands that ethics must no longer be, as it previously was, vertically oriented or have the Purest Goodness as reference and nor conceive as valid the Kantian precepts related to goodness as the ideal regulator, since this logic views only subjective intentions and movements and renounces the control over the outcomes of human action. He

emphatically declares that the intention to change the world and to construct the future must give place to the imperative of protecting life and preserving the future.

So many possibilities arise in view of genetic manipulation that Jonas considers it to be imperious "to place the technological galloping under extra-technological control". He asks for humility and ponderousness in face of the "loud technological arrogance" by arguing that the practical possibilities offered by the new area of knowledge can be irreversible; therefore, we should be prudent, since what is under consideration is nothing more or nothing less than man's own nature. To the philosopher of the Responsibility Principle, this reflection should be sufficient to dedicate more scruple and sensibility in the application of the increasing powers of genetic manipulation in human beings (6).

Edgar Morin defends the conception of a moral that is centered on anthro-poetic norms, namely: understanding, solidarity and compassion. Understanding would mean receiving without excluding, a conjoint effort that intends to welcome individuals and cultures. Solidarity indicates the unity performed by those who choose to move with others. Finally, compassion designates the availability to participate in the suffering of others by accepting the recognition of the other's fortune as something that is applicable to all. These are, therefore, the typical values of a planetary ethics, since they recognize interdependence and the necessary opening to communication and endeavor to develop co-responsibility, thus prefiguring universal human fraternity. In accordance with the relational and interactive logic of a complexity paradigm, Morin's ethical proposal is not unidirectional, that is, it does not only explain that which one owes to others, but also that which one owes oneself. Living in conformity with understanding, solidarity and compassion implies, at the same time, the struggle to "live without being used, insulted or despised".

To that author, fraternity is a radical appeal because it echoes in man's irremediable finitude and transitoriness. The condition of terrestrial be-

ings conjointly imposes to us the condition of being siblings e inexorably destined to nothing. This awareness of the nothingness that awaits us does not induce us to comply with the absurd and accept the violence of a meaningless world. In a lyric and prophetic tone, he concludes:

“The very bad news is: we are lost, irremediably lost. If there is a gospel, that is, good news, it must arise from the bad news; we are lost, but we have a shelter, a home, a nation: the small planet in which life has created its own garden, and where human beings made their homes, where humanity must recognize their own common home. This is not the Promised Land, it is not the paradise on Earth. It is our country, the place of our destination community and of earthly death. We must cultivate our garden on Earth. The Gospel of the lost man and of the Homeland tells us: we must be brothers, not because we will be saved, but because we are lost” (7).

Morin defends the idea that although moved by metaphysical and even opposite convictions, human beings can think and make attempts to make their own conditions on Earth just and pacific. Away from this attitude of fusing horizons, which dialogically involves different cultures from their innermost nucleus of meaning, a real planetary conscience will not.

Emmanuel Lèvinas defends the “humanism of the other Man”, where the needy other, with his absolute alteration, decentralizes his self and dislocates it from freedom as discretion to freedom that stems from responsibility. It is not the self’s conscience and freedom that institutes the moral tie and gives it a base: Lèvinas’ emphasis dislocates both to the limit of the responsibility that has always surrounded us. It is the unmeasurability of the face, the living ethics, that must be recognized as a measuring unit of our relations with the other.

That author proposes a transition of the philosophical fundamentals in the search for the existential conversion that can truly make justice to the other’s rights. On such radical conversion, to which everyone is compelled, is based the possibility of a social and political pluralism that is not

simply the coexistence of individuals, but ties formed by the most authentic fraternity. The dislocation of the individualism that imposes the defense of one’s own interests, as rights to be reinforced at any cost, is based on the restlessness and by the other’s misery. This is where the defense of human rights arise, where such rights are taken as the other’s rights and my obligations.

In an effective world community, justice and its laws can no longer simply be the instrument for the advocacy of one’s own interests or of the interests of one’s own clan. Contrarily, the assimilation of human rights will be the expression of fraternity.

Efforts towards this objective are mainly sustained on that conversion of existence and thought, thanks to which the foundation of an existence that will not betray the fraternity of all men can be seen as feasible. Whilst some actors such as Jonas appeal to fear for the attainment of humanity’s moral turnaround, Lèvinas defends the value of the ethical relation as a spring of all possible responsibility (8).

Finally, it would be favorable if scientists took into account, in their daily practice, the warnings given by Jaspers concerning the inadequate use of techno-science as an instrument of dominance; if they noticed Jonas’ urge for humility and pondering in face of the scientific advancement and accepted Morin’s call for the construction of a society based on understanding, solidarity and compassion. Finally, they should attentive to the universal urgency of an existential conversion that would make justice to the others’ rights, particularly the weakest.

It is certain that based on such assumptions, all the advancements in molecular biology, gene therapy and predictive medicine would culminate in the full fulfillment of the human being as the subject of rights to life with dignity.

Despite its contradictions, the 20th century, according to Garrafa, was when scientific knowledge concerning the mechanisms of life was developed. In that century, mean life spans approximated the number of years predicted as adequate for the human race; it was also the time when workers’

health was defended and their dignity was recognized in many countries where, for instance, women's rights to a juridical and cultural life was imposed. The great challenge remaining is that of constructing the process of inclusion of all people as beneficiaries of such progress (9).

The potential for advancement is fantastic and the multiple impacts of new technologies on our daily lives and on human relations will certainly occur. Particularly in the health area, the Human Genome Project proposes the complete mapping of all genes as well as the sequencing of 3 billion nucleotides, which has just been concluded. The ethical and social aspects of the knowledge generated by the Project are of utmost importance, since it dedicates 5% of its budget to the discussion of topics involving: 1- privacy of genetic information; 2- safety and efficacy of genetic medicine; 3- justice in the use of genetic information. There are five basic principles that guide the project: autonomy, privacy, justice, equality and quality of life (10).

The principle of equality particularly rules the need for equal access to techno-scientific advancement, regardless of geographic origin, race, ethnicity and socio-economic status. For Brazil, a country which is strongly marked by inequality in the access to health services, this principle constitutes an essential prerogative that requires reflections and actions that are also special (11).

In this sense, the frameworks supporting the evaluation of medical professionals can provide a lot of information on their present and future decisions. In order to conduct the study on physicians' profiles with regard to new technologies in gene therapy, we resorted to these professionals' social representations which can be defined as "an organized corpus of knowledge and one of the mental activities due to which man can make physical and social reality intelligible by including themselves in a group or continuous link of exchanges, which enables to release the powers of their imagination" (12). This type of representation also allows the unveiling of the subjective universe as well as the identification of likely actions stemming from such representation. This aspect is cru-

cial as the ethical posture or attitude becomes a limit for the issues presented so far.

The Social Representations Theory was selected because this concept, as "a socially elaborated and shared form of knowledge, has a practical and concurrent view for the construction of a reality that is common to a social set", which enables not only the dimensioning of what physicians think, but also the evaluation of the actions that they may intend to perform in biotechnology, particularly, those associated with their areas of knowledge.

By reflecting on these issues, we proposed to investigate the evaluations made by physicians from the City of Londrina concerning gene therapy and molecular diagnosis.

Material and Methods

The subjects were 115 physicians from the City of Londrina, some of whom were also faculty members in the local university.

The subjects to be interviewed were randomly selected through a list of physicians maintained by the Regional Council of Medicine. As to the university faculty, data provided by the Human Resources Department the State University of Londrina were used. Semi-structured interviews with multiple-choice and open questions were used for data collections.

The subjects under investigation were previously informed about the objectives of the research and, before the interviews began, they signed an informed consent term. The results were evaluated according to the Social Representations Theory.

The set of closed answers was transferred to a table and changed into percentages so as to facilitate the presentations of results. The answers to the open questions were organized in categories according to criteria involving the similarity and affinity of their content. In addition, a refinement in data organization was made within each category according to the values individually expressed by the interviewees.

Results

Before presenting the results, we will show some indicators that characterize the subjects in our investigation, as follows: their ages ranged from 25 to 75 years old and 35.09% were 36 to 45 years old. As to education, 48.21% were specialists and 20% had a Master's or a Doctoral Degree. In their professional practice, 40.91% had an average of 10 to 20 patients a day who either had a private health insurance or were assisted by the public medical care system. Of the total number of participants, 64.55% had computers in their offices.

Regarding gene therapy, the research data showed it is not only the representational universes, that is, the numerous possibilities of "interpretations" concerning biotechnology -molecular biology - that are processed by physicians, but also how they anchor (13) their knowledge.

The transfer between the reified (scientific) universe and the consensual universe (lay) pointed out the need to know the information, deepen it and add more adequate concepts to the representations.

The answers obtained for the question Are you acquainted with disease diagnoses based on DNA analysis or molecular techniques? showed that the interviewees were capable of identifying the technique, although incompletely. The fact that they considered to be possible "to identify carbonized corpses" or "modified genes in microorganisms" points out the need for more detailed and less punctual information concerning the procedure.

Most of the interviewees (approximately 75%) expressed superficial knowledge concerning molecular diagnosis, since the most frequently sources of information were "newspapers and magazines" for lay readers and, exceptionally, "specialized journals. This fact is repeated in relation to the representation of molecular biology, more specifically with regard to the DNA manipulation technique, which was shown to be supported on inadequate readings and, in many cases, lacked any scientific support. Once again, it was shown that the transit between the reified universe and the consensual universe took place through unsatisfactory information.

Another relevant aspect was related to proposals for gene alterations. Almost all the interviewees were against any gene alteration proposals that did not have exclusively therapeutic purposes, since they considered that one should not intervene or modify what is defined as "the natural route of events". They identified such proposals as "a difficult issue involving great risk for the being under formation, since the embryo has its own identity and diversity is the world's true wealth; genetic chance is fundamental because if it is not respected, one risks falling in ideologies that would implement a random racial superiority". Among others, these manifestations express concerns, some of which are pertinent whereas others are essentially fictional and their dissemination is made by the large communication media, thus lacking scientific basis. Furthermore, they defend the principle of precaution and are willing to improve their knowledge regarding the new technologies before including them in their professional practice.

A very relevant aspect that was emphatically presented by the interviewees referred to the correct allocation of public health resources. They defended, almost unanimously, policies that can benefit the whole population, particularly people who lack minimum actions in basic health. They questioned the relevance of DNA manipulation techniques in a country that presents alarming rates of poverty and of mortality due to infectious diseases. Most of them proposed that the investment of public grants should aim at basic sanitation and reducing the evils of the so-called "persistent situations" such as hunger and malnutrition.

In spite of the fact that most of the interviewed professionals presented interest in enlarging their knowledge on biotechnology, the number of answers evincing the active search for specialization or equivalent courses in that area was small. A small group stated not to have any interest in knowing the new frontiers of knowledge, since it would not help their professional action in any way. This expresses not only the perception mistake, but, above all, the fallacy that the universe of scientific knowledge can be demarcated by medi-

cal specialty areas that would remain unaffected by biotechno-scientific transformations.

A positive aspect observed was the professionals' almost unanimous concern about the inadequate use of DNA manipulation. They frequently referred to questionable economic interests of large biotechnology companies and were concerned about other more pressing problems in the country, particularly in the poorer regions. Finally, it was evident that the interviewed physicians' were greatly concerned about social commitments within the principle of an ethics of responsibility to address the issues regarding human health.

Conclusion

Far from the purpose to exhaust the topic under discussion and based on the obtained data, some conclusions can be drawn.

Although the understanding of an expressive number of interviewed physicians of the necessity to prioritize measures that will bring about solutions for society's most pressing needs are undoubtedly correct, it must be analyzed with proper care, since, in addition to being based on obvious scientific reductionism, if it is summarily adopted, it will deprive patients with genetic diseases from the benefit offered by new therapeutic methodologies.

Another aspect to be considered is related to some initiatives that will enable medical professionals to have access to advancements in gene therapy through specialized literature, which will allow a greater involvement of professionals with the construction of this new area of knowledge and the expansion of possibilities in clinical decision-making. In the case of continuing education, the creation of graduate programs in order to meet these needs is observed. With regard to undergraduate education, teaching organizations must introduce disciplines that will encourage students to better know these new therapeutic proposals as

well as stimulate them to conduct ethical reflections on that theme. Furthermore, it seems to be imperious to facilitate the interaction with professionals from other fields of scientific knowledge which will allow a more solid and rational construction of scientific knowledge in gene therapy.

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