

GENETIC ENGINEERING - ETHICAL DIMENSIONS

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Recently, there have been many discussions on bio-ethics, bio-engineering and in-vitro fertilization. Quantitatively, the amount of attention paid to these subjects is in contrast to the fact that the problem has been limited (since 1982) to about 10,000 children. Qualitatively, there are more important problems, such as incest (at least one birth in 10,000 in industrialized societies), undesired children, child abuse, adoption of Third World children (legally or illegally) and the trafficking of children for organ banks.

The reason for the particular interest in matters related to bioethics is that we cannot disassociate this topic from the definition of life in general and of human life in particular.

DEFINITION OF LIFE

To define human life we need criteria which allow us to distinguish qualitatively the different periods of life within the continuous life-cycle. One can use biological characteristics, such as nervous sensibility, viability, or non-biological characteristics, such as consciousness, thinking, social relationships, sense of identity. In my opinion, all of these characteristics should be considered globally, however, such an approach leads implicitly to the impossibility of defining accurate limits. Despite these difficulties, it still seems that any answer to these questions, based on the arbitrary isolation of one of these characteristics, is unjustified on both biological and philosophical grounds.

With regard to humans, one should distinguish the biological life from the conscious human life of an individual and from the social recognition of life. Biological life starts before the emergence of an individual's life and continues some time after death. This distinction between the two definitions of life is central to the discussion of many bioethical problems. It is also essential in distinguishing between the definition of death as the loss of all vital functions or as the loss of cerebral function.

Life is biological, even chemical. Life is reduced by geneticists to the vital mechanisms of a cell, to the control of the genetic code of DNA, and the regulation of protein synthesis. Better knowledge of biological sciences has contributed to a better understanding of the vital functions and has resulted in the substitutions of functions by technical surrogates.

In their moral decisions on the problems of life and death, some are proposing a moral right to life, as an absolute right, often considered as metaphysical, by the fact that life would be a gift of God. In this absolutism, the concept of the right to life would imply that it would be morally intolerable to interrupt life of any kind, under any circumstances. It would also imply that war is immoral, as is self-defence, the death penalty, contraception and abortion.

By considering conception as the onset of life, one assumes that the whole potentiality of an individual is established by the fusion of a sperm with an ovum. Within this concept, one denies the fact that these potentialities were already present in the gametes and considers that hindering their fusion, and thus fecundation, is not natural. In the same line of thought, it could also be considered unnatural to adopt such techniques as interrupted copulation or abstinence during certain periods of the ovarian cycle. Moreover, these concepts deny the fact that fecundation is not a sudden event, but a process which lasts 24 hours, and the first stages of development are undifferentiated, sometimes resulting in twinning.

A foetus is, of course, also a potential human being. However, the development of life is gradual, and the delineation of life stages is difficult. Naturally, it is possible to delineate the anatomical development of the nervous system, but it is more difficult to evaluate its functional maturation. A more evident sign constitutes the independent viability of the foetus. It might be difficult to set precise limits on this criteria due to the variation in viability from one foetus to another, and due to the fact that viability depends on the availability of medical techniques to maintain life which would not naturally be independent.

These attempts to define life are arbitrary and, as a consequence, not scientific. Thus, there is a conflict between the idea that a fertilized ovum is a human being, and the idea that it is a tiny piece of tissue which will be recognized as a human being only when it has reached some stage of independent viability.

Indeed, an individual should not only be characterized by biological functions, but also by a normal consciousness, an introspective psychology and moral responsibility. Human life must also be defined in social terms.

IS THE GENETIC REVOLUTION SACRILEGIOUS?

Genetics implies scientific objectivity, based on the accumulation of experimental results. This scientific discipline tries to understand the functioning and control of cellular mechanisms. Anxieties are sometimes expressed as "would these objectives be sacrilegious?"

The genetic "revolution" is not an abuse of the geneticists' authority, nor is it an ingenious invention of a researcher more intelligent than others, or an accidental discovery in a laboratory. It is the gradual result of discoveries on the basic structure of the genetic material.

What is DNA? How is the information coded? How does the duplication of this information occur? How is DNA organized in the genes? How is the gene information controlled? The answers to these questions are now fairly well-known and allow us to understand and manipulate the biology of the bacterium, the fly, the mouse and of man by the fact that these mechanisms are largely universal. The vital mechanisms are naturally not fully elucidated, and many generations of biologists and geneticists will still need to do a lot of hard work to reach their "goal" of discovering the finer details of these mechanisms. Biologists will become more and more "sacrilegious" in the analysis of fundamental biological mechanisms and in the capacity for intervention on the vital mechanisms.

Research in genetics is not the only contributor to this demystification. Physics and chemistry have also provided explanations of the vital mechanisms. We are in a transition period where dogmas of the past thousand years are disappearing at the same speed that biological structures are becoming better understood. Due to the rapidity of all these changes, societies react by expressing somewhat traditionalist fears, such as the creationist movement. In fact, just like societies, individual human beings have a conservative background. They show some resistance to all kinds of change, since it requires adjustments of their customs and habits, opinions and sometimes their philosophies.

Most religions elevate man, holding him above all other kinds of animal life. They embrace the complexity of human life in dogma, and are given finality to life and death. When biologists deviate from the "safe" road of systematic analysis of living systems, or from the stabilizing road of ecological study of biotopes and give a chemical and mechanical explanation of life, they become disconcerting to those who prefer not to explore the natural course of human life but take refuge behind its inexplicability.

The separation of religion and biological life is largely accepted, as long as one does not intend to intervene with living mechanisms, i.e. watch and observe, but do not touch; otherwise the biologist "becomes god" or "plays god". In fact, the question should be asked if he could become "better than God" because he would be able to cure those congenital diseases that are now "spontaneously" appearing in each generation.

IMPLICATIONS

Genetic engineering is ethically a sensitive topic to discuss, not only because it implies a specialized technical language which we try to avoid wherever possible, but also because it inevitably concerns individual political and philosophical, or religious ideas.

In all probability, in the lives of all, genetic engineering will have drastic implications both at the level of fundamental and applied research and at the level of society.

Fundamental and applied research

For the public at large, science is often synonymous with technology and thus genetics with genetic engineering. However, there is a fundamental difference between science, the research of knowledge and technology and the consequent applications of this knowledge. Our basic scientific knowledge has not progressed by a number of revolutionary changes, but is the result of the continuing accumulation discovery.

The first justification of biological and genetical research remains the discovery of the phenomenon of cellular division, of the interaction between cells, of cellular differentiation, of genetic regulation, of the effect of mutagenic and carcinogenic factors, of the processes of fertilization and implantation. Animal experimentations are indispensable, but must be confirmed by human experimentations.

To refuse new knowledge and new technologies is, in the long term, "to fight a losing battle"; this general statement may, beyond all doubt, also be extended to genetic engineering.

Scientific-societal Interactions

There is always a mutual influence between fundamental and applied science, in much the same way as occurs between science and society. If genetic research influences society, society also influences genetic research and the science of reproduction. Today's "goal" is to have a limited number of children, but to offer a life of quality with minimal constraints.

Without a doubt, these social "norms" also have a eugenic effect. Interactions between science and society appear at each new important discovery, due to the fact that it requires some adaptation or adjustment by society to this newly-acquired knowledge. These adaptations usually come after a period of fear of the unknown. These fears, consciously or unconsciously, are in fact the expression of the conservatism of society, obliged to adapt itself, and of the conservatism of the individual, obliged to change his philosophical and ethical rules.

Ethics and genetics

We do not become adults without moral a priori, and it would be nonsense to neglect the social or familial influences on our moral attitudes. We do not need to analyze Freud's findings about the familial influences on the sexual ego, or Marx's theories on the important role of the economic system, to be aware of the fact that our attitudes are conditioned by familial habits and social rules. The first step towards freedom and lack of manipulation is the development of a greater autonomy in the individual's own way of thinking.

A discussion between two individuals who have different ethical points of view, can be made difficult by the fact that they start with divergent arguments that they consider, respectively, as fundamental. E.g., I can perfectly reconcile myself with the idea that avoiding a heavy physical or mental handicap through abortion is a moral act and I base my judgement on the moral possibility of avoiding unnecessary pain. Avoiding unnecessary distress is, in my opinion, a fundamental moral concept that I adopt as a starting point in the formulation of my judgement on ethical problems, and to which I feel no necessity to add supplementary arguments.

For some, ethics are the definition of sense and prejudice, of purity and sin, of good and evil. For others, the critical terms are profit and loss, hope and risk, gain and cost. Still others consider the rights of individuals or of groups, or the best solution for society and its members, in terms of advancement of knowledge and of health promotion, as fundamental.

Before deciding what is moral or immoral, correct or incorrect, with respect to genetic techniques, one has to gain a better understanding of the possible techniques and the significance or implications of their application. It is also necessary that society creates opportunities for providing better information, or even favor a more biological culture.

Fears and regulations

At many levels, we can omit the possibility of some control systems on biotechnology.

The risk of an epidemic is of course no longer expressed at Asilomar. However, it is true that the economic interests of the applications of genetic engineering are such that there might be great temptation to disrespect security rules. Control would, however, imply the possibility to interact at industrial as well as military levels. Military abuses cannot be excluded; fortunately, biological arms seem less easy to target than nuclear ones.

Recent progress in the study of the human genetic map has made it possible to identify an individual on the basis of genetic information locked in his chromosomes and to estimate the likelihood of acquiring some disease or handicap later in his life. This kind of information can be used to decrease the chances of an individual contracting certain diseases and improve the quality of his future life, thus improving the overall health situation of a population. It is also quite clear that such advances in genetic research imply that society has to follow very strict rules in order to protect the privacy of individuals. For example, attempts to misuse such information by employers or insurance companies are not merely hypothetical.

Genetic therapy in Man

If tests clearly show that a foetus has a severe defect, it would, in my opinion, be immoral to refuse an abortion. Indeed, it does not appear to be acceptable to deliberately give birth to a severely handicapped child, while a subsequent pregnancy may lead to a perfectly normal child. It should be understood that this does not mean that abortion should be compulsory in all such situations, since there may be quite divergent opinion as to the type and severity of a handicap. I have no miraculous proposals: I can only express the idea that the mother would recover from the consequences of an abortion, but that the handicap, if not lethal, could persist for a long time - thus it is the mother who should have the last word in a decision on such a matter.

Here, as in many ethical issues, generalizations can be problematic. We do not want to offend severely handicapped people or their families by suggesting that the quality of their lives, all other factors being equal, is likely to be lower than for non-handicapped people. Of course, this does not imply a generalization, but is a probabilistic kind of thinking: it is true that handicapped people can have a better quality of life than some non-handicapped people.

Ethics are always confronted with the problem of making choices. Actually, the choice is whether we consciously decide to maintain the development of a physically or mentally handicapped foetus, or if we decide on an abortion. Tomorrow, we will have to make a supplementary choice, for instance, the treatment of the patient by genetic engineering techniques - at least those patients with diseases where the defective product is secreted in the blood. The day after tomorrow, the correction will occur even earlier, i.e. by early detection of abnormalities in the fertilized ovum and preventing its further development, or by replacing defective genes in the fertilize ovum by normally functioning genes, or even before fertilization of the ovum, by preventing the fusion of sperms and ova which carry defective genes. At this level, we will no longer talk about abortion, but rather about "in vitro" fertilization.

Permanent education

If the 21st century must become the "century of biology", we should realize that we have much ground to cover in teaching genetics. Within the present educational system, inadequate emphasis is placed on the development of a scientific and biological culture. Many professors are aware of this, but modifying the teaching programmes of secondary schools and universities is a slow process which cannot compete with the fast evolution in genetic research. However, the new techniques are based on a specific and esoteric language, and their integration into society is put at risk just by incomprehension. Misunderstandings appear, which result in unnecessary fears - "fear is ignorance" (Gandhi).

However, it is this permanent education which will justify our liberties; it is the pedagogy of pluralist discussions which can preserve society from dehumanization.

To fear that man would destroy the natural mechanisms, or to speculate on the fact that man would "go too far", seems somehow to ridicule his intelligence or to separate him from nature. It is, in the end, bringing man back to his animal origin. In this field such as in others, mankind does not need repressive morals: the ethically responsible choice is that of objectively informing the public at large on the knowledge and applications, as well as on the possibilities and limitations of science. This education must help us to remain honest and free, to remove untruths and prejudices.

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