The Human Genome and Gene "Therapy": Some Ethical Issues

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Abstract

The major scientific achievement of the Twentieth Century was the discovery of the double helix, and the mapping of the human genome in 2003. Contemporary medical and scientific knowledge in the field of gene therapy has the potential to inform us about many of the known inherited genetic conditions. In addition, medicine now has the ability to identify a significant number of diseases which may be inherited from us by our children. When we discuss the ethics of gene therapy, a distinction should be made between somatic (non-reproductive) and germ (reproductive) cell therapies. In this article, we focus on the ethical issues related to prenatal screening for genetic disorders which include autonomy, cost and maternal anxiety.

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Discussion

Perhaps the major scientific achievement of the Twentieth Century was the discovery of the double helix. By 2003 scientists had mapped the human genome. Contemporary medical and scientific knowledge, for example in the field of gene therapy has the potential to inform us much concerning many of the known inherited genetic conditions. As such, we may now be informed about our innate genetic disease predispositions. It follows that medicine now has the ability to identify a significant number of diseases which we may pass down to our children. From us to our children, the disease or disease propensity is passed to their offspring and so it continues through time in the "family tree'. The possibility of gene therapy to alter this pattern, to remove this inevitable presage appears infinite. However, since technological advances always carry some detrimental effects; to welcome gene therapy as *the* medical and social panacea would be misguided.

While we may applaud the prospective benefits to human health and well-being, we must also be mindful that considered arguments are also made which concern the potential of threat to our liberties, the erosion of autonomy and the diminution of the human moral form. In the gene therapy ethics debate, science provides us with the facts. The facts are necessary for us to make informed decisions. But science cannot tell us what our choices *ought* to be.

When discussing the ethics of gene therapy, a distinction should first be made between somatic (non-reproductive [*in situ, ex vivo, in vivo*]) and germ (reproductive) cell therapies. Germ cells alone carry the genes which will be passed down to further generations. This area of research appears to be the most debated. Authors such as Rifkin argue against "tinkering" with any genetic components as the webs of earth's complex systems are yet unknown.[1] Others support somatic therapy but are concerned that the venture into germ therapy is still too scientifically complicated and may result in untoward consequences to future generations.[2,3] Still others make the argument that it is the very nature of research to explore possibilities and that regulatory frameworks to accommodate ethically acceptable public-supported scientific progress will naturally evolve.[4,5]

Prenatal screening for genetic disorders may provide examples of some types of ethical dilemmas raised. Ultrasound screening is, in most countries, now simply a routine part of prenatal care. Globally, we are obliged to accept that ultrasound screening may encompass multiple facets, such as sex screening and/or selection, screening for congenital malformations such as spina bifida, anencephaly, Down's syndrome, screening for genetically transmissible disorders (e.g. haemophilia, cystic fibrosis, thalassaemia), fetal reduction of multiple gestations, as well as testing for infectious diseases likely to affect the offspring (e.g. toxoplasmosis, rubella, syphilis, HIV). Each one of these conditions, as well as others, raises different moral issues.

Other reproductive dilemmas arise in genetic counselling concerning autosomal dominant diseases such as Huntington's disease. These quandaries might surround the *prevention* of a pregnancy that could or would result in a severely handicapped child or in the child's early death. For others, in cases when a debilitating handicap or disease could not

have been anticipated or diagnosed early, dilemmas may include the option of a late termination of pregnancy or the birth of the child. In both cases, there are always the consequences of choice. The choice though should lie with the parents. In cases where no technology exists for prenatal screening, there are no choices (right or wrong) to be made. Here it should be said that the decisions available to a pregnant woman's fetus or neonate regardless of screening or not are often culture-bound. Garg relates an example from Northern India where relatives made all decisions concerning the denial of medically recommended care because the neonate was female.[7]

Robinson argues that the ethical issues involved in prenatal screening concern *autonomy*, *cost*, and *maternal anxiety*. Concerning autonomy, ideally, healthcare professionals in the procedures they enact ought to be designed to ensure they respect each individual's autonomy. However, in the context of prenatal screening for genetic disease the role of individual autonomy is not strictly outlined. This is because to be "autonomous" requires that each individual has the capability to understand, reflect, reason and thus under ordinary circumstances, make an informed decision. However, in the context of pregnancy, a point Robinson makes is that making an autonomous choice does not imply that the pregnant woman or the couple ought to be given *carte blanche* concerning potential or real harms to the "unconsulted fetus".[6] By this he means that consideration should also be given to the fetus in terms of the scientific evidence known concerning the type and prognosis of the genetically transmitted disease or malady in question. If one holds to a utilitarian analysis, an argument can be made that it is a moral wrong to knowingly transmit a disease to one's offspring when it is known that the disease is fatal or has a low probability of cure.

Another factor contributing to "autonomous" choice in such situations is more subtle and involves "cost". It appears that the healthcare management trend (and societal acceptance) is to circumvent the monetary cost to society by avoiding the birth of a physically and/or mentally challenged child. For instance, prenatal screening and abortion of a Down's fetus was estimated to save about £ 120,000 in the UK in 1992. For many, especially the parents of a child with Down's syndrome, this approach may be conceived as a moral wrong. Nonetheless, in many industrialised countries, very few Down's syndrome babies are currently born. What must remain the main ethical focus is not the idea of cost-saving. Rather, the focus should concern the goal of reducing the incidence of genetic diseases in populations because of the consequences borne by those so afflicted. [8]

The final ethical issue Robinson considers in prenatal genetic screening is, "maternal anxiety". Arguably, proper counselling and psychological support could assist in reducing maternal anxiety factors. However, as with all maladies, it is not uncommon for blame to be placed on someone or something. In cases of babies born with, for example, malformations and severe handicaps, it is often the woman who not only bears the child but also the 'blame'. In this regard, family counselling (sometimes including grandparents or extended family) is considered the best way to ameliorate such unwarranted prejudices.

These few issues represent merely a feather's touch upon the numerous interesting and challenging ethical dilemmas raised in the explosion of genetic technologies. They reflect deeper questions that will continue to be debated such as: Is the term 'gene therapy' even the correct term? "Therapy" implies the remedy or alleviation of a defect or illness. What are the connotations of this in medical practice? Is it ethical to modify the human genome? What is considered a disease and who decides? Is behaviour genetically modifiable, and if so, who decides what types of behaviour are acceptable? Is genetic therapy a misnomer for research? Is it possible that genetic modifications could produce a new human species? These are some of the questions that need answers in a more robust discussion.

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