Human Gene Therapy

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Human Gene Therapy

Background Paper

"Where two principles really do meet which cannot be reconciled with one another, then each man declares the other a fool and heretic. "

–Ludwig Wittgenstein, 1950-1951

"Even in the extreme case where disagreement extends irreducibly to ultimate moral ends, the proper counsel is not one of pluralistic tolerance . . . We can still call the good good and the bad bad, and hope . . . that these epithets may work their emotive weal."

"Thus we do what we can with our ultimate values, but we have to deplore the irreparable lack of the empirical checkpoints that are the solace of the scientist. Loose ends are untidy at best, and disturbingly so when the ultimate good is at stake."

—Willard Van Orman Quine, 1981

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Preface

This background paper is the fourth in a series of OTA publications on genetics, and the third in a series focusing on emerging biological technologies. * It was prepared at the request of Representative Albert Gore, Jr., as Chairman of the Subcommittee on Investigations and Oversight of the Committee on Science and Technology, U.S. House of Representatives. Preparation of the paper involved extensive assistance from and review by experts and other interested parties (apps. C and D), and included a workshop convened at OTA on September 25, 1984.

Interest in human applications of recombinant DNA technology has been expressed by numerous scientific, medical, religious, civic, and government leaders by Representative Gore's subcommittee and resulted in congressional hearings in November 1982, Human gene therapy is currently preeminent among the the topics of concern. This paper focuses on the imminent development of human gene therapy, emphasizing early medical applications. The governmental concerns related to human gene therapy, as for other medical technologies, will include protection of subjects involved in research and clinical treatment, ensuring safety and efficacy of the techniques in specific applications, and public discussion and education.

Human gene therapy, if it is approved for use, will first be performed on patients who have no better prospect for treatment, and who suffer from severe, rapidly fatal diseases caused by defective genes. Treatment will involve inserting copies of the normal gene into cells where the new gene can be used to produce proteins that correct a biochemical defect. Human gene therapy as currently envisioned would thus be applied to treat patients with specific rare genetic diseases, and not as the tool of a eugenic social program intended to improve the human gene pool.

Gene therapy in humans will first be done in cells from an organ or tissue other than germ cells, probably from a patient's bone marrow. Such treatment would therefore not lead to heritable changes. Therefore, because cells that are used in reproduction are not involved, gene therapy of this type is quite similar to other kinds of medical therapy, and does not pose new kinds of risks. When considering gene therapy that does not result in inherited change, the factor that most distinguishes it from other medical technologies is its conspicuousness in the public eye; otherwise it can be viewed as simply another tool to help individuals overcome an illness.

Public interest in gene therapy suggests that utmost care must be taken to ensure that the process for approving its early application is fair, open, and thorough. Several Federal agencies, including the Recombinant DNA Advisory Committee at the National Institutes of Health and the Food and Drug Administration, are presently involved in just this process.

It is generally agreed that gene therapy that affects only the patient is analogous to other medical technologies. There is, however, no agreement about the need, technical feasibility, or ethical acceptability of gene therapy that leads to inherited changes. Commencement of gene therapy that would involve inherited changes should not proceed without substantial further evaluation and public discussion.

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*The other OTA publications on genetics are ***Impacts of Applied Genetics*** (April 1981), ***The Role of Genetic Testing in the Prevention of Occupational Disease*** (April 1983), and ***Commercial Biotechnology: An International Analysis*** (January 1984). The other publications on novel biological technologies are ***Impacts of Applied Genetics*** and ***Impacts of Neuroscience*** (March 1984).

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