

## Chapter 1

# Executive Summary

A substantial majority of Americans do not have a sufficient vocabulary or comprehension of concepts to utilize a wide array of scientific communication . . .

—Jon D. Miller  
*Washington Post*, June 2, 1986

The public . . . can assimilate an astonishing amount of technical information if they feel that it's necessary to protect themselves in a dispute.

—Robert C. Forney  
*Christian Science Monitor*, Sept. 26, 1986

Public opinion in this country is everything.

—Abraham Lincoln  
Sept. 16, 1859

# Executive Summary

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The United States stands at the brink of a new scientific revolution—one based on novel biological techniques—that could significantly alter the lives and futures of many people. While the basic scientific developments that underlie this revolution have occurred already, advances in genetic technology have not yet been applied widely. In the near future, decisions made by the Federal Government will profoundly affect the timing, direction, and limits of this technological revolution—and hence its impact on the American public. Because government represents all of the public, it cannot ignore the concerns and preferences—no matter the extent of the misconceptions or how transitory the opinions might be—of any portion. It is important for policymakers to know not only what public opinion is, but also on what it is based. But what are the public's perceptions on biotechnology and genetic engineering?

As part of the assessment, “New Developments in Biotechnology,” the Office of Technology Assessment commissioned a nationwide survey to answer this question. Conducted by Louis Harris & Associates between October 30 and November 17, 1986, among a national probability sample of 1,273 American adults<sup>1</sup> this survey gathered information about public knowledge and opinion on science and technology issues in general, and genetic engineering and biotechnology in particular. This background paper presents the data obtained from that survey. It describes **perceptions and beliefs of American adults measured over a 19-day period—public consensus could shift if a cataclysmic event were to occur.**

The survey found widespread interest and concern about scientific and technological issues among the American people. Only about one in six Americans (16 percent) rates his or her basic understanding of science and technology as “very good” and nearly a quarter (23 percent) say that they are “very interested” in scientific and technological matters. And, nearly a third (32 percent) say that they are “very concerned” about govern-

ment policy concerning science and technology. In all, **nearly half (47 percent) of the adult population of the United States describe themselves as very interested, very concerned, or very knowledgeable about science and technology. OTA defines this population as the science observant public.** Three of ten Americans say they discuss issues related to science and technology at least weekly.

A large majority of the American public (80 percent) says it expects developments in science and technology in the next 20 years to benefit them and their families. At the same time, there is widespread expectation (71 percent) that developments in science and technology will pose at least some risks to them and their families. However, **when faced with the fundamental choice between the risks and benefits to society from continued technological and scientific innovation, a majority of the public (62 percent) feels that the benefits outweigh the risks. In contrast, 28 percent of the public feel that the risks outweigh the benefits.** Neither age, education, nor science observance substantially affects concern about risks of scientific development.

The basic interest in science and technology among the American people carries over to issues of biotechnology and genetic engineering. Two-thirds of the public (66 percent) feel that they understand the meaning of genetic engineering. More than a third (35 percent) say that they have heard or read a fair amount about genetic engineering, yet **only one in five Americans (19 percent) say they have heard about any potential dangers of genetically engineered products. A larger segment of the public (52 percent) believes that genetically engineered products are at least somewhat likely to represent a serious danger to people or the environment.** Nonetheless, a two-thirds majority of the public (66 percent) says it thinks that genetic engineering will make life better for all people.

When all other factors are equal, the public says it is more favorably disposed toward genetic alteration of plants, animals, and bacteria than manipu-

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<sup>1</sup>Individuals age 18 and older

lation of human cells. Approximately one-fourth (24 percent) of the population who have heard about genetic manipulation of DNA to create hybrid plants and animals feel it is morally wrong. Furthermore, 26 percent of the public who are aware of the classic biological techniques of cross-fertilization and crossbreeding also believe that these techniques are morally wrong. This belief opposing any form of biological manipulation, including those in use for thousands of years, is partially a function of religious background. It also reflects a belief that humans should not meddle with nature—a sentiment strongly held by a quarter (26 percent) of the American public.

Some individuals expressed concern about potential risks of environmental applications of genetically engineered products, as well as the moral status of such products. When queried about specific consequences, a majority of the public believes that it is at least somewhat likely that genetically engineered products could create antibiotic-resistant diseases (61 percent), produce birth defects in humans (57 percent), create herbicide-resistant weeds (56 percent), or endanger the food supply (52 percent). Fewer than one in five Americans, however, thinks any of these outcomes is very likely.

**A majority of the public appears willing to accept relatively high rates of risks to the environment to gain the potential benefits of genetically engineered organisms.** Fifty-five percent say they would approve the environmental use of an organism that would significantly increase farm production if the risk of losing some local species of plants or fish were 1 in 1,000. As the rate of risk declines, public approval of environmental use of genetically altered organisms for agriculture increases. **However, despite public willingness to approve environmental use of genetically engineered products at relatively high rates of risk, a majority of the public says it would not approve if the risk were unknown—substantially fewer (46 percent) say they would approve if the risk were “unknown, but very remote” than if the risk were 1 in 1,000.**

Under conditions of no direct risk to humans and very remote risks to the environment, a majority of the public says it would approve the

environmental use of genetically altered organisms to produce disease-resistant crops (73 percent), bacteria to clean oilspills (73 percent), frost-resistant crops (70 percent), more effective pesticides (56 percent), and larger game fish (53 percent). This overall approval, however, is qualified. **A large majority of the public (82 percent) favors environmental applications of genetically altered organisms on a small-scale, experimental basis. In fact, 63 percent say they would favor and 14 percent state they would not care if their community were selected as a site to test a genetically altered organism. However, only 42 percent of the public think commercial firms should be permitted to apply genetically altered organisms on a large-scale basis.**

The issue of human cell manipulation is more sensitive than other forms of genetic engineering. While a majority of the public (52 percent) believes it is not morally wrong to change the genetic makeup of human cells, a significant minority (42 percent) says that it is. When confronted with specific applications of human cell manipulation, however, many Americans relax their position. A large majority of the American public says it approves of scientists changing the makeup of human cells: to stop children from inheriting a usually fatal genetic disease (84 percent); to cure a usually fatal genetic disease (83 percent); to stop children from inheriting a nonfatal birth defect (77 percent); or to reduce the risk of developing a fatal disease later in life (77 percent). In fact, a large majority of Americans (78 percent) says it would be willing to undergo therapy to have genes corrected if tests showed they were likely to get a serious genetic disease later in life. An even larger majority (86 percent) says it would be willing to have their child undergo genetic therapy, if the child had a usually fatal genetic disease.

Much of the public actually supports a type of human gene therapy that scientists are not now advocating. At the present time, all proposals for human gene therapy are restricted to somatic cells—those that affect the characteristics of the patient, but not the patient’s ability to pass on such traits to future generations. Yet a majority of the public says it favors the correction of potentially fatal genetic defects in germ line cells (defects that

are passed on to future generations,) as well as somatic cells. **A majority of those who feel human gene manipulation in general is morally wrong nonetheless says it would approve its use in specific therapeutic applications.**

Public support for the development and application of biotechnology is neither uniform nor unequivocal. A third of the public believe, to some extent, that it would be better if humans did not know how to genetically alter cells. Nearly a fifth (18 percent) say they would not approve a proposed application for the environmental release of a genetically altered organism even if the environmental risk were only 1 in 1 million. And 11 percent of the public say they would not approve either somatic or germ line manipulation of human cells, even to cure a disease that is usually fatal. The concerns and preferences of these segments of the population must be weighed against the perception of most Americans that genetic engineering will personally benefit them and their families.

**A large majority of the American public (82 percent) believes that research in genetic engineering and biotechnology should be continued. Support for this continued research appears in all segments of the population.** In fact, continued research into genetic engineering is supported by majorities of those: who believe human cell manipulation is morally wrong (71 percent); who believe that it is likely that genetically engineered products will represent a serious danger (73 percent); and who feel it would be better if humans did not know how to genetically alter cells (63 percent). This public approval for continuing genetic research spills over into widespread support for government funding of biological research. Despite public concerns about a balanced budget, only 10 percent of the American public say that government funding for biological research should be cut. Forty-three percent of the public believe it should remain the same. Four in ten Americans (40 percent) say that government funding for biological research should be increased. Support for government funding for biological research is bipartisan, with 38 percent of Republicans and 45 percent of Democrats favoring increased funding for this research.

In addition to supporting research, the public also sees another important role for government

in the development of biotechnology-regulating and assessing potential risks. When asked who should be responsible for deciding whether commercial firms should be permitted to apply genetically altered organisms on a large-scale basis, a plurality felt that a government agency should decide (37 percent). However, the survey also identifies a potential credibility problem in governmental involvement in biotechnology. **The public believes that Federal agencies are distinctly less able than university scientists to assess potential risks. Moreover, in disputes between Federal agencies and environmental groups over risk statements, the majority of the public says it is inclined to believe the environmental groups.**

In summary, most Americans appear to be pragmatists on the issue of genetic engineering. They are concerned about both the morality and the risks of the technology. **The survey finds that while the public expresses concern about genetic engineering in the abstract, it approves nearly every specific environmental or therapeutic application. And, while Americans find the end products of biotechnology attractive, they are sufficiently concerned about potential risks that a majority believes strict regulation is necessary.** Moreover, the majority of Americans believes that a government agency or an external scientific body should be responsible for deciding about environmental use of genetically altered organisms. At the same time, a majority (55 percent) believes that the risks of genetic engineering have been greatly exaggerated, and 58 percent feel that unjustified fears of genetic engineering have seriously impeded the development of valuable new drugs and therapies.

As in other areas of science and technology, people favor the continued development and application of biotechnology and genetic engineering because they believe the benefits will outweigh the risks. And, **while the public expects strict regulation to avoid unnecessary risks, obstruction of technological development is not a popular cause in the United States in the mid-1980s. This survey indicates that a majority of the public believes the expected benefits of science, biotechnology, and genetic engineering are sufficient to outweigh the risks.**