Genetically Engineered "Foods for Health": Are We Asking the Right (Ethical) Questions?

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My purpose is to discuss the ethics of genetically engineered foods for health (GE foods for health, GE foods). Ethical questions about agricultural biotechnology in general, and about specific applications, such as biofuels and biomaterials, have been addressed in previous NABC meetings. These have included considerations of environmental safety, research ethics, and socioeconomic concerns such as power and control in the food system (*e.g.* Thompson, 2000; Comstock, 2001). I want to focus on a different kind—perhaps a different order—of questions associated with ethics and agricultural biotechnology. These concern the basic ethical legitimacy of GE foods for health. Simply put, are these GE foods ethically justifiable? The importance of this issue stems from the increasing human and financial resources that are being committed to research and development on GE foods. Yet, most people in the food biotechnology establishment have never asked whether this R&D is ethically justifiable in the first place. Indeed, most appear to *assume* that GE foods are ethically justifiable or legitimate. This assumption may not be legitimate, even if science generally is ethically justifiable and some other applications of biotechnology are also legitimate. If GE foods are ethically justifiable, the biotechnology establishment will have to accept the ethical responsibility to prove that they are. This, however, implies that some other questions, specifically concerning the ethical responsibilities of those in the biotechnology establishment, need to be addressed.

Ethical Questions

Basic ethical questions are normative and critical. They ask for *justifications* for actions, for the principles or reasons why we should or should not do certain things. Ethical questions demand reflection on our principles and values, on the way we live our lives, and how we interact among ourselves as we go about our business. Critical ethical reflection should give us answers to the following questions:

1. Should we genetically engineer foods to produce health- and nutrition-enhancing traits?
2. Are we ethically justified in doing so?
3. And, most importantly, why are we ethically justified in this work—that is, on what principled basis?

There are two main kinds of ethical principles that can be employed to justify and critique actions and /or practices: *Consequentialist* and *Intentionalist*. Consequentialist ethical principles assess actions or practices in terms of their outcomes. Accordingly, good outcomes justify an action, bad outcomes condemn it. How "good" and "bad" are defined is, of course, critical, though most ethicists interpret good in terms of benefits and bad in terms of costs or risks. It is important to note that consequentialist ethics stand in contrast to intentionalist ethics (technically, *deontological* ethics). Intentionalist principles judge actions in terms of their consonance with a pre-determined set of duties or virtuous character traits. Intentionalist justifications undertake to show that people have followed or tried to follow what ethical principles demand. When people do their duty, they are justified; when they stray from acting on principle, they are wrong.

Before we can ask whether GE foods are ethically justifiable, we need to ask on what ethical basis science in general is to be judged. This is important, because science is usually regarded as ethically neutral. Science generates knowledge and technology, and it is only after the results of scientific practice are in the public arena that questions can be raised as to their ethical justifiability. But this is precisely the point. While the ethical neutrality of science may be a goal or ideal, in fact we judge science by its results or outcomes. Indeed, scientists appear to want their work to be judged by its fruits. There is some consensus among ethical analysts that the very nature of modern science—institutionalized, corporate, product-driven—demands that we focus on outcomes or products as a way of determining whether the scientific enterprise is ethically sound, since it is difficult, if not impossible, to discern intentions to be dutiful or virtuous. The ethical basis for judging science must, therefore, be a consequentialist ethical principle: science is justified when its outcomes are justifiable. Usually, this means when its consequences are beneficial. When science confers benefits that outweigh costs or override risks, it is considered to be engaged in justifiable practices. When it does not confer benefits, ethical questions remain (Burkhardt, 1992). As much as we may want science to conform to predetermined ethical principles or virtues such as the Golden Rule or the Hippocratic Oath, in fact we judge it by its results.

There is consensus among ethical analysts—echoed by many scientists and endorsed by the public—that science has *prima facie* ethical legitimacy. Science has produced knowledge and technologies whose benefits are clear and

outweigh any relevant costs or risks. Certainly, on occasion, science has generated outcomes of a less-than-clearly-beneficial nature. Overall, however, it has succeeded in an ethical sense. The importance of this ethical legitimacy cannot be overstated, because it confers on the larger scientific enterprise an ethical "high ground" from which scientists and research administrators can defend themselves from critics, and command resources and moral support from the public. Surveys have shown a general trust of university scientists and medical people, providing some support for this claim. This is because the public believes that science has justified itself through what it has delivered (NSF, 2000). For the past several years, researchers engaged in biotechnology have been making a bid for the same ethical justifiability and public credibility, which has met with less success. Ultimately, the outcome of this attempt will depend on benefits actually delivered.

Indeed, the question is whether a currently proposed set of products—GE foods for health—is ethically justifiable. According to consequentialism, actions are ethical only if they provide benefits that outweigh costs and minimize risks. Products that are the outcomes of those actions are legitimate only if they are truly beneficial. *Are* GE foods beneficial? The problem is, we cannot answer that question, since GE foods do not yet exist in a real-world context in which to judge their benefits.

We can, however, ask a similar question about GE products currently on the market and extrapolate an answer for foods for health. Consider two types of current GE products: in the medical arena, human insulin and in agriculture, *Bt* corn. Are these products ethically acceptable, meaning, are they beneficial? If so, the actions of those who researched, developed, commercialized and marketed them are (were) justifiable.

Regarding GE human insulin, I think the answer is yes. Genetic engineering has resulted in a product that serves a significant portion of the public, without risk or benefit to the rest of society, and with only minimal (if any) risk to the consumer. The benefits conferred far outweigh any risks. We might even make the case that once scientists knew how to engineer bacteria to produce human insulin, they were ethically obliged to do so.

Bt corn appears to be less unequivocal as to benefit/cost/risk assessment. This is not to say that it is ethically unacceptable. There are ongoing debates about environmental and economic risks, and questions as to farmers' ability to sell *Bt* crops. This may be a situation in which differing parties to the debates have different understanding of what counts as a benefit and what counts as a cost or risk. The point is that a consequentialist ethical principle such as "provide benefits greater than risks" demands that "benefits greater than risks" must be proven unequivocally for the action or product under consideration to be ethically justified.

This points to an important concern regarding the ethics of GE foods for health. If consequentialist ethics demand actual benefit/risk/cost calculation in

order for an action to be justified, future products of genetic engineering cannot (yet) be subject to an ethical judgement. It would appear that we cannot answer the question, "Is research and development of GE foods for health ethically justifiable?" Yet, given the clearly positive connotation of the term "foods for health" and the clearly beneficial nature of the kinds of GE foods that have been proposed, biotechnologists, nutritionists, farmers, and many others want to answer that question with a resounding "Yes!" Despite hopes and visions of a hunger-free world and universal health, ethics demand that some principled reason be given for that answer. This reason can be found in what I refer to as the "Future Benefits" argument.

The Future Benefits Argument

The vision and hopes associated with GE foods for health are occasionally framed in terms of slogans proclaiming "the promise of biotechnology." There is actually a philosophically sophisticated and potentially powerful argument that underlies the slogan. This argument might provide an ethical justification for the actions of people in the agricultural and scientific communities who not only believe that pursuit of products such as the "foods for health" is ethically justifiable but that it is obligatory. In one form, the "Future Benefits" argument is as follows (Burkhardt, 2001):

1. Technologies intended to provide benefits in the future are ethically justifiable if they will provide benefits that outweigh risks/costs.
2. Agricultural biotechnology will provide benefits in the future that outweigh risks/costs.
3. Therefore, current agricultural biotechnology R&D is ethically justifiable.

Two things are initially worth noting. First, Premise 1 is a general principle that establishes conditions on ethical acceptability or justifiability. Second, Premise 1 is a consequentialist principle, concerned with the outcomes of (future) actions or, in this case, technology products. This is important because it means that ethical justifiability depends on benefits actually being conferred that outweigh risks or costs. It further means that the conclusion, *i.e.* that current research and product development is ethically acceptable, depends on those benefits actually being conferred. The onus is on what the second premise actually means.

In the way that it is stated, Premise 2 looks like a prediction, an answer to several of the "can" and "will" questions found in the conference program. This begs the question, "What will it take for Premise 2 to come true?"

Charles Arntzen (2002) noted several hurdles that must be overcome for the hope of medicine's and agriculture's merger to be fulfilled, and I will not dwell on them. Still, we must note that the first and foremost condition for functional foods to become a reality is that scientists succeed in their individual and collective enterprises. Crops must be transformed so that health and nutritional

properties can be added or enhanced, or allergenic properties eliminated. Beneficial traits must be introduced or enhanced in crops that people already consume or will readily adjust to consuming. There will have to be legal and institutional successes as well, as Gregory Jaffe (2002) has pointed out. The patent process will have to be successfully negotiated both domestically and internationally. Differences in the cultures that prevail in medical/health/nutritional research, agriculture, and agricultural research will have to be worked through. Corporations involved in everything from life-sciences research to marketing seed may have to adjust to the realities of dealing with perhaps numerous federal, regional, state/provincial or even local bodies such as health departments rather than just one or two federal government agencies. Ultimately, consumers will have to accept the new foods. Furthermore, the products must be such that their first consumer, the farmer, can easily adapt and grow the crops. For example, protein-enriched wheat that requires excessive inputs of, say, water or a grower's time, without there being a concomitant price increase, would never succeed.

GE foods for health will ultimately have to reach, and be accepted by, the ordinary consumer. This means that these foods will have to be compatible with consumers' tastes and preferences, lifestyles, and basic values. Most importantly, these foods will have to be available and affordable, or they will fail. Even if they are inexpensive, nutritious, delicious, allergen-free, disease-curing, *etc.*, possessing all of the health-positive characteristics we currently envision, if they fail in the marketplace they will fail to confer the benefits necessary to make their present development ethically justifiable. In other words, GE foods will actually have to be beneficial in order for them to be ethical. Will they be beneficial? Will they succeed at each step in the chain, from the laboratory, through regulatory assessment, through farmers' fields, to the dinner table? Although social scientists can offer some assurances about the future, most would concede that they can predict only broad social trends or patterns. Since science, law, agriculture, and economics are all human enterprises, predictions about the benefits of future foods for health are uncertain.

If we cannot reasonably predict that agricultural biotechnology will confer benefits in the future, the Future Benefits argument fails, leaving the conclusion without foundation. If biotechnology will not confer future benefits, then, in terms of consequentialist ethics, current research and development are not ethically justifiable.

Clearly, this conclusion contradicts what most of us believe about future foods for health and about current work being done to produce them. It certainly contradicts what most of us *hope* about them. The above conclusion suggests, however, that we might want to interpret the Future Benefits argument's Premise 2—agriculture biotechnology will provide benefits in the future—not as a prediction, but as a promise. There has certainly been enough *rhetoric* about the "Promise of Biotechnology." Perhaps it is time to interpret

that "promise" not in terms of *potential*, but as an *ethical commitment*. As such, "agricultural biotechnology will provide benefits in the future" *means* that those who engage in it place themselves under an ethical obligation to guarantee, as far as it is within their power, that benefits are actually conferred sometime in the future. Since "agricultural biotechnology" means the whole food biotechnology establishment—all the individuals and institutions that surround the conceptualization, research, development, marketing, *etc*.—this also includes those in the medical/health/nutritional establishment engaged in this enterprise.

The Promise of Biotechnology

The "Promise of Biotechnology," so understood, immediately leads to another set of ethical questions, and to many scientific and social-political-economic questions that follow from them. Promises or commitments are only as good as the possibility of their being carried out. One question that immediately arises is thus: "What should one do to guarantee that benefits result from one's work in this enterprise?" This may appear to be a scientific question—*e.g.*, "What will make this plant species exhibit this trait?"—and this is certainly relevant. More to the point, however, are questions that address social-political-economic concerns: "What future institutional or historical or economic conditions must be in place for the benefits of GE foods for health to be fully realized?" "What must we do to ensure, strengthen, or change institutions so that benefits are realized?" These questions follow from a prior commitment to help bring about the "promised" benefits of GE foods for health.

One standard argument used to justify the high prices of prescription drugs is the cost of producing them. These costs include everything from basic laboratory research to obtaining patents, to passing regulatory requirements concerning utility and safety, to marketing. People in poverty and those on fixed incomes might begrudge pharmaceutical companies the high costs of health-preserving and lifesaving medications. In a comparatively free-market context, however, it is not the pharmaceutical companies' responsibilities to ensure affordability. Governments, employers, or individuals must shoulder the burden if everyone who needs medications is to receive them.

We have reached a situation in which conditions are ripe for the same thing to happen with food, especially new disease-fighting or nutrition-enhancing foods for health. Similar institutional R&D, patenting, regulatory and production costs will occur, and we must also include the farmer's livelihood as an additional cost. If we are to fulfill our "promise of biotechnology," it seems to be implied that we—whoever can affect such things—must attempt to make sure that legal-economic conditions exist so that the new foods are available and affordable, especially to those who need them most. Some may believe that asking this is outside the province of science. The response is that the Future Benefits argument is sound only insofar as the promises it entails are kept.

Conclusion: Keeping Promises

Recently, Norman Borlaug (2000) offered the argument that we *must* pursue agricultural biotechnology as a matter of humanitarian duty. Although his focus was not GE foods for health, he was referring to one problem that at least one "food for health"—golden rice—is meant to address: improved nutrition for the world's ever-increasing population. It is hard to deny Borlaug's assessment that agriculture will not be able to provide enough food without increasing the use of biotechnology. Nevertheless, what he and many others fail to acknowledge is that even if we were to produce enough food, poverty, economic underdevelopment, and unjust political regimes would prevent people who need it from growing and/or obtaining it. If the benefits of GE foods for health, or any other product of agricultural biotechnology, are to be made available to the starving populations of less-developed nations (and the poor in North America as well), political conditions must change. Therefore, it is appropriate and even imperative that we ask another ethical question: "How can we bring about international economic justice so that the results of our science can truly benefit humankind?" The social power of science—and of scientists worldwide—is such that many small efforts in this regard may yield large payoffs.

Jawaharlal Nehru (1960) wrote:

> *It is science alone that can solve the problems of hunger and poverty, of insanitation and illiteracy, of superstition and deadening custom and tradition, of vast resources running to waste, of a rich country inhabited by starving people. Who indeed could afford to ignore science today? At every turn we seek its aid.*

The power of science, especially genetic engineering, and its capacity to solve human problems, seems to establish a *noblesse oblige* that we are not entitled to ignore or leave to others—or impersonal market forces—to carry out. If this appears to overstep the so-called ethical neutrality of science, the presumed ethical neutrality of those of us in the scientific establishment, so be it. If science—and now genetic engineering—wants to be judged positively by the fruits of its labors, we cannot simply cast the fruit on the market, or to the public, and expect that it will necessarily confer positive results. Rather, we must tend the fruit, and watch it and guide it, so that we can ultimately say that this work is indeed ethically justifiable.

References

Arntzen C (2002) Technology progression in plants used for food and medicine. This volume 43–50.

Borlaug N (2000) Ending world hunger: the promise of biotechnology and the threat of antiscience zealotry. Plant Physiology 124 487–490.

Burkhardt J (1992) On the ethics of technical change: The case of bST. Technology and Society 14 (Fall) 221–243.

Burkhardt J (2001) Agricultural biotechnology and the future benefits argument. Journal of Agricultural and Environmental Ethics 14 2.
Comstock G (2001) Ethics and genetically modified foods, in NACB Report 13: Genetically Modified Food and the Consumer (Eaglesham A *et al*. eds.) 181–200. Ithaca, NY: National Agricultural Biotechnology Council.
Jaffe G (2002) How to approach the regulatory conundrum? This volume 51–60.
National Science Foundation (2000) Attitudes of Scientists, Legislators, and the Public Toward Science and Technology. http://www.nsf.gov/sbe/srs/seind00/access/c8/c8s2.htm#attitude
Nehru J (1960) Quotation from Sorell T (1991) Scientism. London: Routledge.
Thompson PB (2000) Bioethics issues in a biobased economy, in NABC Report 12: The Biobased Economy of the Twenty-First Century: Agriculture Expanding into Health, Energy, Chemicals, and Materials (Eaglesham A *et al*. eds.) 113–121. Ithaca, NY: National Agricultural Biotechnology Council.