CHAPTER 1

I. The Federal Framework for the Regulation of Biotechnology

A. Scope

This deskbook is designed to provide a comprehensive overview of the federal laws and regulations that apply to those genetically modified organisms produced through recombinant deoxyribonucleic acid (rDNA) technology which are not drugs. These organisms are being designed for use in agriculture (food and materials production), forestry, environmental remediation, and a variety of industrial applications. Examples include genetically engineered enzymes, biopesticides, plants that either express their own insect repellents or are engineered to survive herbicide application, trees and bacteria designed for bioremediation, transgenic fish that grow faster and quicker, plants or animals capable of producing pharmaceuticals, and foods modified to provide greater nutrient value.

As commercialized, most of these organisms will live, grow, and perform their intended function outside of the scientific laboratory or traditional manufacturing plant. All present issues relating to their potential to create unreasonable risk for human health or the environment. There is, however, no single comprehensive U.S. biotechnology law that provides a uniform process for evaluating such risks or a uniform standard for risk management decisions prior to commercialization. A number of different federal laws apply, depending on the intended use of the organism. This means that commercialization will likely trigger the jurisdiction of several different agencies, most commonly including the U.S. Department of Agriculture (UDSA), the U.S. Environmental Protection Agency (EPA), or the Food and Drug Administration (FDA). Where release into the environment raises potential issues for endangered species, or for migratory birds, the U.S. Department of the Interior (DOI) will also have a significant role.

The relationship and coordination of these authorities is governed by the policy statements contained in the 1986 *Coordinated Framework for the Regulation of Biotechnology (Framework)*[1] and the 1992 *Policy on Planned Introductions of Biotechnology Products Into the Environment (Planned Introductions)*.[2] Both of these policy statements were developed by an interagency task force working under the direction of the White House Office of Science and Technology Policy (OSTP). The individual and collective experience of the primary agencies of jurisdiction has also been translated into a substantial body of regulation and guidance for particular types of organisms.[3] Recent case studies of the path to commercialization for a variety of genetically modified organisms provide additional examples of the application of these laws within the *Framework* umbrella. These case studies also highlight the increasing complexity of federal reviews and the implication of more and more of the primary environmental and natural resources laws.

This chapter will provide an overview of the *Framework* and subsequent guidance on the planned release of genetically modified organisms into the environment. The next chapter will describe the role of the National Environmental Policy Act (NEPA) in assuring full consideration of environmental effects of releases. Chapters 3 through 7 will deal with the current regulatory programs of the FDA, the USDA, and EPA. Chapter 8 will address liability and enforcement issues.

This deskbook will not address the numerous other legal topics in the field of biotechnology. These include ethics, patents, and international law, each of which could be the subject of a separate deskbook.[4]

B. The Coordinated Framework for the Regulation of Biotechnology

The 1986 *Framework* is the product of a series of discussions in the early 1980s about the legal rules which should apply to the commercialization of products of biotechnology. In 1980, the U.S. Supreme Court held for the first time that a living bacteria, engineered by human invention to do a better job of cleaning up oil, could be patented.[5] This decision opened the door to expansive intellectual property rights in genetically engineered organisms. Other new applications of biotechnology to produce new and improved

1. Coordinated Framework for Regulation of Biotechnology, 51 Fed. Reg. 23302 (June 26, 1986).
2. Exercise of Federal Oversight Within Scope of Statutory Authority: Planned Introductions of Biotechnology Products Into the Environment, 57 Fed. Reg. 6753 (Feb. 27, 1992).
3. Each of the primary federal regulatory agencies has a website providing historic and current information on its activities with relation to the regulation of biotechnology. These include: http://www.aphis.usda.gov/bbep (USDA); http://fda.gov/biotechn.html (FDA); and http://www.epa.gov/pesticides/biopesticides and http://www.epa.gov/opptintr/biotech/index.html (EPA) (last visited July 20, 2001).
4. Ethical issues play a major role in the formulation of biotechnology policy, the use of biotechnology to create living organisms, and the need for privacy in genetic testing. Several excellent websites addressing ethical issues include http://www.ethics.ubc.ca/brynw/ (The Centre for Applied Ethics, University of British Columbia (last visited July 20, 2001) and http://www.ajobonline.com/beginners.php (The American Journal of Bioethics Online) (last visited July 20, 2001). Patent law developments have opened the door to new intellectual property rights in intergeneric bacteria, plants, and animals. An important and unresolved constitutional issue relates to how much human genetic material will render a transgenic animal unpatentable under the Thirteenth Amendment. *See, e.g.*, Animal Legal Defense Fund v. Quigg, 932 F.2d 920 (Fed. Cir. 1991); Richard Maulsby, Facts on Patenting Life Forms Having a Relationship to Humans (unpublished manuscript), *available at* http://uspto.gov/web/offices/com/speeches/98-06.htm (last visited July 20, 2001). An excellent introduction to the developing area of international law in this field can be found in Jim Chen, *Diversity and Deadlock: Transcending Conventional Wisdom on the Relationship Between Biological Diversity and Intellectual Property*, 31 ELR 10625 (June 2001). The website of the European Union, http://www.europa.eu.int/index-en.htm (last visited July 20, 2001) provides a good source of up-to-date information on the regulation of biotechnology in Europe.
5. Diamond v. Cakrabarty, 447 U.S. 303 (1980).

drugs, enhance plant and animal productivity, and convert biomass to energy were rapidly appearing. The technology was viewed as vitally important to U.S. competitiveness. It also appeared to promise opportunities to reduce the environmental impact of many existing practices, such as the extensive use of chemical pesticides.

At the same time, legitimate safety concerns were being raised associated with the movement of genetically modified organisms out of the laboratory and into the environment. The National Institutes of Health's (NIH's) *Guidelines for Research Involving Recombinant DNA Molecules (Guidelines)*[6] had, as published in 1976, listed environmental release as a prohibited form of experimentation, although this provision had been liberalized to allow for such research with approvals.[7] What was the effect of the genetic manipulation on the potential virulence of the altered organisms? Would the new organisms obtain a selective advantage? Was there an adequate safety net in place to assure appropriate safeguards for human health and the environment?

1. The 1984 Proposal

In response to these issues, an interagency working group was formed under the White House Cabinet Council on Natural Resources and the Environment to evaluate the adequacy of the health and environmental safety review in the regulatory processes applicable to the variety of new organisms.[8] The workgroup's evaluation and recommendations were published in late 1984 as a *Proposal for a Coordinated Framework for Regulation of Biotechnology*.[9] This proposal included:

- A 19-page index matrix of existing federal laws applicable to licensing and other premarketing requirements, post-marketing requirements (safety, manufacturing, reporting requirements, transportation, and disposal), export controls, research and information-gathering authorities, patents, air and water emissions, and requirements applicable to federal agencies[10];
- Proposed regulatory policies of the FDA,[11] EPA,[12] and the USDA[13] on the review of research and products of biotechnology;
- A proposed scientific advisory mechanism for coordinating responses to scientific questions raised by applications received by the various involved agencies (establishment of agency-specific advisory committees on biotechnology)[14]; and
- A proposal for interagency coordination of regulatory activities related to biotechnology.[15]

The legal matrix, as suggested by the comprehensive nature of the categories described above, is a cradle-to-grave approach to coverage. Of particular interest for this deskbook are three of the seven categories—licensing and premarketing review, post-marketing requirements, and requirements for federal agencies. The laws identified include:

- *Licensing and Premarket Review*: The Federal Food, Drug, and Cosmetic Act (FFDCA) (drugs, medical devices, food and color additives, and human drugs)[16]; the Public Health Service Act (PHS) (licensing requirements for human biologics and clinical laboratories engaged in interstate commerce)[17]; the Virus-Serum-Toxin Act) (licenses for products used in the treatment of animals shipped interstate or imported)[18]; the Toxic Substances Control Act (TSCA) (premanufacture review of new chemical substances and authorizes regulation of new and existing substances)[19]; and the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) (premarket registration of all pesticides).[20]
- *Post-Marketing Requirements*: The Occupational Safety and Health Act (OSH Act)[21]; worker protection regulations and guidances; hazardous substance and waste management laws including the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)[22]; the Resource Conservation and Recovery Act (RCRA)[23]; the Marine Protection, Research, and Sanctuaries Act (Ocean Dumping)[24]; and other containment laws such as the Federal Meat Inspection Act (FMIA)[25]; the Poultry and Poultry Products Inspection Act (PPIA)[26]; the Federal Plant Pest Act (FPPA)[27]; the Plant Quarantine Act (PQA)[28]; the Animal Quarantine Laws,[29] and the Hazardous Materials Transportation Act (HMTA).[30]
- *Requirements for Federal Agencies*: Two key laws are identified in this section. These are NEPA,[31] which requires all agencies to conduct environmental impact statements on "major federal actions significantly affecting the environment."

6. Guidelines for Research Involving Recombinant DNA Molecules, 51 Fed. Reg. 16958 (May 7, 1986) (originally published at 41 Fed. Reg. 27902 (July 7, 1976)).
7. For a history of the maturation of these *Guidelines* as they apply to environmental releases, see the discussion in Foundation on Econ. Trends v. Heckler, 756 F.2d 143, 15 ELR 20248 (D.C. Cir. 1985).
8. Proposal for a Coordinated Framework for Regulation of Biotechnology, 49 Fed. Reg. 50856 (Dec. 31, 1984).
9. *Id.*
10. *Id.* at 50858-77.
11. *Id.* at 50878-80.
12. *Id.* at 50888-97.
13. *Id.* at 50897-904.
14. *Id.* at 50905.
15. *Id.*
16. 21 U.S.C. §301 et seq.
17. 42 U.S.C. §§262, 263a.
18. 21 U.S.C. §151 et seq.
19. 15 U.S.C. §2601 et seq.
20. 7 U.S.C. §§136-136y, ELR STAT. FIFRA §§2-34.
21. 29 U.S.C. §651 et seq.
22. 42 U.S.C. §§9601-9675, ELR STAT. CERCLA §§101-405.
23. *Id.* §§6901-6992k, ELR STAT. RCRA §§1001-11011.
24. 33 U.S.C. §1401 et seq.
25. 21 U.S.C. §601 et seq.
26. *Id.* §451 et seq.
27. 7 U.S.C. §§150aa-jj.
28. 39 U.S.C. §3014.
29. 21 U.S.C. §101 et seq. and 19 U.S.C. §1306.
30. 49 U.S.C. §5101 et seq.
31. 42 U.S.C. §§4321-4370d, ELR STAT. NEPA §§2-209.

The second is the Endangered Species Act (ESA).[32] This legislation requires federal agencies to ensure that their activities or programs will not jeopardize the continued existence of a listed species. Consultation is required with the DOI or the National Marine Fisheries Service (NMFS).

In general, the sense of the proposal offered for comment was that existing authorities were sufficient to address the potential risks presented by products of biotechnology. These should be evaluated on a case-by-case basis drawing on the expertise of the particular agency involved in the area, and new or revised authorities developed as needed. Several key themes in the *Framework* include the reminder that biological manipulation in agriculture is well known and understood; it was important not to hobble innovation through unreasonably restrictive regulatory measures; and that interagency coordination could ease the difficulty of dealing with multiple agencies.

2. Establishment of the Biotechnology Science Coordinating Committee (BSCC) and Finalization of the Statutory Matrix

The proposed *Framework* was finalized in two installments. The first, which occurred on November 15, 1985, finalized the legal matrix.[33] It also identified the agency-specific advisory committees which would advise on biotechnology issues. And it established the BSCC, as an interagency coordinating committee. In order to assure independence from any individual agency, the BSCC was created as a committee to the Federal Coordinating Council for Science, Engineering, and Technology (FCCSET). The FCCSET is the statutory interagency coordinating mechanism housed within the OSTP. The BSCC's charter provides that it would:

- Serve as a coordinating forum for addressing scientific problems, sharing information, and developing consensus;
- Promote consistency in the development of federal agencies' review procedures and assessments;
- Facilitate continuing cooperation among federal agencies on emerging scientific issues; and
- Identify gaps in scientific knowledge.[34]

3. The 1986 *Framework*

In 1986, the remainder of the *Framework* was finalized, including the general principles for its application, and statements of agency policy from the FDA, the USDA, EPA, the Occupational Safety and Health Administration (OSHA), and NIH. The essential policy finding of the *Framework* is that commercialization could safely proceed under the framework of existing law because:

- The biotechnology methods by which the new products are created do not themselves create special risks;
- Use of existing laws provides more immediate regulatory protection and certainty for the industry than possible with the implementation of new laws; and
- No alternative, uniform statutory approach appears reasonable since the broad spectrum of regulated products cuts across many product uses regulated by different agencies.[35]

The *Framework* is designed to accommodate and harmonize the differing legal authorities of the agencies, create common terminology, and assure similarly protective reviews.

a. Definition of "Intergeneric" and "Pathogen"

The *Framework* proposed that the types of products deserving special evaluation under the *Framework* should be those which are "intergeneric" and "pathogenic." Intergeneric organisms are those formed by "deliberate combination of genetic material from sources in different genera."[36] Intergeneric materials that are well-characterized and contain only noncoding regulatory regions would be exempt from this definition. A "pathogen" is a virus or microorganism (including its viruses and plasmids, if any) that has the ability to cause disease in other living organisms (humans, animals, plants, microorganisms).[37] Nonpathogenic strains of a species which contains pathogenic strains would be exempt (such as *Escherichia coli* (e. coli) K-12).

In addition the *Framework* notes that a definition of "release into the environment" was needed and that a working group on greenhouse containment and small field trials had been established. The group was tasked with exploration of both physical and biological "containment" mechanisms.[38]

4. Agency Statements of Policy

a. FDA Statement of Policy for FFDCA-Regulated Foods

The FDA stated that its administrative review of the products of biotechnology under the FFDCA[39] would be conducted in light of the intended use of products on a case-by-case basis. Although the FDA noted that the rDNA technology was capable of producing foods and food additives with new structural features or could introduce new contaminants affecting safety, efficacy, and stability, these could all be addressed within its current procedures. New administrative procedures based on generic concerns about biotechnology were not considered to be necessary. The

32. 16 U.S.C. §§1531-1544, ELR STAT. ESA §§2-18.

33. Coordinated Framework for Regulation of Biotechnology; Establishment of Biotechnology Science Coordinating Committee, 50 Fed. Reg. 47174, 47177 (Nov. 14, 1985). The regulatory matrix is found at Appendix II. Individual statutes are discussed in detail in Chapters 3-8.

34. *Id.* at 47174-75. Under the Clinton Administration, the FCCSET became the National Science and Technology Council (NSTC). The Committee on Science of NSTC has a subcommittee which addresses biotechnology issues. *See* http://www.ostp.gov/NSTC/html/nstc_comm.html (last visited July 20, 2001).

35. 51 Fed. Reg. at 23303.

36. *Id.* at 23307.

37. *Id.*

38. *Id.* at 23308.

39. 21 U.S.C. §§301-397.

FDA further noted the application of NEPA to any of its major actions significantly affecting the environment.[40]

b. EPA Statement of Policy for FIFRA and TSCA

EPA's jurisdiction over products of biotechnology is derived from FIFRA and TSCA. In its statement of policy, EPA announced that it would focus its authorities under both laws on microorganisms which are (1) used in the environment, (2) are pathogenic or contain genetic material from pathogens, or (3) contain new combinations of traits.[41] EPA also announced the following requirements for microbial products subject to FIFRA or TSCA jurisdiction:

- Deliberately formed intergeneric microorganisms will be subject to review before any environmental releases (including small-scale field testing and other environmental research and development);
- Other microorganisms formed by genetic engineering will be subject to pre-release review under FIFRA or TSCA if any source organism is a pathogen; and
- Reporting requirements under TSCA substantial risk and FIFRA unreasonable risk information provisions are applicable.

c. USDA Statement of Policy

The USDA's policy statement essentially provides its view that agriculture and forestry products developed through biotechnology will not differ fundamentally from conventional products and that the existing framework will be adequate. It is noted that its guidelines for research paralleled those of NIH. It also announced new regulations on notifications for biotechnology products which were published as a companion rule.[42]

d. OSHA Statement of Policy

OSHA determined in its statement of policy that its existing statutory authorities and implementing regulations were sufficient to address any occupational safety and health issues that might arise for workers dealing with products of biotechnology. These authorities included the general duty provision of the law, which provides that employers have a general duty to provide a workplace "free from recognized hazards that are causing or are likely to cause death or serious physical harm."[43] In addition, OSHA expressed the view that any particular hazards were likely to arise from chemicals involved in the production of genetically modified organisms and not the organisms themselves. OSHA identified a series of specific standards in place to protect against specific workplace problems, including

- Specific air contaminants,
- Access to employee exposure and medical records,
- Hazard communication,
- Exposure to toxic chemicals in laboratories,
- Respiratory protection, and
- General safety standards.

e. NIH Statement of Policy

NIH's statement of policy relates to the application of the *Guidelines*. The *Guidelines*, originally developed in 1976, apply to research using rDNA technology which is funded in whole or in part by NIH. They provide definitions of physical and biological containment (Biosafety Levels 1–4) and a risk-based hierarchical procedure for approval of experiments, ranging from experiments that are exempt to those for which notification simultaneous with initiation are required, to experiments requiring preapproval by an Institutional Biosafety Committee (IBC) to those requiring review by the NIH Recombinant DNA Advisory Committee (RAC) and approval by NIH and the IBC and publication in the *Federal Register*.

The *Guidelines*, although legally applicable only to NIH-sponsored research, were widely used as guides for research. The regulations at the time placed experiments involving the "deliberate release into the environment of any organism containing recombinant DNA, except [certain listed] plants" in III-A-2, a category requiring RAC review and NIH/IBC approval to the extent conducted with federal funds.[44] NIH's policy statement notes that if such experiments are submitted to other agencies for review and NIH is notified, it may determine that the other agency's review serves the same purpose and waive its review.[45]

C. Field Research: The 1992 OSTP Planned Introductions

Almost immediately upon the conclusion of the *Framework*, the OSTP turned its attention to the issue of standardizing requirements for planned introduction where the implementing legislation left such decisions to the discretion of the administering agency. The *Principles for Federal Oversight of Biotechnology: Planned Introduction Into the Environment of Organisms With Modified Hereditary Traits* were announced on July 31, 1990.[46] These provide that planned introductions into the environment of organisms which deliberately modified hereditary traits should *not* be subject to oversight (defined as notification to, approval by, or other review by a federal agency), unless information concerning the risk posed by the introduction indicates that oversight is necessary.[47]

Introductions are considered similar to those previously made when the level of risk of the introduction is comparable. Based on experience with introduction, the principles encourage agencies to develop categories of introductions for exclusion from oversight. Six categories were suggested, several based on the type of modifications, e.g., selective breeding, transformation, deletions, and use of noncoding marker genes, and one based on risk (risk no greater than that of unmodified parent organisms).

40. 51 Fed. Reg. at 23313.
41. *Id.* at 23315.
42. *Id.* at 23302.
43. 29 U.S.C. §654(a)(1); 51 Fed. Reg. at 23348.
44. As appears in 51 Fed. Reg. 16958 (May 7, 1986).
45. 51 Fed. Reg. at 23350.
46. Planned Introduction Into the Environment of Organisms With Modified Hereditary Traits, 55 Fed. Reg. 31118 (July 31, 1990).
47. *Id.* at 31120.

Risk-based factors for evaluation for both organisms and the target environment are identified.[48] In 1992, the OSTP issued a final policy incorporating these principles with minor revisions.[49] The final policy announced three fundamental scope principles. These are:

- A decision to exercise oversight within the scope of discretion afforded by statute should not turn on the fact that an organism has been modified or modified by a particular process or technique, because such fact is not alone a sufficient indication of risk.
- A decision to exercise oversight in the scope of discretion afforded by statute should be based on evidence that the risk presented by introduction of an organism in a particular environment used for a particular type of application is unreasonable.
- Organisms with new phenotypic traits conferring no greater risk to the target environment than the parental organisms should be subject to a level of oversight no greater than that associated with the unmodified organisms.[50]

The primary changes made to the final policy included the recognition that a number of different types of oversight were available—ranging from no action to full pre-release approval processes. In addition, examples of categories for exclusion were taken out of the policy—and development of appropriate exclusions left to the agencies. The standard given to the agencies was described as follows:

> Unreasonable risk is the threshold for exercising oversight within the scope of discretion afforded by statute. The term does not denote a fixed absolute number. Rather, a risk is "unreasonable" where the environmental benefits achieved by oversight measures to reduce the risk are greater than the social cost of those oversight measures.[51]

D. The National Research Council (NRC) 2000 Report: Genetically Modified Pest-Protected Plants

The NRC revisited issues in implementation of the *Framework* in a report issued in 2000.[52] The report notes that hundreds of decisions concerning environmental releases of genetically engineered products have now been made. It evaluates the operation of the *Framework* with respect to one particular type of product—plants that are engineered to express bT toxins to protect themselves from insects. Such plants are considered to be "pest-protected plants" and trigger the jurisdiction of the three major regulatory agencies, EPA, the USDA, and the FDA. EPA has jurisdiction to review the incorporated protectant as a pesticide under FIFRA. The USDA has jurisdiction to review the plant to assure that it is not a plant pest. The FDA has jurisdiction over the food produced by the plant to assure that it is safe and not adulterated.

The subject of how the agencies discharge their substantive reviews of these products is discussed in detail in the following chapters. In general, the NRC finds that toxicity, allergenicity, effects of gene flow, development of resistant pests, and effects on nontarget species are of concern for both conventional and transgenic pest-protected plants and encourages additional and comparable research on both. The NRC reaffirms the fundamental principles of the *Framework* and finds that EPA, the USDA, and the FDA have successfully applied existing statutes to address risks of introduction of new products of biotechnology. General recommendations for improvement include the following:

- The quantity, quality, and public accessibility of information on the regulation of products should be expanded;
- Ready access to information on product reviews and approvals and a meaningful opportunity for stakeholder participation are critical to the credibility of the regulatory process;
- A joint memorandum of understanding which provides guidance on the regulatory issues that are the purview of each agency and which may be joint issues (such as gene transfer for the USDA and EPA and allergenicity for EPA and the FDA) and provides a process for the timely exchange of information would be useful;
- A joint guidance document from the agency identifying common date and information needed to characterized products would be helpful;
- Nonregulatory mechanisms should be used to accomplish federal goals wherever possible;
- Greater process flexibility is desirable; and
- Work remains to be done to fill in gaps in the existing framework which become apparent as new issues emerge.

E. The OSTP/Council on Environmental Quality (CEQ) Case Studies

On May 3, 2000, President William J. Clinton directed the CEQ and the OSTP to "conduct a six-month interagency assessment of Federal environmental regulations pertaining to agricultural biotechnology and, if appropriate, make recommendations to improve them."[53] The assessment was intended to focus on environmental regulation—an area perceived to be not well understood. The case studies provide excellent descriptions of the regulatory path to market for a

48. For *organisms*, these include fitness, infectivity, virulence, pathogenicity, and toxicity; host range, the type of substrate or resources utilized; environmental limits to growth or resources utilized; environmental limits to growth or reproduction (habitat or microhabitat); susceptibility to control by antibiotics, biocides, by substrate or by mechanical means; and whether and how introduced traits are expressed.

    For the *target environment*, the factors include selection pressure for the introduced trait; presence of wild, weedy, or feral relatives within dispersal capability of the organism or its genes; presence of vectors or agents of dissemination or dispersal (e.g., mites, insects, rodents, birds, humans, machines, wind, and water); direct involvement in basic ecosystem process (e.g., nutrients cycling); whether there are alternative hosts or partners (e.g., the organism is involved in symbiosis or mutualism); range of environments for testing or use in light of potential geographic range; and effectiveness of confinement, monitoring, and migration plans.

49. 57 Fed. Reg. 6753 (Feb. 27, 1992).

50. *Id.* at 6757.

51. *Id.*

52. National Research Council, Genetically Modified Pest Protected Plants: Science and Regulation (2000).

53. Council on Environmental Quality and the Office of Science & Technology Policy, CEQ/OSTP Assessment: Case Studies of Environmental Regulation for Biotechnology 1 (2001).

variety of products, some of which have made it and some which are in early stage development. The term "agricultural biotechnology" is defined to include "the use in the environment of any organism that has been genetically modified using [rDNA] techniques." The term "environmental regulations" is defined to include certain aspects of confinement, as well as introduction into the environment without confinement.

There are six case studies, reprinted in the Appendix of this text, and four sidebars.[54] These are:

- *Salmon*: This case study involves the potential aquaculture production or importation of Atlantic salmon genetically engineered to contain an additional fish growth hormone gene that will make it grow faster. The genetic engineering causes the fish to contain a new animal drug which is regulated by the FDA, the agency with lead drafting authority for the case study. Net pen aquaculture provides a high opportunity for escape of fish into the wild, triggering concerns under the ESA and NEPA. Other applicable statutes include the Lacey Act, the Non-Indigenous Aquatic Nuisance Prevention and Control Act, and the §10 provisions of the Rivers and Harbors Act. A sidebar discussion of the commercialization of ornamental goldfish accompanies this case study. EPA's authorities under TSCA replace the FDA/FFDCA role in this sidebar.[55] Petitions seeking a thorough assessment of risks associated with commercialization of this species have recently been filed with both the FDA and the USDA.[56]
- *Bt (Bacillus thuringiensis)-Maize*: Bt-maize is in widespread use in the United States, and there has been much debate on its possible effects on nontarget species. Food safety issues have also been associated with the BtCry9D protein found in StarLink™ corn but that issue is not addressed in this case study. The primary statutes involved are FIFRA, the FFDCA, and the Plant Protection Act (PPA). The Migratory Bird Treaty Act (MBTA) and the ESA are also addressed. EPA was the lead drafting agency, with assistance from the Animal and Plant Health Inspection Service (APHIS) and the DOI. Sidebars evaluating biocontrol using a virus and genetically modified arthropods are also included. The FFDCA is not a relevant statute in this analysis.[57]
- *Herbicide-Tolerant Soybean:* This plant is also currently grown widely in the United States and has the potential to change the way in which herbicides are used to control weeds. The principle statutes involved here are the PPA, FIFRA, the FFDCA, and the ESA. APHIS was the drafting team leader, assisted by EPA and the DOI. A hypothetical pharmaceutical producing plant is included as a sidebar for comparison of different environmental exposure issues. This plant is evaluated under the Virus-Serum-Toxin Act (VSTA), the PHS, the FFDCA, the PPA, and NEPA. The FDA and APHIS prepared the case study.[58]
- *Animals Producing Human Drugs*: This hypothetical example evaluates a genetically engineered goat whose primary use is to produce pharmaceuticals. Primary statutes include the PHS, the FFDCA, and NEPA. The FDA, APHIS, and the Food Safety and Inspection Service (FSIS) drafted the study. A sidebar for animals used to produce animal biologics discusses the VSTA, the Animal Quarantine Laws, TSCA, and the Animal Welfare Act. APHIS, the FDA, and the FSIS drafted this case study.[59]
- *Bioremediation Using Poplar Trees*: This case study evaluates a poplar tree genetically modified to detoxify trichloroethylene (TCE), a common and widespread environmental contaminant. This tree is currently in research and development but is used to describe the environmental regulation and oversight of a perennial plant. The principle statutes involved are the PPA and TSCA. The role of compliance with remedy selection requirements of CERCLA are also discussed. The U.S. Forest Service, APHIS, EPA, and the DOI were on the drafting team.[60]
- *Bioremediation and Biosensing Using Bacteria*: This case study describes a TSCA premanufacture notice (PMN) filed in 1995 for a genetically modified bacteria used to detect and destroy concentrations of polycyclic aromatic hydrocarbons. The process resulted in a consent order defining terms under which the bacteria could be released in the field for developmental testing purposes at a single site and identified the outstanding risk questions that would need to be addressed prior to commercialization. The primary statute discussed in the case study is TSCA. EPA, the DOI, and APHIS were on the drafting team.[61]

54. These case studies are discussed in greater detail in subsequent chapters, in the context of the specific legal authorities involved. Each of the case studies is reproduced in the Appendix.
55. *Case Study No. I: Growth-Enhanced Salmon, at* http://www.ostp.gov/html/012201.html (last visited July 10, 2001).
56. *See Foes of Genetically Engineered Salmon Call for Close FDA Scrutiny of Risks*, WALL ST. J., May 10, 2001, at A20.
57. *Case Study No. II: Bt-Maize, at* http://www.ostp.gov/html/012201.html (last visited July 20, 2001).
58. *Case Study No. III: Herbicide-Tolerant Soybean, at* http://www.ostp.gov/html/012201.html (last visited July 20, 2001).
59. *Case Study No. IV: Farm Animal (Goat) That Produces Human Drugs, at* http://www.ostp.gov/html/012201.html (last visited July 20, 2001).
60. *Case Study No. V: Bioremediation Using Poplar Trees, at* http://www.ostp.gov/html/012201.html (last visited July 20, 2001).
61. *Case Study No. VI: Bioremediation and Biosensing Using Bacteria, at* http://www.ostp.gov/html/012201.html (last visited July 20, 2001).

CHAPTER 2

I. The Umbrella Function of NEPA

The 1986 *Framework*, as described in Chapter 1, identified two laws containing requirements applicable to all agencies reviewing biotechnology products. These laws are NEPA[1] and the ESA.[2] Litigation under NEPA has been instrumental in identifying critical issues of risk associated with the release of products of biotechnology into the environment. This chapter will provide a review of the NEPA process followed by an analysis of the NEPA case law dealing with biotechnology. It will also summarize the key provisions of the ESA and current issues arising under that law which relate to the commercialization of products of biotechnology, such as growth-enhanced salmon.

A. The Role of NEPA

NEPA requires that federal agencies publicly address the environmental impact of any of their proposals for action that may significantly affect the environment. Section 102 of NEPA compels agencies to develop methods and procedures that will ensure that "unquantified environmental amenities and values may be given appropriate consideration in decisionmaking."[3] Section 102 requires that, for "every recommendation or report on proposals for legislation and other major Federal actions significantly affecting the quality of the human environment," the responsible federal official must prepare a "detailed statement" covering five specific issues, including impacts, effects, and alternatives.[4] This detailed statement is commonly referred to as an environmental impact statement (EIS). It is typically preceded by a "rough-cut" assessment, or environmental assessment (EA), to determine whether a full-fledged EIS is necessary.

The EIS serves as both an aid in decisionmaking for the agency and as a source of information for other interested parties. It provides environmental source material for evaluating the benefit of the proposed project in light of its environmental risks and for comparing these to the environmental risks presented by alternative courses of action.[5] As the Supreme Court has stated:

> NEPA has twin aims. First, it places upon an agency the obligation to consider every significant aspect of the environmental impact of a proposed action. Second, it ensures that the agency will inform the public that it has indeed considered environmental concerns in the decisionmaking process.[6]

1. The CEQ

Section 202 of NEPA created the CEQ which consists of three members appointed by the president with advice and consent of the Senate.[7] The CEQ has a variety of functions. These include gathering and analyzing information concerning the quality of the environment, review and appraisal of federal programs and activities, development of recommendations for improving environmental quality, reviewing the adequacy of systems for monitoring environmental changes, and assisting efforts of federal agencies to develop programs related to environmental quality.[8]

2. NEPA Regulations

The regulations adopted by the CEQ for implementing NEPA are codified at 40 C.F.R. Parts 1500-1508. These regulations implement the EIS requirement and other NEPA requirements and generally address the way in which environmental considerations should be included in agency decisionmaking. Because NEPA does not give the CEQ authority to impose regulations on other federal agencies, some courts have held that the CEQ's regulations are not binding on agencies which have not expressly adopted them,[9] although courts are likely to pay substantial deference to the CEQ's interpretation of NEPA.[10] Moreover, almost all federal agencies have expressly adopted the CEQ's regulations.[11]

3. The Role of EPA

EPA reviews and comments upon all draft EIS officially filed with EPA and has established procedures governing this review and evaluation.[12] EPA seeks to participate early in the NEPA compliance efforts of other federal agencies in order to identify matters of concern at the earliest possible moment. Agencies are under a special obligation to provide draft EIS to EPA where the proposed action relates to air or water quality, noise abatement or control, pesticide regulation, solid waste disposal, radiation criteria and standards, or other areas in which EPA has jurisdiction. For example, §309 of the Clean Air Act (CAA) requires that EPA comment in writing on EIS and refer to the CEQ any matter determined to be unsatisfactory from a standpoint of public health or welfare or environmental quality. Thus, EPA comments on virtually every draft EIS.

1. 42 U.S.C. §§4321-4370d, ELR STAT. NEPA §§2-209.
2. 16 U.S.C. §§1531–1544, ELR STAT. ESA §§2-18.
3. 42 U.S.C. §4332, ELR STAT. NEPA §102.
4. *Id.* §4332(2)(C), ELR STAT. NEPA §102(2)(C).
5. *See* Massachusetts v. Andrus, 594 F.2d 872, 883, 9 ELR 20162, 20168 (1st Cir. 1979).
6. Baltimore Gas & Elec. Co. v. Natural Resources Defense Council, 462 U.S. 87, 97, 13 ELR 20544, 20546 (1983).
7. 42 U.S.C. §4342, ELR STAT. NEPA §202.
8. *Id.* §4344, ELR STAT. NEPA §204.
9. *See, e.g.*, Limerick Ecology Action v. NRC, 869 F.2d 719, 19 ELR Digest 20907 (3d Cir. 1989).
10. Robertson v. Methow Valley Citizens Council, 490 U.S. 332, 19 ELR 20743 (1989).
11. NEPA regulations adopted by the USDA are codified at 7 C.F.R. pt. 1b; those adopted by the FDA are codified at 21 C.F.R. pt. 25; and those adopted by EPA are codified at 40 C.F.R. pt. 6.
12. U.S. EPA, POLICIES AND PROCEDURES FOR THE REVIEW OF FEDERAL ACTIONS IMPACTING THE ENVIRONMENT (1984).

EPA also has its own procedures for compliance with CEQ regulations.[13] Congress has expressly exempted numerous EPA activities from NEPA. Thus, the Agency prepares an EIS when specifically required to do so—as in the case of Clean Water Act new source national pollutant discharge elimination system (NPDES) permits—or when it chooses to do so. Courts have also granted implied exemptions to EPA for many of its regulatory functions on the theory that EPA's adherence to the procedural mandates of its statutes is the "functional equivalent" of an EIS and provides adequate assurance that environmental factors are given appropriate consideration.[14]

4. The EIS Process

The first step in the EIS process is to determine whether a particular action is a major federal action "significantly affecting the quality of the human environment." Responsibility for making this determination rests with the agency that will undertake the action. CEQ regulations require agencies to identify those types of actions for which an EIS is not necessary.[15] These are called "categorical exclusions."[16] If the contemplated action does not fall within a categorical exclusion, the agency must prepare an EA. The EA is a "rough-cut" assessment to determine whether a full-fledged EIS is necessary.[17]

The decision on whether to prepare an EIS is governed by the rule of reason. The agency must make a rational decision that its planned action is "major" and that it will have a "significant" impact on the environment. Courts recognize that this decision "implicates substantial agency expertise" and will give deference to agency expertise; there are, however, many instances in which courts have overturned an agency decision that was arbitrary and capricious or involved a clear error in judgment.[18]

If the agency decides, based on the EA, that an EIS is not required, it must then issue a finding of no significant impact (FONSI).[19] The FONSI may be a simple document that briefly explains the finding. It will typically include the EA or a summary of the EA and may reference related documents. This is intended to ensure that the agency understood the NEPA requirements and gave the problem adequate consideration, and it provides the courts with a basis for review.

If the decision is to proceed with an EIS, the agency must publish a notice of intent and begin to determine, within the scope of the EIS, the range of actions, alternatives, and impacts to be considered. This "scoping process" is a preliminary step intended to encourage participation and to focus the EIS.[20] It provides an early opportunity to affect the subject matter of the EIS.

A draft EIS must be made available for comment to the CEQ, to other federal agencies, and to identifiable outside interest groups.[21] The draft statement is subject to comment for 45 days.[22] In addition, federal agencies are required to consult with state and local environmental agencies in preparing the EIS. Other federal statutes impose specific consultation responsibilities in addition to the NEPA requirements.[23] The CEQ rarely comments. As noted above, EPA comments on virtually every draft EIS, by virtue of the statutes it administers and pursuant to §309 of the CAA, which applies generally to the environmental impact of any matter relating to its duties and responsibilities.[24]

After comments have been reviewed and any new issues have been incorporated into the EIS, a final EIS must be circulated to each agency and individual who made substantive comments on the draft and to any other agency with jurisdiction or special expertise in the area in which environmental impacts have been identified.[25] If there are significant changes to the project or the analysis, the EIS may have to be recirculated as a draft. Unless there are compelling reasons, no decision on a proposed action may be made until 90 days after publication of notice of the filing of a draft EIS or 30 days after publication of notice of the filing of a final EIS.[26]

NEPA requires that the EIS accompany the proposal through the remaining agency review procedures. This has been interpreted to mean that the EIS must be considered "at every stage where an overall balancing of environmental and nonenvironmental factors is appropriate and where alterations might be made in the proposed action to minimize environmental costs."[27]

5. When Is an EIS Required?

EPA requires agencies to prepare an EIS for all "major Federal actions significantly affecting the quality of the human environment."[28] This phrase has been difficult to define and has been the subject of much litigation. A majority of the courts have found that the proposed action must be both "major" and have a "significant impact" on the environment, but others have found an EIS is necessary if the action has significant impacts and must, therefore, be considered major.[29] CEQ regulations state that the term "major . . . reinforces but does not have a meaning independent of 'significant.'"[30]

The term "action" has been construed broadly to include not only actual construction of facilities, but also project proposals, proposals for new legislation, regulations, policy

13. 40 C.F.R. pt. 6, subpt. J.
14. *See Limerick Ecology Action*, 869 F.2d at 729 n.7, 19 ELR Digest at 20907.
15. 40 C.F.R. §1507.3.
16. *Id.* §1508.4.
17. *Id.* §1508.9.
18. *See, e.g.*, Marsh v. Oregon Natural Resources Council, 490 U.S. 360, 19 ELR 20749 (1989).
19. 40 C.F.R. §1508.13.
20. *Id.* §1501.7.
21. 42 U.S.C. §4332(2)(C), ELR STAT. NEPA §102(2)(C); 40 C.F.R. §§1502.19, 1503.1.
22. 40 C.F.R. §1506.10(c).
23. *See, e.g.*, Fish and Wildlife Coordination Act, 16 U.S.C. §661 et seq.; National Historic Preservation Act, 16 U.S.C. §470 et seq.; ESA; Department of Transportation Act, 49 U.S.C. §1653(f).
24. 42 U.S.C. §7609, ELR STAT. CAA §309. *See* ARNOLD W. REITZE JR., CLEAN AIR ACT: COMPLIANCE AND ENFORCEMENT (Envtl. L. Inst. 2001).
25. 40 C.F.R. §1502.19.
26. *Id.* §1506.10.
27. Calvert Cliffs Coordinating Comm., Inc. v. Atomic Energy Comm'n, 449 F.2d 1109, 1 ELR 20346 (D.C. Cir. 1971).
28. 42 U.S.C. §4332(2)(C), ELR STAT. NEPA §102(2)(C).
29. *Compare* River Rd. Alliance, Inc. v. Corps of Eng'rs, 764 F.2d 445, 15 ELR 20518 (7th Cir. 1985), *cert. denied*, 475 U.S. 1055 (1986), *with* Minnesota Pub. Interest Research Group v. Butz, 498 F.2d 1314, 4 ELR 20700 (8th Cir. 1974).
30. 40 C.F.R. §1508.18.

statements, or expansion or revision of ongoing programs.[31] An action is "federal" if it is directly undertaken by a federal agency. Federal action also includes a federal agency's decision to grant its required approval of the activity of others. This may occur where the agency's authority is essentially supervisory, e.g., rate increases, discharge permits, licenses.[32] An EIS may also be required when the federal agency possesses the power to control a nonfederal activity, although it is not required where the agency has the option, but not the duty, to control nonfederal action.[33]

The term "significant" requires consideration of both the context of the impact and its intensity. For example, "[a]ny action that substantially affects, beneficially or detrimentally, the depth or course of streams, plant life, wildlife habitats, fish and wildlife, and the soil and air 'significantly affects the quality of human environment.'"[34] When coupled with an effect on the physical environment, socio-economic impacts, such as changes in commuter traffic patterns, the loss of job opportunities, or environmental justice concerns may also have to be considered, although economic and social effects alone do not require an EIS.[35]

6. The Preparation of an EIS

Under NEPA, the official responsible for the proposed federal action has the duty to prepare the EIS.[36] This can create a problem where there are two or more federal agencies involved. To address this situation, the CEQ has developed the "lead" agency concept under which the agencies will designate one of their number to prepare the EIS, based on the degree of involvement and other factors.[37] The other agencies act as cooperating agencies.[38] Where both federal and state agencies are involved, a federal and state agency may act as joint lead agencies.[39] In general, the federal agency is responsible for preparation of the EIS, although there are circumstances under §102(2)(D) of NEPA, or under other statutes, in which responsibility can be transferred to states.[40] Private persons may not prepare an EIS, but they may supply the information to be used. The federal agency must independently evaluate the information and is responsible for its accuracy.[41]

The range of impact to be considered in the EIS can be extremely broad. In general, NEPA requires that the EIS address the following five issues:

- The environmental impact of the proposed action;
- Any adverse environmental effects which cannot be avoided if the proposal is implemented;
- Alternatives to the proposed action;
- The relationship between local short-term uses of man's environment and the maintenance and enhancement of long-term productivity; and
- Any irreversible or irretrievable commitments of resources which would be involved in the proposed action if it is implemented.

When information is unavailable regarding reasonably foreseeable and significant impacts, the regulation requires that the agency prepare an evaluation of such impacts based on theoretical approaches or research methods generally accepted in the scientific community.[42]

The EIS should provide "a detailed and careful analysis of the relative environmental merits and demerits of the proposed action and possible alternatives."[43]

7. Judicial Review

NEPA requires agencies to "take a 'hard look' at the environmental consequences before taking a major action."[44] The role of the courts on judicial review of NEPA decisions is "to ensure that the agency has adequately considered and disclosed the environmental impact of its actions and that its decision is not arbitrary or capricious."[45] In most situations, judicial review takes place under the Administrative Procedure Act.[46] Other statutes may specifically provide for judicial review and a NEPA challenge may be undertaken under those statutes.

B. Application of NEPA to Biotechnology

NEPA challenges have been used extensively by plaintiffs to challenge federal decisions relating to biotechnology research and development, the *Framework* itself, and approval of environmental release activities. This case law and the general principles which have emerged from it are described below.

1. EIS for the NIH *Guidelines* Satisfied NEPA Requirements for Laboratory Research

One of the early federal actions on biotechnology was taken by NIH when it issued its *Guidelines*.[47] At the time of publication, NIH announced that it was preparing a draft EIS, which was published for comment in 1976 and finalized in 1977.[48] A research project to test the biological properties of polyoma DNA cloned in bacterial cells in a guideline-compliant laboratory at the Fort Detrick, Maryland, Cancer Research Center was thereafter sought to be en-

31. S. REP. No. 91-296, at 20 (1969).
32. *See, e.g.*, Natural Resources Defense Council v. EPA, 859 F.2d 156, 19 ELR 20016 (D.C. Cir. 1988).
33. Sierra Club v. Hodel, 848 F.2d 1068, 18 ELR 21237 (10th Cir. 1988).
34. Natural Resources Defense Council v. Grant, 341 F. Supp. 356, 357, 2 ELR 20185, 20189 (E.D.N.C. 1972).
35. *See* Town of Groton v. Laird, 353 F. Supp. 344, 3 ELR 20316 (D. Conn. 1972); Tongass Conservation Soc'y v. Cheney, 924 F.2d 1137, 21 ELR 20558 (D.C. Cir. 1991).
36. 42 U.S.C §4332(2)(C), ELR STAT. NEPA §102(2)(C).
37. 40 C.F.R. §1501.5.
38. *Id.* §1501.6.
39. *Id.* §1501.5(b).
40. 42 U.S.C. §4332(2)(D), ELR STAT. NEPA §102(2)(D).
41. 40 C.F.R. §1506.5(a).
42. *Id.* §1502.22(b).
43. Natural Resources Defense Council v. Callaway, 524 F.2d 79, 92, 5 ELR 20640, 20647 (2d Cir. 1975).
44. Kleppe v. Sierra Club, 427 U.S. 390, 410 n.21, 6 ELR 20532, 20537 n.21 (1976).
45. Baltimore Gas & Elec. Co. v. Natural Resources Defense Council, 462 U.S. 87, 97-98, 13 ELR 20544, 20546 (1983).
46. 5 U.S.C. §706(2)(A), *available in* ELR STAT. ADMIN. PROC.
47. 41 Fed. Reg. 27902 (July 7, 1976).
48. *Id.* 38426 (Sept. 9, 1976); 42 Fed. Reg. 6532 (Feb. 2, 1977).

joined for insufficient NEPA compliance.[49] The plaintiff asserted that this experiment could result in the release to the environment of organisms that would present a threat to life and health which had been inadequately considered.

The reviewing court rejected the claim. It held that NIH had appropriately recognized that the issuance of the *Guidelines* constituted a major federal action, as they laid down criteria for safe research in this new area of science, including detailed requirements for both physical and biological containment to prevent environmental release. The court also found that the EIS prepared by NIH met the requisite "hard-look" standard. The court found that the experiment at issue presented no substantial risk to human health or the environment because:

> • There is little likelihood that the materials will escape from the maximum containment of the highly secure laboratory (P4) in which it would be conducted;
> • If such an escape did occur, the rDNA molecules would not survive but would self-destruct outside the laboratory environment; and
> • The particular virus being used had never been implicated in human disease.[50]

2. Deliberate Release Into the Environment Decisions Require an Additional Hard Look

In subsequent litigation, the Foundation on Economic Trends (Foundation) sought to enjoin NIH's approval of an experiment at the University of California involving the deliberate release into the environment of genetically altered bacteria.[51] The plan was to apply these bacteria to plots of potatoes, tomatoes, and beans to determine whether they could increase the crop's frost resistance.[52] NIH had approved this experiment on the basis of an EA. The court considered the facts and enjoined the experiment. NIH was sent back to the drawing board to complete an EIS.

At the time of issuance of the original NIH *Guidelines*, deliberate release experiments were prohibited.[53] The EIS accompanying the *Guidelines* noted:

> Should organisms containing recombined DNA be dispersed into the environment, they might, depending on their fitness relative to naturally occurring organisms, find a suitable ecological niche for their own reproduction. A potentially dangerous organism might then multiply and spread. Subsequent cessation of experiments would not stop the diffusion of the hazardous agent.[54]

Changes to the *Guidelines* in 1978 allowed NIH to waive the prohibition against deliberate release experiments.[55] Such decisions were to be made by the NIH Director with the RAC in order to determine that no significant risk to the environment would be presented. A need for definitive standards to guide the exercise of such discretion was suggested. No such standards were forthcoming. The deliberate release experiments were approved by NIH in September 1983, on the basis of a limited review and the Foundation lawsuit followed. A federal district court enjoined the experiment pending conduct by NIH of further NEPA review.

On appeal, the D.C. Circuit affirmed. It noted that NIH's consideration of the experiment fell far short of NEPA requirements.[56] The court stressed that although the original NIH EIS described the possibility of dispersion of genetically modified organisms as a major environmental concern, NIH completely failed to address the issue. It held that NIH "must attempt to evaluate seriously the risk that emigration of such organisms from the test site will create ecological disruption."[57] Until NIH completed that evaluation, no judgment could be made as to whether an EIS would be required.

3. The Federal *Framework* Is Not a Major Federal Action

The Foundation also sought to challenge the *Framework* itself as invalid for lack of compliance with NEPA.[58] The gravamen of this complaint was that the *Framework* constituted rulemaking fraught with such environmental risk that an EIS was required. The court rejected this argument on a number of grounds.

First, the court held that the *Framework* was not a rule but rather, "a first effort to aid in formulation of agency policy with respect to control of microorganisms developed by genetic engineering techniques."[59] Second, the court held that the plaintiffs had no standing to bring the action. The injury presented was based on a hypothetical construction of how the *Framework* might operate, which was insufficient to establish distinct and palpable injury. The plaintiffs also failed to establish the causation and redressability elements of standing based on failure to properly allege any connection between the *Framework* and any future approval for use of genetically engineered products.[60]

4. When NEPA Does Not Dictate Outcome—The "Hard Look"

With the maturation of the *Framework*, jurisdiction over many environmental release experiments shifted to the major regulatory agencies of jurisdiction, EPA, the USDA, and the FDA. NEPA challenges to enjoin projects became less successful as these agencies applied their risk assessment processes and expertise to the substantive risk issues associated with deliberate release of organisms to the environment.

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49. Mack v. Califano, 447 F. Supp. 668, 8 ELR 20347 (D.D.C. 1978).
50. *Id.* at 671, 8 ELR at 20347-48.
51. Foundation on Econ. Trends v. Heckler, 756 F.2d 143, 15 ELR 20248 (D.C. Cir. 1985).
52. *Id.* at 149, 15 ELR at 20251.
53. *Id.* at 148, 15 ELR at 20250.
54. *Id.* at 148-49, 15 ELR at 20250.
55. *Id.* at 149, 15 ELR at 20250-51(citing 43 Fed. Reg. 33042 (July 28, 1978)).
56. *Id.* at 153, 15 ELR at 20253.
57. *Id.* at 154, 15 ELR at 20254.
58. Foundation on Econ. Trends v. Johnson, 661 F. Supp. 107, 17 ELR 21148 (D.D.C. 1986).
59. *Id.* at 109, 17 ELR at 21148-49.
60. *Id.*, 17 ELR at 21149. Further development of the standing issues presented in this case is provided in a companion case decided on the same date. Foundation on Econ. Trends v. Thomas, 661 F. Supp. 713, 17 ELR 21149 (D.D.C. 1986) (EPA not required to adopt financial responsibility standards under FIFRA for holders of experimental use permits for genetically modified organisms).

One of the first of these cases presented a challenge to EPA's decision under FIFRA to approve an experimental use permit for field testing of the frost-resistant genetically modified strains of *Pseudomonas Syringae* and *Pseudomonas Flourescens*.[61] This decision was based on an extensive administrative record which included evaluation by EPA scientists of extensive information of the characteristics of the altered bacteria, analysis of risks to humans, dissemination of mutant bacteria from the test site, survivability and colonization abilities of the bacteria, and possible effects from its release on precipitation patterns. EPA's internal evaluation and decisions on these risk issues was presented to a group of independent scientists sitting on EPA's FIFRA Scientific Advisory Panel (SAP) for review. EPA's conclusion that no unreasonable risk would be presented by the experiment was also reviewed by the USDA, the FDA, and NIH. Notice of the application was also published in the *Federal Register*.

The court reviewed EPA's decision to grant the permit on the same grounds as those applied to NEPA review—was there a procedural defect or was the agency's decision arbitrary and capricious on the basis of the record before it. The court found the decision was neither and approved it as well-reasoned and focused on all of the critical issues. The court also rejected the Foundation's NEPA arguments as applied to EPA on the now-familiar ground that EPA's analysis was the functional equivalent of NEPA review.[62]

5. New Sorts of Activities, Such as Bioprospecting, Trigger NEPA Review

In an interesting case describing the "integral relationship" between natural resource law and the Federal Technology Transfer Act (FTTA),[63] the court evaluated the role of NEPA in the development of a bioprospecting Cooperative Research and Development Agreement (CRADA) between Diversa Corporation, the National Park Service (NPS), and Yellowstone National Park.[64] The FTTA is designed to encourage and enhance technological innovation for commercial and public purposes. To accomplish this, the FTTA authorizes government-operated laboratories to enter into CRADAs with nonfederal parties. The bioprospecting CRADA provides a set of rules for cooperative research into the biological resources of Yellowstone secured through specimen collection permits and the commercialization of inventions and products developed from those specimens by the parties. Among other things, the CRADA grants royalty fees and licensing rights to Yellowstone in connection with all such inventions and products developed by Diversa.

The CRADA was challenged on a number of grounds, including the failure of the NPS to prepare an EA. The NPS argued that "the activities performed under the CRADA fall under a categorical exclusion for 'day-to-day resource management and research activities,'" and "approval of the CRADA was not a 'major federal action.'"[65] The reviewing court disagreed, pointing out as a matter of fact that the NPS provided no evidence that such a determination was made before the CRADA was finalized. The court also observed that the "commercial exploitation of natural resources does not strike the Court as logically equivalent to 'day-to-day resource management and research activities.'"[66]

The court also noted that the DOI's own department manual identifies several exceptions applicable to all categorical exclusions, including:

> Actions that may "[h]ave adverse effects on such unique geographic characteristics as ecologically significant or critical areas . . . have highly controversial environmental effects, . . . have highly uncertain and potentially significant environmental effects or involve unique or unknown environmental risks, . . . [e]stablish a precedent for future action or represent a decision in principle about future actions with potentially significant environmental effects, . . . [or that are] directly related to other actions with individually insignificant but cumulatively significant environmental effects.[67]

The court thus held that the NPS "could not reasonably have found none of [these] exceptions . . . to apply" because "the Yellowstone-Diversa CRADA is a precedent setting agreement within the National Park System and the DOI in general."[68] In arriving at these conclusions, the court focused squarely on the effects of the CRADA—commercial exploitation of a very broad range of natural resources. As the court noted, "the [Yellowstone-Diversa] CRADA, on its face, allows for a tremendously broad range of activities spanning a broad range of ecosystems" including thermal features, alpine tundra ecosystems, subalping forests, riparian habitats, sedge marshes, bogs, swamps, streams, and lakes.[69]

In the end, it was the court's judgment that "[t]he novel legal and factual issues raised by bioprospecting in Yellowstone require an intensive deliberation by the defendants, ideally with public input—precisely the deliberation mandated by Congress through the NEPA."[70]

C. The Role of the ESA

Congress enacted the ESA in 1973 in recognition of the fact that many of the nation's, and the world's, animal and plant species were disappearing. The ESA applies to all "species"[71] of "fish or wildlife"[72] and "plants."[73] It is intended "to provide a means whereby the ecosystems upon which endangered species and threatened species depend may be conserved."[74]

1. Listing and Critical Habitat Designation

Section 4 of the ESA sets forth a procedure to designate species as "endangered" or "threatened." A species is considered to be endangered if it is in danger of extinction

61. Foundation on Econ. Trends v. Thomas, 637 F. Supp. 25, 16 ELR 20632 (D.D.C. 1986); See discussion of the details of this EPA authority *infra* at Chapter 5.

62. *Foundation on Econ. Trends*, 637 F. Supp. at 28, 16 ELR at 20634.

63. 15 U.S.C. §3701 et seq.

64. Edmonds Inst. v. Babbitt, 42 F. Supp. 2d 1, 17-20, 29 ELR 21154, 21160-61 (D.D.C. 1999).

65. *Id.* at 18, 29 ELR at 21160.

66. *Id.*

67. *Id.* at 18-19, 29 ELR at 21161.

68. *Id.* at 19, 29 ELR at 21161.

69. *Id.*

70. *Id.*

71. 16 U.S.C. §§1531, 1532(16), ELR STAT. ESA §§2, 3(16).

72. *Id.* §1532(8), ELR STAT. ESA §3(8).

73. *Id.* §1532(14), ELR STAT. ESA §3(14).

74. *Id.* §1531(b), ELR STAT. ESA §2(b).

throughout all or a significant portion of its range. A threatened species is one that is likely to become an endangered species within the foreseeable future throughout all or a significant portion of its range.[75] A number of factors are considered in making this determination, including: "the present or threatened destruction, modification, or curtailment of its habitat or range"; "overutilization for commercial, recreational, scientific, or educational purposes"; "disease or predation"; "the inadequacy of existing regulatory mechanisms"; or "other natural or manmade factors affecting its continued existence."[76]

In addition, §4 requires, when "prudent and determinable," the designation of "critical habitat" for any listed species.[77] Critical habitat includes geographic areas where "those physical or biological features essential to the conservation of the species" are found and "which may require special management consideration or protections."[78] This includes areas essential to the conservation of the species, but not otherwise occupied by the species at the time of listing.[79]

2. Prohibition on Unauthorized "Take" of a Listed Species

Once a fish, wildlife, or plant species is listed under the ESA, §9 of the statute proscribes all prohibited acts relative to all such species that apply to "any persons subject to the jurisdiction of the United States."[80] These prohibitions are the principle means by which species are protected under the ESA (and they are reinforced by both civil and criminal penalties).[81]

The most notable among these prohibitions is the one making it unlawful for any person to "take" a listed species. The term "take" means "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."[82] By regulation, the word "harm" is further defined to mean "an act which actually kills or injures wildlife. Such act may include significant habitat modification or degradation where it actually kills or injures wildlife by significantly impairing essential behavioral patterns, including breeding, feeding, or sheltering."[83]

3. Agency Jurisdiction and the Consultation Process

The two federal agencies with primary responsibility for the administration of the ESA are the U.S. Fish and Wildlife Service (FWS), located within the DOI, and the NMFS, located within the U.S. Department of Commerce. Generally speaking, the FWS is responsible for terrestrial and freshwater species and migratory birds, while the NMFS is responsible for marine species and anadromous fish.[84] USDA's APHIS is responsible for overseeing import and export activities involving terrestrial plants listed under the ESA.

Under ESA §7, all federal agencies are required to consult with the FWS or the NMFS, to ensure that "any action authorized, funded or carried out" by the agency will not jeopardize endangered or threatened species or adversely modify its designated or proposed critical habitat.[85] If it is determined that an action is likely to adversely affect a listed species, the FWS or the NMFS, as the case may be, issues a biological opinion (BO). If the BO finds that the action is not likely to jeopardize the species' continued existence or adversely modify its designated critical habitat, the document may, among other things, make an incidental take statement. That statement provides immunity from the take provisions to both the agency and the regulated party. If jeopardy or adverse modification is found, the BO offers reasonable and prudent alternatives to the action.[86] If consultation has not occurred because there was no triggering action or if the FWS/NMFS refrain from issuing an incidental take statement, the federal agency is liable.

Section 7 also sets forth a procedure under which "agency actions" may be exempted from the restrictions of the ESA if a cabinet-level "Endangered Species Committee" decides, among other things, that "the benefits of such actions clearly outweigh the benefits of alternative courses of action consistent with conserving the species or its critical habitat, and such action is in the public interest."[87] This procedure, however, has been used sparingly.

4. Habitat Conservation Plans (HCPs)

Section 10 of the ESA provides a somewhat similar incidental take safe harbor provision for other parties such as private landowners, corporations, state or local governments, or other nonfederal landowners, by permitting "incidental takes" of listed species. To obtain such an "incidental take" permit, one must develop, obtain approval of, and implement a "conservation plan," otherwise known as an HCP.[88] An HCP, which is intended to offset the harmful effects the proposed activity might have on a listed species, must set forth "the impact which will likely result from such taking"; the "steps the applicant will take to minimize and mitigate such impacts"; the "alternative actions to such taking" considered by the applicant; "the reasons why such alternatives are not being utilized"; and "such other measures" that may be required "as being necessary or appropriate for purposes of the plan."[89]

Under §10, therefore, and in concert with an approved HCP, parties may seek to use and develop land inhabited or used by a listed species, and any resulting "take" of that species, to the extent it "will not appreciably reduce the likelihood of the survival and recovery of the species in the wild,"[90] is allowed as "incidental to, and not the purpose of, the carrying out of an otherwise lawful activity."[91]

75. *Id.* §1533(a)(1)-(2), ELR STAT. ESA §4(a)(1)-(2).
76. *Id.* §1533(a)(1)(A)-(E), ELR STAT. ESA §4(a)(1)(A)-(E).
77. *Id.* §1533(a)(3)(A), ELR STAT. ESA §4(a)(3)(A).
78. *Id.* §1532(5)(A)(i), ELR STAT. ESA §3(5)(A)(i).
79. *Id.* §1532(5)(A)(ii), ELR STAT. ESA §3(5)(A)(ii).
80. *See id.* §1538(a)(1)-(2), ELR STAT. ESA §9(a)(1)-(2).
81. *Id.* §1540(a)-(b), ELR STAT. ESA §11(a)-(b).
82. *Id.* at §1532(19), ELR STAT. ESA §3(19).
83. 50 C.F.R. §17.3.
84. *See generally* the FWS' and the NMFS' websites, http://www.fws.gov and http://www.nmfs.noaa.gov (last visited July 20, 2001).
85. 16 U.S.C. §§1531, 1536(a)(2), (a)(4), ELR STAT. ESA §§2, 7(a)(2), (a)(4).
86. *Id.* §1536(b), ELR STAT. ESA §7(b).
87. *Id.* §1536(e)-(h), ELR STAT. ESA §7(e)-(h).
88. *Id.* §1539(a), ELR STAT. ESA §10(a).
89. *Id.* §1539(a)(2)(i)-(iv), ELR STAT. ESA §10(a)(2)(i)-(iv).
90. *Id.* §1539(a)(2)(B)(iv), ELR STAT. ESA §10(a)(2)(B)(iv).
91. *Id.* §1539(a)(1)(B), ELR STAT. ESA §10(a)(1)(B).

D. Biotechnology and Endangered and Threatened Species

The following current examples best illustrate the interplay between biotechnology and the regulation of endangered or threatened species.

1. EPA's FIFRA Endangered Species Protection Program (ESPP)

One regulatory program that warrants mention in connection with any discussion of biotechnology and the federal agency consultation process under the ESA is EPA's ESPP. EPA is required to ensure that the pesticides it registers for use will not harm or otherwise negatively affect listed species, or species proposed for listing, or designated critical habitat, or proposed critical habitat. To assist it in this process, EPA's Office of Pesticide Programs (OPP), Field and External Affairs Division, developed the ESPP, a voluntary initiative that relies on cooperation between the FWS, EPA regional offices, states, and pesticide users.[92]

The stated goals of the ESPP are to protect listed species from the use of pesticides and to minimize the impact of the program on pesticide users.[93] To implement the ESPP, EPA assesses the risk of pesticide use to species listed under the ESA, consults with the FWS where there are unavoidable concerns relating to pesticide uses and listed species or their habitats, and implements use limitations either specified in BOs by the FWS or developed from such opinions.[94]

To implement the use limitations, the OPP, among other things, encourages the addition of generic label statements to pesticides directing users to county-by-county information and maps (county bulletins) that illustrate the location of species and their habitats, and provides relevant recommended pesticide use practices in consideration thereof.[95] The program also provides tips on how to reduce the runoff and drift of pesticides during and after use.

2. Bt-Maize and Nontarget Endangered or Threatened Species

As discussed in more detail in Chapter 5, EPA has granted a number of companies, including the Monsanto Company and Novartis, five-year product registrations under FIFRA to commercially plant corn genetically engineered to produce a bacterial toxin known as Bt. The toxin is genetically added to the corn to kill harmful pests such as the European corn borer that destroys corn crops ("target" species). Since that initial planting, however, considerable debate has arisen as to whether the pollen from the Bt-maize is harming or could harm "nontarget" species such as monarch butterflies. (Monarch butterflies feed on milkweed, which typically is located in and around cornfields. The concern is that the milkweed becomes "dusted" with Bt-maize pollen, which is then digested by the monarchs during feeding.)

Monarch butterflies are not currently a listed species under the ESA. However, some groups are now expressing a similar concern for the 19 or so other nontarget butterfly and moth species, including the Karner Blue butterfly, that are listed as endangered or threatened under the ESA, and that also may eat plants in and around Bt cornfields. As a result, and in anticipation of the expiration of the initial wave of Bt-maize registrations this year, a number of environmental and other groups have already notified EPA of their intent to sue if it fails, during the reregistration process, to consult with the FWS under the ESA on the potential effects of Bt-maize on all nontarget endangered and threatened butterfly and moth species.

3. Transgenic Salmon Versus Wild Endangered Salmon

In addition to the possible impacts of genetically modified plant organisms on nontarget endangered or threatened species, another rising area of concern involves the impact of genetically modified animal species on their wild endangered or threatened cousins. On November 17, 2000, the FWS and the NMFS jointly listed the native Atlantic salmon population in Maine as an endangered species under the ESA[96] That listing implicates the aquaculture production of transgenic salmon in open water net pens or other "contained" conditions in or near the critical habitat waters of the newly listed endangered salmon population as discussed in OSTP Case Study No. I: Growth-Enhanced Salmon. "Transgenic fish are fish that have been modified to contain copies of new genetic constructs introduced into their genome by modern techniques (specifically, recombinant DNA techniques)."[97] The impetus behind the genetic modification of salmon is to produce a faster growing salmon at less cost than is currently possible with nontransgenic, farm-raised hybrid salmon.

The chief concern regarding transgenic salmon is their propensity to escape from their open water containment systems into the surrounding waters. Escape can occur as a result of storms, seal attacks, or human error. Escaped transgenic salmon may disturb the newly listed endangered salmon's habitat through, among other things, predation, competition for resources, and the spread of disease, or by breeding with the endangered salmon, altering their genetic makeup forever. And while plans are to raise only reproductively sterile female transgenic salmon, science currently cannot guarantee 100% reproductive sterility, leaving open the possibility that a reproductively active female transgenic salmon could be released.

The FWS and the NMFS already have been working with the state of Maine and other interested stakeholders and agencies to address the potential impacts of nontransgenic, farm-raised hybrid salmon on the endangered salmon population and critical habitat. More recently, the FDA spearheaded the first of a reported series of case studies into the potential impacts of transgenic Atlantic salmon raised in net pens in or near both the Atlantic and Pacific coastal waters of the United States. The purpose of the FDA case study is to illustrate "the types of environmental safety considerations that would go into a U.S. government evaluation of a request

92. *See generally* EPA's website, http://www.epa.gov (last visited July 20, 2001).

93. *Id.*

94. *Id.*

95. *Id.*

96. 65 Fed. Reg. 69459 (Nov. 17, 2000).

97. *Case Study No. I: Growth-Enhanced Salmon, supra* Chapter 1, note 55, at 2. Traditional aquaculture production of nontransgenic, farm-raised hybrid salmon is also implicated by the listing of the native Atlantic salmon population in Maine as an endangered species.

for approval of a transgenic Atlantic salmon variety for use in aquaculture, and the government agencies and authorities involved."[98]

Although it is reported that no "complete application [has yet been] submitted to FDA for use of a transgenic fish,"[99] when and if such an application is made, the procedures, namely the federal agency consultation process, and prohibitions of the ESA certainly will be implicated.

E. Other U.S. Wildlife Laws

In addition to the ESA, a number of other U.S. laws also are intended to protect wild fauna and flora and related habitat. As a result, they too could be implicated by biotechnology applications. These include the Marine Mammal Protection Act (MMPA),[100] the MBTA,[101] the Anadromous Fish Conservation Act,[102] the Lacey Act,[103] and the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act),[104] as amended by the 1996 Sustainable Fisheries Act.

For example, the MMPA, which the NMFS is responsible for implementing, regulates the "taking" of marine mammals, e.g., whales, dolphins, porpoises, seals, and seal lions, which includes anything that may harm, harass, or kill a marine mammal. The MMPA also proscribes protection, conservation, and recovery programs for marine mammals.

The Lacey Act, prohibits the importation into, or the shipment among, the United States, including any territory or possession, of certain categories of wild animal species determined to be "injurious to human beings, to the interest of agriculture, horticulture, forestry, or to wildlife or the wildlife resources of the United States."[105] Another part of the Lacey Act, generally speaking, makes it a federal crime for any person to import, export, transport, sell, receive, acquire, possess, or purchase any fish, wildlife, or plant taken, possessed, transported, or sold in violation of any federal, state, foreign, or Indian tribal law, treaty, or regulation.[106]

Finally, the Magnuson-Stevens Act, also administered by the NMFS, applies when designated "essential fish habitat" is present. Any activities that might adversely affect designated essential fish habitat, which is defined as "those waters and substrate necessary to fish for spawning, breeding, feeding or growth to maturity,"[107] must be assessed and measures taken to avoid, minimize, mitigate, or compensate for such impacts. Failing that, the lead federal agency must explain why such measures will not be taken.[108]

98. *Id.* at 2. The federal regulatory agencies with some kind of authority or responsibility over transgenic salmon farming operations include the FDA, the U.S. Army Corps of Engineers, the FWS, the NMFS, and EPA.

99. *Id.*

100. 16 U.S.C. §§1361-1421h, ELR STAT. MMPA §§2-409.

101. *Id.* §§703-712.

102. *Id.* §§757a-757g.

103. 18 U.S.C. §42 et seq.

104. 16 U.S.C. §§1801-1883.

105. 18 U.S.C. §42.

106. *Id.* §3372(1), (2)(A), (4).

107. 16 U.S.C. §1802(10).

108. *See Case Study No. 1: Growth-Enhanced Salmon, supra* Chapter 1, note 55, at 12.

CHAPTER 4

I. The FDA

A. Statutory and Regulatory Authority

As stated in the FFDCA,[1] the mission of the FDA includes to "protect the public health by ensuring that [ ] foods are safe, wholesome, sanitary and properly labeled."[2] Generally, the FDA's responsibilities extend to all domestic and imported food, with certain exceptions, notably including meat and poultry, which are regulated by the FSIS of the USDA.

Most of the FDA's authority to regulate food derives from the FFDCA.[3] Chapter IV of the Act[4] contains the substantive provisions particular to food, but other parts of the statute are important to understanding how the FDA regulates foods. As discussed below, key provisions include those found in Chapter III,[5] which identifies prohibited acts and the FDA's enforcement authority, Chapter VII,[6] which spells out the FDA's inspection authority, and Chapter VIII,[7] which deals with imports and exports of FDA-regulated products.

Acting through authority delegated from the Secretary of Health and Human Services, the FDA has authority to issue regulations for enforcement of the FFDCA.[8] The FDA's substantive regulations regarding human food are found within Subchapter B of Title 21 of the *Code of Federal Regulations*,[9] for the most part, and the regulations regarding animal feeds are in Subchapter E.[10] Subchapter A of Title 21 contains regulations regarding procedure or of other, more general applicability.[11] Additionally, the FDA issues "guidance documents" that describe the agency's interpretation of, or policy on, a regulatory issue.[12] Although not binding on the agency (or the public), guidance documents "represent the agency's current thinking" on a given issue, and generally indicate the policy that the FDA will follow.[13]

B. FDA Regulation of Food

The FFDCA defines "food" to mean "(1) articles used for food or drink for man or other animals, (2) chewing gum, and (3) articles used for components of any such article."[14] Although quite broad and rather circular (in essence, "food means articles used for food"), the definition has not, for the most part, been the subject of much litigation. Within the FDA, responsibility for regulation of food rests with the Center for Food Safety and Applied Nutrition (CFSAN) and field staff in FDA offices around the country.

1. Post-Market Review: Adulteration and Misbranding

As a general rule, FDA approval is not required before a food may be marketed.[15] Rather, the availability of food in the U.S. market is regulated by means of prohibitions within the FFDCA against adulterating or misbranding food or taking certain actions, e.g., manufacturing, introducing into interstate commerce, with regard to food that is adulterated or misbranded.[16] Not surprisingly, the FFDCA spells out in some detail what constitutes adulteration and misbranding.

The statute identifies 20 or so conditions or situations that render a food adulterated.[17] Because, as discussed below, a genetic modification may fall within the definition of a "food additive," perhaps the most relevant provision is that which defines a food as adulterated if it bears or contains an unsafe food additive.[18] Other provisions include a food that:

- Bears or contains a poisonous or deleterious substance that may cause the food to be injurious to health[19];
- Bears or contains an unsafe pesticide chemical residue[20];
- Consists of any filthy, putrid, or decomposed substance, or is otherwise unfit for food[21]; or
- Has been prepared, packed, or held under unsanitary conditions such that it may have become con-

1. 21 U.S.C. §321 et seq.
2. FFDCA §903(b)(2)(A), 21 U.S.C. §393(b)(2)(A).
3. Other major acts providing the FDA authority to regulate food in ways not necessarily relevant to this discussion include the PHS, 42 U.S.C. §201 et seq., and the Fair Packaging and Labeling Act, 15 U.S.C. §§1451-1461.
4. FFDCA §§401-413, 21 U.S.C. §§341-350b.
5. *Id.* §§301-310, 21 U.S.C. §§331-337.
6. *Id.* §§701-756, 21 U.S.C. §§371-379v.
7. *Id.* §§801-803, 21 U.S.C. §§381-383.
8. *Id.* §701, 21 U.S.C. §371. As discussed further below, the FDA also has specific authority to take certain enforcement actions, both administratively and in court.
9. 21 C.F.R. pts. 100-190.
10. *Id.* pts. 500-589.
11. *Id.* pts. 1-99.
12. 21 C.F.R. §10.115(b)(1).
13. *Id.* §10.115(d)(3); *see also* Administrative Practices and Procedures; Good Guidance Practices; Final Rule, 65 Fed. Reg. 56468, 56471 (Sept. 19, 2000). FDA employees "may depart from guidance documents only with appropriate justification and supervisory concurrence." 21 C.F.R. §10.115(d)(3).
14. FFDCA §201(f), 21 U.S.C. §321(f).
15. Food additives, discussed below, are a notable exception.
16. FFDCA §301, 21 U.S.C. §331; *see* discussion of FDA enforcement below.
17. *Id.* §402, 21 U.S.C. §342.
18. *Id.* §402(a)(2)(C)(i), 21 U.S.C. §342(a)(2)(C)(i). As discussed below, a food additive is presumed unsafe unless there is a regulation establishing the conditions of its safe use. *Id.* §409, 21 U.S.C. §348.
19. If the substance is not added to the food, i.e., it is naturally occurring in the food, the food is not considered adulterated so long as the amount of the substance in the food "does not ordinarily render [the food] injurious to health." *Id.* §402(a)(1), 21 U.S.C. §342(a)(1). Where a substance is added to a food and is necessary for production or cannot be avoided, the FDA can set tolerances, and the food is adulterated only if the amount of added substance exceeds the tolerance. *Id.* §§402(a)(2)(A), 406, 21 U.S.C. §§342(a)(2)(A), 346.
20. *Id.* §402(a)(2)(B), 21 U.S.C. §342(a)(2)(B). The Act contains extensive provisions for establishing tolerances and granting exemptions. *Id.* §408, 21 U.S.C. §346a.
21. *Id.* §402(a)(3), 21 U.S.C. §342(a)(3).

> taminated with filth or been rendered injurious to health.[22]

Similarly, although the Act lists a number of conditions that can render a food misbranded,[23] the provisions most likely to come into play with regard to genetically modified foods are those regarding false or misleading labeling,[24] and the need to describe the food on its label by a "common or usual name."[25] A product's "label" is the written, printed, or graphic material upon the immediate container,[26] and "labeling" includes not only the label, but also such material "accompanying" the product.[27] Material need not physically accompany the product in order to fall within the definition of "labeling"[28]; as a result, promotional materials are generally considered labeling.

2. Premarket Approval: Food Additives

As noted above, a food may be considered adulterated if it bears or contains an unsafe food additive.[29] The threshold issues, therefore, are defining what constitutes a "food additive" and determining whether it is safe. The FFDCA defines a "food additive" as

> any substance the intended use of which results or may reasonably be expected to result, directly or indirectly, in its becoming a component or otherwise affecting the characteristics of any food . . . , if such substance is not generally recognized, among experts qualified by scientific training and experience to evaluate its safety, as having been adequately shown . . . to be safe under the conditions of its intended use.[30]

Food additives include substances that added directly to food products, such as texturizers or flavoring agents, as well as what are known as "indirect additives," substances that are used on or in food or food contact surfaces or packaging materials and that may be expected to migrate to the food itself.[31] Just as the definition of "food" is somewhat tautological, i.e., a "food" is "an article used for food," it also can include a whole food when it is mixed with or used as a component of another food.[32] As a result, a wide range of foods can be considered to be food additives.[33]

If an article meets the statutory definition of "food additive," it is, as a matter of law, deemed to be unsafe unless (with certain exceptions) the FDA has issued a regulation establishing the conditions under which it may be safely used.[34] The FDA can issue such a regulation on its own initiative,[35] or in response to a food additive petition submitted to the agency.[36] Among other things, a food additive petition must include information regarding the chemical identity and composition of the food additive; its physical, chemical, and biological properties; and full reports of investigations made regarding the safety of the food additive.[37]

In the absence of "extraordinary circumstances," the FDA will publicly release much of the information submitted in a food additive petition, including (1) safety and functionality data and information; (2) study protocols; (3) reports of adverse reactions, product experiences, and consumer complaints; (4) a list of ingredients; and (5) analytical methods, including assays. In certain circumstances, some of this information may be protected from disclosure as trade secrets or confidential commercial information.[38]

A determination that a food additive is safe for the intended use reflects the FDA's determination that there is "a reasonable certainty in the minds of competent scientists that the substance is not harmful under the intended conditions of use."[39] Such a determination requires consideration of:

- The probable consumption of the substance and any substance formed in or on food because of its use;
- The cumulative effect of the substance in the diet, taking into account any chemically or pharmacologically related substance or substances in the diet; and
- Those safety factors experts generally recognize as appropriate.[40]

A regulation prescribing the conditions under which a food additive can be safely used can include specifications regarding:

- The specific foods or types of food in which the substance may be used;
- The maximum quantity of the substance that can be used;
- How the substance can be used; and
- Directions for use, or other labeling or packaging requirements.[41]

22. *Id.* §402(a)(4), 21 U.S.C. §342(a)(4).
23. *Id.* §403, 21 U.S.C. §343.
24. *Id.* §403(a)(1), 21 U.S.C. §343(a)(1).
25. *Id.* §403(i), 21 U.S.C. §343(i).
26. *Id.* §201(k), 21 U.S.C. §321(k).
27. *Id.* §201(m), 21 U.S.C. §321(m).
28. *See, e.g.*, Kordel v. United States, 335 U.S. 345 (1948). Although there is a distinction made between advertising and other promotional materials, the FDA has, in other contexts, asserted that advertising is a subset of labeling. *See, e.g.*, Warning Letter dated July 9, 1996, from Lillian J. Gill, CDRH Office of Compliance, to Valerie Castle, Positive Response Television, Inc.
29. FFDCA §402(a)(2)(C)(i), 21 U.S.C. §342(a)(2)(C)(i).
30. *Id.* §201(s), 21 U.S.C. §321(s); *see also* 21 C.F.R. §170.3(e).
31. 21 C.F.R. §170.3(e)(1).
32. *See, e.g.*, United States v. Two Plastic Drums, 984 F.2d 814, 817 (7th Cir. 1993) (citing National Nutritional Foods Ass'n v. Kennedy, 572 F.2d 377, 391 (2d Cir. 1978)).
33. As a practical matter, it is likely that most whole foods would be considered generally recognized as safe (GRAS) and, as discussed below, would therefore fall outside the definition of "food additive," even when used as a component.
34. FFDCA §409(a), 21 U.S.C. §348(a).
35. 21 C.F.R. §170.15.
36. FFDCA §409(b), 21 U.S.C. §348(b); 21 C.F.R. pt. 171.
37. FFDCA §409(b)(2), 21 U.S.C. §348(b)(2); 21 C.F.R. §171.1(c). A company planning to conduct experiments intended to demonstrate the safety of a food additive may have the FDA review the proposed experiments and opine on whether the agency believes they will yield data that are adequate to evaluate the product's safety. 21 C.F.R. §170.20(b).
38. 21 C.F.R. §171.1(h).
39. *Id.* §170.3(i).
40. *Id.* The regulatory standard also reflects recognition that it is not possible "to establish with complete certainty the absolute harmlessness of the use of any substance." *Id.*
41. *Id.* §171.100.

Food additives for which the FDA has issued regulations regarding their safe use are identified at 21 C.F.R. Parts 172-178.

3. Substances Generally Recognized as Safe (GRAS)

Certain substances that are "component[s] or otherwise affect[ ] the characteristics of" a food are nonetheless not food additives, and therefore not subject to premarket approval. The statutory definition of "food additive" excludes pesticide chemicals and pesticide chemical residues, color additives, new animal drugs, dietary supplements, or ingredients in dietary supplements, and "prior-sanctioned" ingredients, i.e., products that were specifically approved for use before the 1958 enactment of the Food Additive Amendments.[42] For most purposes, however, the most relevant exemption is for substances that are GRAS.[43]

A substance is GRAS if it is "generally recognized, among experts qualified by scientific training and experience to evaluate its safety, as having been adequately shown . . . to be safe under the conditions of its intended use."[44] Unless the substance was used in food before 1958, the basis for determining its safety must be "scientific procedures"; if used before 1958, a substance may alternatively be shown to be safe on the basis of "experience based on [the] common use [of the substance] in food."[45] The "scientific procedures" on which a product's GRAS status may be based include human, animal, analytical, or other scientific studies, both published and unpublished.[46] If a pre-1958 substance is to be considered GRAS on the basis of its "common use in food," there must be a substantial history of consumption of the substance as food by a significant number of consumers.[47]

The FDA has enumerated a list of substances that the agency considers to be GRAS for use in food.[48] As with regulations establishing the conditions of safe use for food additives, these determinations are either initiated by the FDA of its own accord or in response to the submission of a petition.[49] A manufacturer intending to use a food substance and hoping to avoid a regulation establishing conditions for safe use as a food additive may submit a petition seeking the FDA's affirmation that the ingredient is GRAS.[50] The petition must include, among other things, information about past use of the substance, methods for detecting the substance in food, and information to establish the safety and functionality of the substance, including published scientific literature and any adverse information or consumer complaints.[51] Further, the petition must be "a representative and balanced submission" that includes both favorable and unfavorable information regarding the safety and functionality of the substance.[52]

A GRAS determination on the basis of scientific procedures requires the same scientific evidence as is necessary for approval of a food additive petition, and typically is based on published studies, corroborated by unpublished studies, and other data and information.[53] The FDA has explained that one must show "a consensus of expert opinion regarding the safety of the use of the substance," and that, although "[u]nanimity among experts . . . is not required," a "severe conflict among experts . . . precludes a finding" that a product is GRAS.[54]

A conclusion that a substance is GRAS on the basis of its prior use in food obviously does not require the same quantity or quality of scientific procedures, and usually is based on generally available data and information.[55] A substance can be GRAS on the basis of its pre-1958 use outside the United States, although the FDA will likely look for greater documentation and corroboration of the ingredient's use.[56]

There is no requirement to have the FDA affirm the GRAS status of a food ingredient, however. In light of this, and the burdens of submitting a GRAS petition,[57] manufacturers often simply conduct their own review to gather information supporting the GRAS status of the product, and then begin using the product. The FDA believes many manufacturers are deterred from submitting GRAS affirmation petitions by the fact that the process is, for the petitioner and agency, a resource-intensive and relatively lengthy process.[58] To encourage manufacturers to more frequently submit information about their own GRAS determinations, the FDA in 1997, proposed a less burdensome scheme, under which manufacturers would merely notify the agency of their determinations of GRAS status, providing information as to the basis for their "GRAS exemption claim." The FDA would not conduct a detailed evaluation of the data relied on (which would not necessarily be submitted to the FDA, but would be available for the agency to review upon request), and accordingly would not affirm the GRAS status of an ingredient. Rather, the FDA would "evaluate whether the notice provides a sufficient basis for a GRAS determination and whether information in the notice or otherwise available to [the] FDA raises issues that lead the agency to question whether use of the substance is GRAS."[59] The FDA would respond to the notification in writing within 90 days, and would advise the submitter if the agency had identified any "problem" with the notice.[60]

42. FFDCA §201(s), 21 U.S.C. §321(s). Prior-sanctioned food ingredients are listed at 21 C.F.R. pt. 181.
43. FFDCA §201(s), 21 U.S.C. §321(s).
44. *Id.*
45. *Id.*
46. 21 C.F.R. §170.3(h).
47. *Id.* §170.3(f).
48. *Id.* pts. 182, 184, 186.
49. *Id.* §170.35.
50. *Id.* §170.35(c).
51. *Id.* §170.35(c)(1).
52. *Id.* §170.35(c)(1)(v).
53. *Id.* §170.30(b).
54. Substances Generally Recognized as Safe; Proposed Rule, 62 Fed. Reg. 18937, 18939 (Apr. 17, 1997) [hereinafter GRAS Notification Proposed Rule].
55. 21 C.F.R. §170.30(c)(1). Moreover, such a determination must be based solely on food use before 1958. *Id.*
56. *Id.* §170.30(c)(2).
57. A determination that a substance is GRAS requires the FDA to conclude both that the product is safe and that this safety is generally known and accepted. By contrast, approval of a food additive requires the FDA to reach a conclusion only as to an ingredient's safety. GRAS Notification Proposed Rule, *supra* note 54, at 18940 & n.1.
58. *Id.* at 18941.
59. *Id.*
60. *Id.*

When it proposed the GRAS notification program, the FDA encouraged manufacturers to avail themselves of it even before a final rule was adopted.[61] Although there still was no final rule by mid-2001, it appears that, as a practical matter, the notification program has replaced the GRAS affirmation petition process. By the end of 2000, the FDA reportedly had received several dozen GRAS notifications.[62]

C. Regulation of Bioengineered Food

In 1992, the FDA issued a policy statement regarding how the agency intended to regulate human foods and animals feeds derived from new plant varieties, including varieties developed using rDNA technology, which were referred to as "bioengineered foods."[63] In general, the FDA announced that bioengineered foods would be regulated no differently than foods developed through traditional plant breeding. As a class, bioengineered foods did not require special labeling nor were they subject to premarket approval. The FDA would look to the objective characteristics of the food and its intended use, not the method by which the food was developed.[64]

Generally, this meant that bioengineered foods would be subject to regulation for safety within the context of FFDCA provisions regarding adulteration and misbranding of food, and would be subject to premarket approval only if the genetic modification created a substance that fell within the definition of a food additive.[65] In that regard, however, the FDA noted that, "[i]n most cases, the substances expected to become components of food as a result of genetic modification of a plant will be the same as or substantially similar to substances commonly found in food, such as proteins, fats and oils, and carbohydrates."[66] For the most part, therefore, the FDA expected that the results of bioengineering would be GRAS.[67]

Nonetheless, the FDA did foresee certain potential issues related to bioengineering, although they could be addressed within the context of current provisions of the FFDCA. For example, if a bioengineered food contained a naturally occurring toxicant increased by the genetic modification, or an unexpected toxicant that first appeared in the food as a result of the genetic modification, the food might be considered adulterated as containing an added deleterious substance that "'may render' the food injurious to health."[68]

In the 1992 *Planned Introductions*, the FDA acknowledged the food industry's long-standing practice of consulting with the FDA in the early stages of developing food through new technologies. This practice, although not required, allowed the agency to identify and address issues regarding foods and food ingredients before they were marketed.[69] The FDA expressed its expectation that such consultations would continue with regard to bioengineered foods.[70] In 1996, the FDA issued a guidance on procedures for those consultations.[71] A company that intends to commercialize a bioengineered food meets with the FDA at an "initial consultation" to identify and discuss possible issues regarding safety, nutritional, or other regulatory issues. A "final consultation" is held once the company believes it has developed the data and information necessary to address issues or concerns raised by the FDA.[72] The FDA believes that, through the end of the year 2000, all developers of bioengineered foods commercially marketed in the United States have consulted with the agency before marketing the food.[73]

Although the FDA's 1992 *Planned Introductions* has not been popular with some consumer groups and has spawned legislative efforts to change the statutory framework,[74] it has been upheld in court.[75] Nonetheless, the FDA is aware of continuing consumer concern, and in January 2001, issued two documents (discussed below) that, although based on the 1992 *Planned Introductions*, appear to be an attempt to go further in addressing consumers' concerns. The first document is a draft guidance to industry on issues that may arise with regard to labeling food as made with or without ingredients developed through biotechnology. The second is a proposed rule that would require developers of bioengineered foods to submit data and information to the FDA 120 days before commercial distribution of such foods, giving the FDA an opportunity to evaluate whether (1) the bioengineered food is as safe as comparable food, and (2) the proposed use complies with FFDCA requirements.

1. Draft Guidance on Labeling

In January 2001, the FDA issued a draft guidance for industry regarding labeling of bioengineered foods.[76] In the draft, the FDA reaffirms that special labeling is not required for such foods because there is "no basis for concluding that bioengineered foods differ from other foods in any meaningful or uniform way, or that, as a class, foods developed by the new techniques present any different or greater safety concern than foods developed by traditional plant breeding."[77]

Nonetheless, the draft guidance sets out several scenarios under which a bioengineered food might be mislabeled. For example, because a food must be labeled with a common or

61. *Id.*

62. Premarket Notice Concerning Bioengineered Foods; Proposed Rule, 66 Fed. Reg. 4706, 4717 n.12 (Jan. 18, 2001) [hereinafter Premarket Notice Proposed Rule].

63. Statement of Policy: Foods Derived From New Plant Varieties, 57 Fed. Reg. 22984 (May 29, 1992).

64. *Id.*

65. *Id.* at 22985.

66. *Id.*

67. *Id.* at 22990.

68. *Id.* (quoting FFDCA §402(a)(1), 21 U.S.C. §342(a)(1)).

69. *Id.* at 22991.

70. *Id.*

71. FDA, GUIDANCE ON CONSULTATION PROCEDURES: FOODS DERIVED FROM NEW PLANT VARIETIES (June 1996; revised Oct. 1997 to reflect organizational changes), *available at* http://www.cfsan.fda.gov/~/rd/consulpr.html (last visited July 20, 2001).

72. *Id.* §II.

73. Premarket Notice Proposed Rule, *supra* note 62; *see also* FDA, LIST OF COMPLETED CONSULTATIONS ON BIOENGINEERED FOODS, *available at* http://www.cfsan.fda.gov/~lrd/biocon.html (last visited July 20, 2001).

74. *See, e.g.*, Genetically Engineered Food Right-to-Know Act, H.R. 3377, 106th Cong. (2000).

75. *See* Alliance for Bio-Integrity v. Shalala, 116 F. Supp. 2d 166 (D.D.C. 2000).

76. Draft Guidance for Industry: Voluntary Labeling Indicating Whether Foods Have or Have Not Been Developed Using Bioengineering; Availability, 66 Fed. Reg. 4839 (Jan. 18, 2001).

77. FDA, GUIDANCE FOR INDUSTRY: VOLUNTARY LABELING INDICATING WHETHER FOODS HAVE OR HAVE NOT BEEN DEVELOPED USING BIOENGINEERING 2 (2001) [hereinafter LABELING GUIDANCE].

usual name or an appropriately descriptive term,[78] the FDA notes that there may be instances in which a bioengineered food is "significantly different from" its traditional counterpart such that the common or usual name does not adequately describe the food, and the name must be changed to describe the difference.[79] As an example, the FDA has suggested that the term "high oleic acid soybean oil" would be required for a soybean oil that has been bioengineered to reduce the amount of saturated fat and, as a result, contains more oleic acid than traditional soybean oil.[80]

More generally, because a food can be misbranded if its labeling omits material information,[81] the FDA identifies certain circumstances in which labeling may require affirmative disclosures:

- If there is an issue regarding how a food is used or the consequences of its use;
- If the bioengineered food has a significantly different nutritional property; or
- If the bioengineered food contains an allergen that consumers would not expect to be in the food.[82]

The FDA understands that, notwithstanding the agency's conclusion that bioengineered foods do not require special labeling, manufacturers may want to respond to consumers' perceived interest in knowing whether a food product is the result of genetic modification. With that in mind, the draft guidance identifies (and in some cases, addresses) issues that are implicated by a decision to label a food as genetically modified or (the more likely scenario) to claim that it is not the result of genetic modification. The FDA's expressed goal is to help manufacturers avoid labeling that is false or misleading, either because of statements made or the omission of material information.[83]

With regard to foods that are bioengineered or that contain ingredients produced from bioengineered food, the FDA offers the following:

- A statement that the food or an ingredient is "genetically engineered" or "produced using biotechnology" is not necessary, but if used, is not likely to be misleading.
- A change in texture that makes a "significant difference" in the finished product that is noticeable to the consumer may need to be described on the label. If the difference would not be noticed by a consumer, however (a change made to facilitate processing, for example), it could actually be misleading to say that the food has been changed. In that instance, the FDA recommends that, if the change is identified, its purpose should be described to avoid misleading consumers, e.g., "These tomatoes were genetically engineered to improve texture for processing."
- It is permissible, but not necessary, to state that a food has been genetically altered to increase yield, but if such a statement is made, there must be substantiation of the stated difference.
- Care should be taken to make sure that statements about a bioengineered ingredient are understood to be about the ingredient, not the entire food.
- A statement that an ingredient has been nutritionally improved likely would be misleading if the food contains only a small amount of the ingredient, such that the overall nutritional quality of the food is not significantly improved.[84]

As to foods that are not the result of bioengineering, the FDA is concerned that terms such as "not genetically modified" or "GMO free" are in many instances not technically accurate, and may be misleading. Because genetic modification includes much of what is done in traditional plant breeding, not just bioengineering, a food that was not bioengineered may nonetheless be genetically modified. Similarly, because most foods do not contain organisms (seeds and yogurt are notable exceptions), a statement that a food is free of (genetically modified) organisms can be misleading, in the FDA's eyes.[85]

The FDA believes consumers understand a claim that a product is "free" of bioengineered material to mean that "zero" bioengineered material is present. Recognizing "the potential for adventitious presence of bioengineered material" and noting the absence of an agreed-upon threshold above which the terms should not be used, the FDA considers the term "free" to be possibly false or misleading. The agency suggests that manufacturers avoid the term, unless it is used in a context that makes clear that a "zero level" is not implied. As an alternative, the FDA suggests a statement that a food or its ingredients were "not developed using bioengineering."[86]

With regard to claims that a product is not the result of bioengineering, the FDA also suggests the following:

- A statement as to the absence of bioengineering is misleading if it implies that the food is superior to, e.g., safer or of higher quality, foods that are the result of bioengineering.
- A statement that an ingredient is not bioengineered may be misleading if the food contains another ingredient that is bioengineered.
- A statement that a food is not bioengineered may be misleading if no bioengineered varieties of that category of food are marketed.
- A statement that a food is not bioengineered should be substantiated. The FDA recognizes that although validated testing is the preferred method of substantiating such a claim, it is not always available or reliable. In such circumstances, manufacturers may be able to rely on careful documentation of the source of such foods, along with special handling to segregate bioengineered and nonbioengineered foods.
- Under regulations published by the USDA in December 2000, food identified as "organic" cannot be produced using biotechnology, and organic foods must be segregated from nonorganic foods.[87]

78. FFDCA §403(i), 21 U.S.C. §343(i).
79. LABELING GUIDANCE, *supra* note 77, at 4.
80. *Id.* at 8.
81. FFDCA §§201(n), 403(a)(1), 21 U.S.C. §§321(n), 343(a)(1).
82. LABELING GUIDANCE, *supra* note 77, at 4.
83. *Id.* at 6-7.
84. *Id.* at 7-10.
85. *Id.* at 11-12.
86. *Id.* at 12-13.
87. National Organic Program; Final Rule, 65 Fed. Reg. 80548 (Dec. 21, 2000).

> In light of these regulations, the FDA concludes that food that meets the standards to be "certified organic" would also be able to be identified as not being produced using bioengineering.[88]

2. Proposed Rule on Premarket Notice

The same day it announced the availability of a draft guidance on labeling of bioengineered food, the FDA published a proposed rule that would require submission of data and information 120 days before placing on the market any plant-derived bioengineered food for humans or animals.[89] Even as it proposed these new obligations, the FDA reiterated its view, expressed in the 1992 *Planned Introductions*, that transferred genetic material can be presumed to be GRAS.[90] Nonetheless, pointing to ever-advancing technology, the agency identified several areas in which there may be regulatory issues, some of which are also raised in the labeling guidance. They include:

- Recognizing that rDNA technology now permits the introduction of genetic material from a wider range of sources than previously possible, there is a greater likelihood that a bioengineered food will contain substances that are not GRAS because they are significantly different from substances historically consumed as food, or present at a significantly higher level.
- There is the possibility of transferring a food allergen from one food into another food in which the allergen would not be expected, which could make the food misbranded, and perhaps adulterated, even with labeling disclosures.
- A bioengineered food could be different from its nonbioengineered counterparts in a way that is sufficiently significant to require a different common or usual name. As an example, the FDA points to the use of rDNA technology to introduce multiple genes to generate new metabolic pathways that are intended to lead to the synthesis of substances not normally present in the host plant.
- The risk of creating unintended changes to the characteristics of a food by introducing mutations into the plant's native genetic material raises potential adulteration or misbranding issues.
- Most of the previously reviewed genetic modifications have involved agronomic traits, i.e., characteristics of the plant, not of the food produced by the plant. The FDA is seeing more proposed modifications that are intended to modify the food itself, such as altered protein quality, increased carotenoid content, increased fruit solids, altered fiber quality, and increased fruit sweetness. Such changes are more likely than those in the past to raise regulatory issues.[91]

With the expressed goal of "enhanced agency awareness of all [bioengineered] foods intended for commercial distribution,"[92] the FDA proposed that a premarket biotechnology notice (PBN) be required 120 days before commercial distribution of a plant-derived bioengineered food. The PBN could be submitted by any person who is responsible for the development, distribution, importation, or sale of the food, but the FDA expects seed developers and purveyors to be the reporting entity in most instances.[93] A PBN would be required for any bioengineered food unless:

- The food derives from a plant line that represents a transformation event that has been addressed in a previous PBN;
- The use or application of the food has been addressed in a previous notice to the FDA; and
- The FDA has issued a letter demonstrating that the agency has evaluated, and has no questions about, the use or application.[94]

Although EPA, not the FDA, has jurisdiction over pesticides and pesticide residues in food, a PBN would be required for a bioengineered food derived from a plant modified to contain a pesticidal substance. The FDA reasons that this is necessary for the agency to be able to meet its responsibilities for issues beyond those associated with the pesticide, such as unexpected or unintended compositional changes.[95]

As proposed by the FDA, the components of a PBN would include:

- A signed statement by the notifier that (1) the bioengineered food is as safe as comparable food, (2) the intended use complies with all applicable requirements, and (3) the PBN is a representative and balanced submission that includes favorable and unfavorable information pertinent to safety, nutritional, or other regulatory issues.[96]
- A report of the status of the food at other U.S. federal agencies, as well as whether the food is or has been the subject of review by any foreign government and, if so, a description of that review.[97]
- Data or information about the method of development, including characterization of the parent plant, construction of the vector used in the transformation of the parent plant, characterization of the inserted genetic material, and data or information related to the inheritance and genetic stability of the inserted material.[98]
- A discussion about any newly inserted genes that encode antibiotic resistance.[99]
- Data or information about substances introduced into, or modified in, the food, including their identify and function, the level of them in the food, di-

88. LABELING GUIDANCE, *supra* note 77, at 13-16.

89. Premarket Notice Proposed Rule, *supra* note 62.

90. *Id.* at 4709.

91. *Id.* at 4709-11.

92. *Id.* at 4712. The FDA notes that approximately 45% of U.S. plant-derived food is imported, and the percentage is increasing. *Id.* The proposed requirements would apply to bioengineered food manufactured in the United States, as well as foods intended for import into the United States. *Id.*

93. *Id.* at 4712, 4730 (proposed 21 C.F.R. §192.1(c)).

94. *Id.* at 4713, 4730 (proposed 21 C.F.R. §192.5).

95. *Id.* at 4713.

96. *Id.* at 4717-18, 4732 (proposed 21 C.F.R. §192.25(a)).

97. *Id.* at 4718-19, 4732 (proposed 21 C.F.R. §192.25(c)).

98. *Id.* at 4719, 4732-33 (proposed 21 C.F.R. §192.25(d)).

99. *Id.* at 4719, 4733 (proposed 21 C.F.R. §192.25(e)).

etary exposure to them, and the potential that an introduced protein will be an allergen.[100]
- Data or information about the bioengineered food, including an explanation of the basis for the conclusion that the bioengineered food is as safe as comparable foods and complies with all applicable requirements of the FFDCA.[101]

The FDA expects to have reviewed each PBN within 120 days, and to respond with a letter that either states that the agency has no questions regarding the submitter's view that the bioengineered food is as safe as comparable food and is otherwise lawful, or explains why the FDA has concluded that the PBN does not provide a basis for that view. The regulations would also provide for a 120-day extension of the review and response period. If the FDA either needs more time or concludes that the PBN does not support the requisite conclusion, the letter would state the agency's expectation that the food not be marketed.[102]

Because the rule would require premarket notification, not a requirement of approval, the marketing of a bioengineered food in the absence of the FDA's conclusion that the PBN is adequate would not be a violation of the FFDCA. In such a circumstance, however, it would be the FDA's intention to vigorously pursue the product as adulterated or misbranded.[103]

The FDA expects to be able to respond within 120 days because it anticipates that, before submitting a PBN, most companies will have been communicating with the agency in a presubmission consultation program that the proposed regulations would encourage, but not require. It is the agency's expectation that, by the time it submits a PBN, the company will be well aware of what information the FDA will need to come to the desired conclusion.[104]

Given that one of the goals of the PBN/presubmission consultation program is to increase "transparency" in the process of regulating bioengineered foods,[105] it is not surprising that the FDA expects to make publicly available much of the materials it obtains in a PBN submission and during the presubmission consultations.[106] The FDA believes that, in most cases, the data or information provided during a presubmission consultation or in a PBN would not be considered trade secrets or confidential commercial information.[107] The FDA also intends to make public the text of the agency's evaluation of each PBN, as well as the response letter.[108]

100. *Id.* at 4719-20, 4733 (proposed 21 C.F.R. §192.25(f)).

101. *Id.* at 4720-21, 4733 (proposed 21 C.F.R. §192.25(g)).

102. *Id.* at 4722-23, 4733 (proposed 21 C.F.R. §192.30).

103. *Id.* at 4722.

104. *Id.* at 4713-14, 4730-31 (proposed 21 C.F.R. §192.10). Even if a bioengineered plant is being developed for a non-food use, such as encoding pharmaceutical proteins or oral vaccines, the FDA encourages the developer to participate in the consultation program if there is the potential for the plant to inadvertently enter the food supply. *Id.* at 4714.

105. *Id.* at 4708.

106. *Id.* at 4714, 4731 (proposed 21 C.F.R. §192.10(c)-(d)), 4723-24, 4733-34 (proposed 21 C.F.R. §192.40).

107. *Id.* at 4714, 4723.

108. *Id.* at 4723-24, 4734 (proposed 21 C.F.R. §192.40(e)).

D. FDA Enforcement

Although the FDA typically enforces compliance with the FFDCA administratively, the agency also has authority to pursue civil and criminal remedies in court. Section 301 of the FFDCA enumerates acts that are prohibited; with regard to food, they include:

- Introducing or delivering for introduction into interstate commerce an adulterated or misbranded food;
- Adulterating or misbranding a food in interstate commerce;
- Receiving in interstate commerce an adulterated or misbranded food, and delivering or proffering delivery thereof;
- Refusing to permit the FDA to copy records of interstate shipment;
- Refusing to permit the FDA to inspect a warehouse, factory, or establishment in which food is manufactured, processed, packed, or held;
- Manufacturing an adulterated or misbranded food; or
- Doing any act with respect to a food that causes the food to be adulterated or misbranded, if the act is done while the food is held for sale after shipment in interstate commerce.[109]

The FDA often obtains information regarding violations through establishment inspections and record reviews. Interstate carriers and anyone who receives food in interstate commerce or holds articles of food received in interstate commerce must, upon written request, allow the FDA to review and copy records of movement in interstate commerce.[110] The FDA also has authority to enter and inspect a factory, warehouse, or establishment in which food is manufactured, processed, packed, or held.[111]

The FDA Form 483, the form for reporting inspectional observations that is presented to a company official at the close of an inspection, is often a means for the FDA to communicate about alleged violations. The agency also sends "warning letters," which are an informal but powerful way of informing a company of practices that it considers violative. When such informal methods seem inadequate, however, the agency has other avenues of redress. The FDA can file suit in federal court and obtain an injunction to restrain violations of FFDCA §301,[112] or for seizure, condemnation, and destruction of an adulterated or misbranded product.[113] Similarly, if a food offered for import into the United States appears to be (among other things) adulterated or misbranded, it may be detained and, unless the FDA agrees to means of bringing the product into compliance (which is not always an available option), the product will be refused admission and must be exported or destroyed.[114]

109. FFDCA §301(a)-(k), 21 U.S.C. §331(a)-(k).

110. *Id.* §703, 21 U.S.C. §373. Evidence obtained from a review conducted pursuant to a written request cannot be used in a criminal prosecution. *Id.*

111. *Id.* §704, 21 U.S.C. §374.

112. *Id.* §302, 21 U.S.C. §332. There are certain exceptions not relevant here.

113. *Id.* §304, 21 U.S.C. §334.

114. *Id.* §801, 21 U.S.C. §381.

With regard to drugs and medical devices, the FDA has also had some recent success obtaining civil judgments for sale of violative products under a theory of restitution or disgorgement.[115] Although this may not yet have been pursued with regard to a food product, it should be available to the agency under the same theory. Additionally, any violation of FFDCA §301 can be a criminal matter. A first violation is a misdemeanor, punishable with up to one year in prison and a $1,000 fine.[116] A violation committed with intent to defraud or mislead is a felony that can lead to a three-year prison term and a $10,000 fine, as is any second violation, i.e., after a first conviction.[117] It is well established that criminal liability extends to individual employees and officers.[118]

115. *See, e.g.*, United States v. Universal Mgmt. Servs., 191 F.3d 750, 760-64 (6th Cir. 1999).

116. FFDCA §303(a)(1), 21 U.S.C. §333(a)(1). There is an exception involving labeling or advertising for vitamins and minerals that is not relevant. *Id.* §303(d), 21 U.S.C. §333(d).

117. *Id.* §303(a)(2), 21 U.S.C. §333(a)(2).

118. *See, e.g.*, United States v. Park, 421 U.S. 658 (1975).

CHAPTER 8

I. Liability and Litigation

Like any product involving substantial financial potential, genetically modified products (GMPs) will not escape litigation. In fact, GMPs may see more than their share of litigation, due to the increasing public and governmental concern and scrutiny over the safety of genetically manipulated products. The ability to predict the success of such litigation is considerably limited at present, however, by the novelty of the products and the litigation issues they raise, and by the lack of legal precedent on those issues.

Recognizing the limited basis from which to assess liability, this chapter nevertheless discusses a framework for considering and preparing for anticipated litigation generated by genetically modified (GM) crop, forestry, and animal-related products. We discuss the major arenas in which litigation can be anticipated; the theories likely to be asserted; and some strategic considerations for companies who wish to prepare for the lawsuits their products will face. The little current litigation that exists (apart from litigation over proprietary rights in GMPs, a subject beyond the scope of this deskbook) is in the areas of (1) GM food lawsuits arising out of the StarLink™ corn recall; and (2) environmental litigation involving government approvals of GMPs. Additional litigation, however, is likely because of the public notoriety and legal turmoil involving consumer products caused by the fallout from the StarLink™ corn situation and by growing opposition to GMPs by some groups.

Most companies involved with GM organisms are presently focused on the issues discussed in the remainder of this deskbook, particularly product development and the regulatory schemes. The litigation aspects, however, should not be ignored. As products make their way to market, litigation will undoubtedly follow and could prove as detrimental to a product's success as any scientific or regulatory hurdle.

A. GM Crop Product Litigation

1. The StarLink™ Recall and Subsequent Litigation

The highly publicized problems involving StarLink™ corn not only illustrate, but in some ways can be expected to generate, the kind of business and consumer litigation GMPs will likely face.

StarLink™ corn contains a GM protein, Cry9C, designed to kill the European corn borer, a natural insect predator. The corn's inventor, Aventis, obtained EPA regulatory approval under FIFRA to market the corn for use in animal feed,[1] but the approval for use in humans remained under regulatory review. The realities of the U.S. food distribution chain, however, were not conducive to keeping animal and human uses separate. In September 2000, an environmental group identified StarLink™ corn in a brand of taco shells.[2] Subsequent testing confirmed this and also found the protein in other corn-based products in the United States and elsewhere,[3] leading to a massive recall of those products.[4] Aventis has withdrawn StarLink™ from the market[5] and is presently dealing with the massive regulatory and distribution issues generated by these events. It is presently estimated that 430 million bushels of stored corn contain the StarLink™ protein.[6]

The maker of the taco shells, Kraft, and the producer of the corn flour used, Azteca Milling, have been sued in a consumer fraud class action lawsuit alleging that buyers of the affected taco shells were sold mislabeled and potentially dangerous goods.[7] The class action complaint alleges counts under the Illinois Consumer Fraud Act, the Uniform Deceptive Trade Practices Act, common-law fraud, negligence, and Uniform Commercial Code (U.C.C.) violations, primarily seeking a disgorgement of profits from sale of the shells. Kraft is a defendant because it sold the taco shells at issue, and Azteca is a defendant based on its alleged failure to segregate corn intended for human versus nonhuman consumption in the production of corn flour used in the shells. Interestingly, Aventis, the inventor and marketer of StarLink™ corn seed, is not a defendant in this lawsuit.

In a potentially more far-reaching class action lawsuit, a farmer has sued Aventis for economic damages from the loss of corn sales, even though he never grew StarLink™ corn.[8] The theory of this case is that StarLink™'s contamination of human corn supplies has wiped out the market for American corn in Europe and elsewhere, damaging even growers whose crops are not contaminated.

The companies involved in the StarLink™ situation have taken substantial steps to contain the repercussions of these events. Kraft almost immediately instituted a massive recall of the taco shells.[9] Aventis also cancelled the registration, recalled seed product from the market, and instituted a reimbursement system to cover the losses incurred by farmers and others.[10] The reimbursement program also extended to 17 state governments, with whom Aventis signed an agreement on January 23, 2001, to cover farmers' losses in those states.[11]

1. *See* 63 Fed. Reg. 43936 (Aug. 17, 1998); 65 Fed. Reg. 48701 (Aug. 9, 2000).
2. *See* Daily Env't Rep. (BNA), Sept. 19, 2000, at A-3.
3. *See Japanese Agriculture Ministry Confirms Presence of StarLink in Animal Feed Corn*, Daily Env't Rep. (BNA), Nov. 17, 2000, at A-7.
4. *See Biotech Corn Fuels a Recall*, WASH. POST, Sept. 23, 2000, at A1; *Kraft Recalls Taco Shells After Tests Reveal Presence of Unapproved Corn*, Daily Env't Rep. (BNA), Sept. 25, 2000, at A-9.
5. *See Aventis Halts Seed Sales of Genetically Engineered Corn*, WALL ST. J., Sept. 27, 2000, at A9.
6. *Biotech Grain Is in 430 Million Bushels of Corn, Firm Says*, WASH. POST, Mar. 18, 2001, at A8.
7. *See* Merri Place v. Kraft Foods, No. 00CH014114 (Cir. Ct. Cook County, Ill. filed Nov. 2, 2000).
8. Sutt v. Aventis, No. CL85480 (D. Iowa filed Feb. 5, 2001). *See Iowa Farmer Files Biotech Corn Class Action Suit Against Aventis*, LIABILITY & INS. WK., Feb. 12, 2001, at 8.
9. *See Kraft Recalls Taco Shells, supra* note 4.
10. *See* 66 Fed. Reg. 4825 (Jan. 18, 2001) (notice of registration cancellation).
11. *See Compensation Agreement Reached Between Aventis, State Representatives*, Daily Env't Rep. (BNA), Jan. 26, 2001, at A-4.

These efforts have probably served to limit the companies' liability but have not prevented the filing of class actions.

The most serious fallout from the StarLink™ matter, however, is the heightened public fear of GM consumer products that has arisen, rightly or wrongly, from StarLink™'s appearance in human products and the wide publicity surrounding these events. Other products labeled solely for animal use or otherwise intended for limited distribution should be considered high litigation-risk products, as it will be difficult to ensure complete segregation of those products. More importantly, even products labeled for human use could be pulled into litigation, driven either by the absence of labeling and disclosure of the GM basis of the product, or by cross-contamination of products that are supposedly GM-free, e.g., organic foods. The resulting market impacts could generate business-to-business lawsuits as companies seek indemnification and reimbursement for their losses.

2. Rejection, Segregation, and Labeling of Other GMPs

The StarLink™ situation has resulted in limited shipment rejections of product tested or suspected to contain the StarLink™ protein. More troubling is the rejection of other, or even *all* GM consumer products, by certain countries. For instance, several European countries, led by France, have refused to comply with European Union (EU) approvals of certain GM foods and seeds and will not allow either the importation or the production of GM consumer products—including any non-GM materials "contaminated" with approved GM material—within their borders.[12] Further, EU countries are moving toward segregation and labeling of all GMPs,[13] as well as requiring product traceability and recall ability throughout the food chain,[14] a practical nightmare for companies dealing with the production and distribution of these products. The USDA is also considering a segregation rule.[15] Reflecting the growing resistance to GMPs, a number of countries—including Egypt, Japan, and several EU Member states—have already announced that they do not intend to accept a new GM "roundup ready" wheat product developed by Monsanto that is not expected on the market for two to four years.[16] To alleviate these concerns over its new wheat product, Monsanto has agreed to a segregation plan under which the GM wheat will be grown and sold separately.[17]

Segregation and labeling, if accepted, may prove difficult to achieve completely.[18] The types of lawsuits likely to arise from the difficulties in obtaining complete segregation are discussed below.

3. Business Claims

If indeed GMPs begin to encounter difficulty in the marketplace, the impact of lost sales, recalls, etc., will likely generate a risk of lawsuits up and down the product chain. The StarLink™ situation, for example, has resulted in the rejection of shipments of corn and other grains to Europe and Japan, although there do not appear to be lawsuits from these rejections to date. Such lawsuits would likely focus on the contractual or tort causes of action aimed at responsibility for contamination of the food product, since StarLink™ corn is not supposed to be found in products for human consumption. These disputes may in large part be resolved short of lawsuits if the parties can identify the source of contamination and take business steps to eliminate what might otherwise be large-scale liability problems, e.g., Aventis' and Kraft's recall and claims-payment process.

If consumers reject GMPs that are *approved* for human consumption, however, the responsibility will be far less clear cut and the outcome of lawsuits more uncertain. Assume, for instance, that grocery chains—prompted by large-scale protests and media coverage—refuse to sell any baby food with GMP. There is arguably no obvious breach of contract or tort duty, yet hundreds or thousands of stores, distributors, product sellers, and growers could be hit by the financial ripples. Possible lawsuits could arise in the following two major areas:

a. Food Sale and Distribution Lawsuits

Lawsuits over product sales disruption could come from the end sellers who remove product from shelves; from the distributors whose warehouses are full of unsellable product; and from the farmers whose crops are no longer marketable. The legal theories of recovery in this setting could draw on the following:

- *Product liability theories* alleging design defect and strict liability for GM products that spread their characteristics to other products and thereby caused damage to those products;
- *Contractually derived theories* based on agreements between and among seed producers, seed distributors, growers, and food processers/sellers governing purity of the product, segregation of GM materials, and indemnification;
- *Third-party beneficiary theories* alleging that end users or sellers were the intended beneficiaries of contractual segregation or purity agreements;
- *Warranty and other U.C.C.-derived claims* alleging economic harm from products that did not perform as warranted; and
- *Business tort claims* such as tortious interference with contract or prospective relations, e.g., rejected shipments or sales, to the extent a direct contractual relationship cannot be established.

12. *See* Joe Kerwin, *Mandatory Segregation of GM Crops in U.S. Seen as Prerequisite to New EU Approvals, available at* http://www.biotech-info.net/mandatory_segregation.html (last visited Oct. 15, 2001); *Deal to Revise Laws on GMOs*, FIN. TIMES, Dec. 12, 2000, at 15.

13. *See, e.g.*, European Commission, Proposed Directive 2001/. . ./EC (PE-CONS 3664/00) on the deliberate release into the environment of GM organisms and repealing Council Directive 90/220/EEC; id. art. 4, ¶ 6 (requiring traceability and recall); art. 13, §2 (requiring labeling stating "this product contains genetically modified organisms" on all approved products). *See* ELR UPDATE, Aug. 6, 2001, *available at* http://www.eli.org (last visited July 31, 2001).

14. *See, e.g., Parliament Approves GM Rules That Could Clear Way for New Products,* Daily Env't Rep. (BNA), Feb. 16, 2001, at A-2.

15. *See USDA Considers Rule to Separate GM From Conventional Crops,* Daily Env't Rep. (BNA), Dec. 1, 2000, at A-8.

16. *Gene-Spliced Wheat Stirs Global Fears*, WASH. POST, Feb. 27, 2001, at A1.

17. *Id.* at A5.

18. *See Advisory Panel Says "Zero Tolerance" on Biotechnology Not Feasible*, Daily Env't Rep. (BNA), Dec. 4, 2000, at A-9.

Some of these theories would be of questionable viability, but the lawsuits would be heavily dependant on the facts and circumstances of each situation and the outcome is unpredictable.

b. Cross-Contamination Lawsuits

The nature of GM seed and crops creates a risk that GM seed, pollen, and product will make its way from authorized GM settings into non-GM settings. The introduction of GM seed or crop features from segregated GM fields into non-GM fields, for instance, will be difficult to prevent, as will the mixing of grain or other products once they are in the food and product chain. Even unrelated strains may be at risk if they can be easily cross-pollinated.[19]

Some of the legal theories discussed above are likely to come into play in a cross-pollination case, along with common-law claims based on trespass, nuisance, or conversion. One such lawsuit, against Monsanto, alleged cross-pollination through pollen drift of a non-GM farmer's canola crop.[20] Illustrating the complexity of these suits, Monsanto asserted this farmer had illegally obtained and planted Monsanto's patented seed, but the farmer cross-sued claiming that the Monsanto pollen was blown onto his property, contaminating his non-GM crops. The Canadian court recently ruled in Monsanto's favor, holding that the farmer did not have the right to plant cross-pollinated seed containing Monsanto's patented gene, even if the cross-pollination was accidental.[21]

Lawsuits over cross-pollination are even more likely if the crop, seed, or product affected is not permitted to contain GM elements. Under the few laws that currently exist, for instance, organic foods cannot contain GM material.[22] Thus, organic growers may seek compensation from nearby GM farmers or the originating seed company if their product is tested and found to contain GMP. Another immediate possibility is the rejection of grain shipments to Europe, where some countries are actively embargoing food containing any amount of GM material.

4. Consumer Lawsuits

Lawsuits alleging fraud in the failure to warn consumers of the GM content of foods could prove attractive under a number of state consumer protection statutes or common-law theories. As noted above, several such lawsuits have been filed in regard to the StarLink™ situation. Consumer fraud and unfair business practice statutes are often broadly worded to include any form of consumer transaction or business activity, and some permit individuals to sue on behalf of all citizens without a showing of causation, reliance, or injury.[23] These lawsuits are potentially amenable to class actions seeking, for instance, disgorgement of all profits from the affected product. GMP lawsuits could thus be brought by a single consumer claiming that all consumers have been defrauded by the product manufacturer/seller's misrepresentation as to the GM content of the product.

The defendants will have a ready defense in the approval of these products for human use, *and* the lack of any regulation requiring labeling of GM content. In addition, to date there is no persuasive science demonstrating that human-approved GMPs perform any differently or create any risks to consumers. State consumer protection statutes, however, do not depend necessarily on violations of law and may find fraud in the withholding of information designed to mislead the consumer.

5. Health Lawsuits

Health effects cases based on consumption of or exposure to GMPs are not necessarily as readily anticipated as consumer and business lawsuits, but some health litigation is likely to occur. One such health-related lawsuit has already been filed. That class action, *Finger v. Azteca Foods*,[24] alleges that the named plaintiff suffered an allergic reaction to StarLink™-contaminated corn tortillas.[25] The lawsuit blames Aventis, the holder of the intellectual property rights to StarLink™ corn, and Garst Seed, the distributor of StarLink™ corn seed, for failing to inform farmers about the need to maintain a buffer planting zone and to not sell the product for human consumption. The counts sound in consumer fraud, U.C.C. warranty and related claims, and negligence.

Personal injury damages in a case like this may be somewhat limited. The plaintiff in *Finger*, for instance, claims to have experienced a 24-hour episode of diarrhea, hives, and swelling with no apparent long-term effects. The FDA has received 48 complaints alleging allergic reactions to StarLink™, a dozen or so of which the FDA is treating seriously.[26] Some of these cases may involve anaphylactic shock, a life-threatening event.[27] Notwithstanding, most allergenic reactions, even if associated with GMPs, would probably not be sufficiently serious to generate large-scale health-related litigation. Nor are there currently any indications that GMPs are otherwise associated with health effects.[28]

19. *See Protein Produced by StarLink Corn Found in Unrelated Strain*, Daily Env't Rep. (BNA), Nov. 24, 2000, at A-7.

20. *See* Marc Kaufman, *Farmer Liable for Growing Biotech Crops*, Wash. Post, Mar. 30, 2001, at A3.

21. *Id.*

22. *See* National Organic Program, 7 C.F.R. pt. 205; Oregon Organic Food Regulation Act, OR. REV. STAT. §§616.406-616.421 (2000); OR. ADMIN. R. 603-025-0220 (2000) (listing as "prohibited substance" any rDNA material); California Organic Foods Act, CAL. HEALTH & SAFETY CODE §§110810-110958 (West 2000).

23. *See, e.g.*, CAL. CIV. CODE §1750-56 (West 2000) (Consumer Legal Remedies Act proscribes numerous "unfair" acts in context of consumer transactions); CAL. BUS. & PROF. CODE §17200 (West 2000); Committee on Children's Television v. General Foods Corp., 673 P.2d 660 (Cal. 1983) (unfair competition law does not require showing of injury, reliance, actual deception).

24. No. 01-CV-1181 (N.D. Ill. Feb. 21, 2001).

25. As to the actual risks posed by StarLink™ corn, see *SAP Finds Medium Likelihood That StarLink Corn Could Cause Allergies*, Daily Env't Rep. (BNA), Dec. 6, 2000, at A-7 (only a "low probability" of actual human allergenic reaction).

26. *Biotech Corn Is Test Case for Industry*, Wash. Post, Mar. 19, 2001, at A1.

27. *Id.*

28. *See* Press Release, European Commission, Facts on GMOs in the EU 5-6 (July 13, 2001) (EU research since 1986 into safety of GM crops and foods has shown no safety concerns); *Hearings on the Future of Food: Biotechnology and Consumer Confidence: Hearings Before the House Comm. on Health, Education, Labor, and Pensions*, 106th Cong. (2000) (statement of Joseph A. Levitt, Director, FDA Center for Food Safety and Applied Nutrition) ("[The] FDA is confident that the bioengineered plant foods on the U.S. market today are as safe as their conventionally bred counterparts.").

Thus, as the *Finger* case demonstrates, health-based GMP litigation will likely be derivative of consumer fraud actions and not form an independent and significant ground of liability. The depth of antipathy toward GMPs among some groups, however, suggests that the risk of such allegations should not be minimized. The StarLink™ situation may yet lead to more serious lawsuits after the latency period for pregnancy, cancer, etc. has had time to run.

6. Strategic Considerations

Companies planning to develop and sell GM consumer products need to consider and address a number of critical regulatory, contractual, and scientific issues that could significantly affect any subsequent litigation. Some areas to consider include:

- *Contractual Provisions Regarding Segregation*: Because the allegations in consumer fraud cases are likely to focus on failure to segregate seed, crops or foods, and responsibility for commingling or contamination, these cases may well turn on the clarity of contractual obligations between or among the seed producer, distributor, and farmer.
- *Disclosures and Warnings:* The current and future consumer cases will focus on the nature and extent of alleged failures to warn about the presence of GM components of consumer products. Whether this theory can survive as to human-approved products, for which neither the FDA nor EPA has required any such warning, remains to be seen.
- *Contractual Assumptions of Liability:* As between and among commercial entities, the liability for rejected shipments, recalls, and unsellable product may turn on the provisions of sales and distribution contracts regarding commingling, segregation, risk of contamination, etc.
- *Quality of the Company's Science:* For health-related issues, the safety of these products will be challenged and probably determined based on the quality of the testing the company has conducted. For courtroom purposes, the quality of the company's science may depend on the documentation of that testing.
- *Regulatory Events:* Adverse regulatory action on a product is a likely precursor to litigation. GMPs have received a clean bill of health, for the most part, from U.S. regulators, but those products are very much at issue in Europe and of renewed interest in the United States because of the StarLink™ situation and pressure for labeling and other restrictions.

B. Environmental Litigation

GMPs have generated significant concern over possible environmental impacts. The regulatory aspects of EA are discussed above in Chapters 3-7. This section briefly focuses on litigation arising out of environmental allegations.

Environmental lawsuits likely will be a primary weapon of groups seeking to stop the regulatory approval of new GMPs. As an example, Greenpeace and 25 other groups sued EPA in 1997 alleging that EPA had violated NEPA, the APA, and the ESA in approving the use of Bt-maize genetically altered to contain an insecticide that repels insect pests.[29] Plaintiffs claimed that EPA had not sufficiently tested the corn's environmental and ecological effects. Plaintiffs dismissed their lawsuit in August 2000, citing the "complexity" of EPA's response to the administrative petition.[30] As Greenpeace's withdrawal of the Bt-maize suit demonstrates, the legal mechanisms for bringing environmental lawsuits involving GMPs are complex and somewhat limited. None of the current statutes that specifically address GMP registration and sale provide for private rights of action against regulated entities although in some instances they contain potent citizen suit provisions.

TSCA, for example, authorizes citizen suits to enforce compliance with listing of new chemical substances on the TSCA inventory, reporting obligations and other requirements of the statute.[31] EPA's broad assertion of jurisdiction over intergeneric organisms might provide a basis for such suits—the effect of which is to stop or delay commercialization. RCRA has a broader citizen suit provision authorizing suits for injunctive relief against any person contributing to the "past or present handling, storage, treatment, transportation or disposal of any solid or hazardous waste which may present an imminent and substantial endangerment to health or the environment."[32] NEPA, as described in Chapter 2, can also effectively stop projects with a federal funding or approval link which do not adequately consider environmental effects.

Possibly due to the limited applicability of current environmental laws, proposals exist that would make environmental liability a far more serious threat to GMPs. Both in Europe and the United States, the intentional introduction of GM seed or genetic material into the environment (for example, through the planting of research GM crops) is referred to as a "release."[33] To a U.S. environmental lawyer, familiar with the liability for "release" of hazardous substances under environmental statutes,[34] the use of this word illustrates that regulators view GM products as a potential environmental hazard. If the legitimate use of GM materials is thought of as an environmental "release," then liability may soon follow for unauthorized or unintended "releases" to nonapproved crops. The EU is considering a proposal to create CERCLA-like strict liability for any "releases" of genetic material to non-GMPs.

29. Greenpeace et al. v. Browner, No. 99-389(LFO) (D.D.C. Feb. 18, 1999).
30. *See Greenpeace Withdraws Biotech Case; Ecological, Legal Issues Persist in BT Review*, Daily Env't Rep. (BNA), Aug. 2, 2000, at 3.
31. 15 U.S.C. §2619(a), ELR STAT. TSCA §20(a).
32. 42 U.S.C. §6972(a)(1)(B), ELR STAT. RCRA §7002(a)(1)(B).
33. *See, e.g.*, 7 C.F.R. §340.1 (FDA regulation defining the use of a regulated GM article outside the constraints of physical confinement found in a laboratory, greenhouse, or fermenter as "release into the environment"); EU Directive 90/220/EEC, art. 2 (defining "deliberate release" as "any intentional introduction into the environment of a GM . . . without provisions for containment used to limit their contact with the general population and the environment").
34. 42 U.S.C. §§9601(22), 9604(a)(1), ELR STAT. CERCLA §§101(22), 104(a)(1).