
NABC 10: An Overview

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Concerns about the risks of altered genes migrating into non-crop plants and the risks of pests, such as insects and viruses, developing a resistance to genetically modified plant pesticides are of critical concern to people opposed to genetic engineering, such as Britain's Prince Charles and the Greenpeace organization.

Yet, with more than 67 million acres of transgenic crops in the world today, just 25 years after the discovery of gene splicing technology, we cannot turn back the clock. If anything, the demand for genetically modified food and fiber crops is accelerating.

To address the concerns about gene escape, the National Agricultural Biotechnology Council's 10th annual meeting, *Agricultural Biotechnology and Environmental Quality: Gene Escape and Pest Resistance*, hosted by Clemson University, debated the research and development, regulatory and public policy, and industrial and economic issues surrounding genetic engineering. More than 130 participants from 30 states and three foreign countries, representing consumer groups, industry, government and academia, attended the conference. In addition, news media representatives, from CNN television, *Progressive Farmer*, *Chemical and Engineering News*, and *Southeast Farm Press* served as moderators for the plenary sessions.

Conference participants heard presentations by nine authorities representing the full spectrum of viewpoints on biotechnology, from strongly supportive to strongly opposed. In keeping with the tradition of NABC conferences, all exchanges were conducted in an open forum, respectful of diverse opinions.

Contrasting the general acceptance of agricultural biotechnology by growers with the public's fears was Carl B. Loop, Jr., president of the American Farm Bureau Federation. "Biotechnology is here to stay and will be the future of

agriculture,” Loop said. “Farmers have seen plants produced on land that couldn’t produce crops before biotechnology provided plants that are resistant to drought and disease, and require less pesticides and herbicides. Biotechnology is traditional plant breeding speeded up. If we had continued to call it plant breeding instead of biotechnology, it would have been more acceptable to the public. We must be aware that there is fear in some people, so we must find a happy medium between ‘full speed ahead’ and doing nothing because of fear.”

Public opinion is not always based on scientific research, agreed Frederick H. Buttel, professor of rural sociology at the University of Wisconsin. “The public is not aware of the benefits of agricultural research because there is widespread ignorance of biotechnology and of science in general, and because the groups opposed to biotechnology question the validity of scientific research,” Buttel said. “Agricultural biotechnology has remained controversial for the past 25 years; but there are other areas of more immediate concern to the public than biotechnology, such as food quality and safety, and the impact of chemicals and livestock waste.”

Fred Gould, professor of ecology at North Carolina State University, pointed out the importance of providing refuge areas to prevent insects from developing resistance to Bt (*Bacillus thuringiensis*) crops. “The tobacco budworm that attacks cotton is resistant to traditional pesticides so it would be difficult to come up with a suitable alternative to Bt,” Gould said. “To avoid the possibility of insects becoming resistant to Bt, the US Environmental Protection Agency (EPA) recommends that four percent of the cotton crop be left as a refuge where no insecticide — neither Bt nor chemicals — is used. This strategy was developed for American farming practices. It could have a different effect in developing countries where US regulations are not enforced.”

New genetic engineering strategies are being developed to produce plants that resist viral infections, explained Roger Beachy, head of plant biology at The Scripps Research Institute in California. “The tobacco mosaic virus resistant genes have proven very stable and durable over the past 25 years,” Beachy said. “We can change the interaction of viruses and plants by changing a single amino acid so it does not act as a virus. But not all viruses are the same and not all risks are the same. The question becomes: Can we minimize risk to where it is more favorably accepted? The challenge for molecular biologists is whether we develop a resistance gene that is effective against multiple viruses since there are more than 2,000 plant viruses.

Public opinion varies widely from one country to another, observed Thomas J. Hoban, professor of sociology at North Carolina State University. “Consumers in Canada, the United States, and Japan have a higher acceptance of biotechnology than consumers in Europe,” Hoban said. “The lowest acceptance levels are in Austria and Germany where about one-third of consumers find biotechnology acceptable. This compares to acceptance by two-thirds of consumers surveyed in North America and Japan. This is because of the early strength of

opposition groups in Europe, such as Greenpeace, which held dramatic public demonstrations against genetically modified soybeans and corn. However, there are widespread misperceptions in all countries because people do not understand food processing, much less agriculture. Results clearly show the need for much greater education of consumers and opinion leaders.”

Biotechnology is one of many techniques that can be used to increase food production in a sustainable manner, pointed out Thomas E. Nickson, a scientist with Monsanto Company. “The world’s human population is projected to double in the next 40 years, and the demand for food is projected to triple because of the growing middle class,” he said. “Currently, an area the size of North America is under agricultural cultivation, and we cannot significantly increase that without destroying the world’s wildernesses, deserts, and rain forests. No single technology can address these issues; but we have many tools available now, including genomics, marker-assisted plant breeding, new agrochemicals, biological controls, improved farm management practices, and biotechnology. We must apply science-based risk assessments to the products from biotechnology, and develop appropriate risk management strategies founded in stewardship.”

Sounding a strong cautionary note was Mae-Wan Ho, a senior research fellow at Open University in England who warned of moving too far too fast with biotechnology. “Scientists should not ignore sociological and economic issues,” Ho said. “Big business and science are run by selfish individuals who see nature as objects to be exploited. A few major corporations are poised to take over food production and distribution throughout the world, and internalize the profits while they externalize the risks and costs. This will turn farmers into hired laborers and concentrate farming into giant corporations that are accountable to no one. Europeans are calling for a five-year moratorium on genetic engineering and a return to traditional agriculture because they feel biotechnology today is unethical, unnecessary, unsound, and unsafe.”

There are strict safety regulations for plant-produced pesticides in the United States, explained Sharlene R. Matten, a biologist with the EPA. “Plant pesticides have been regulated by the EPA since 1994,” Matten explained. “The EPA does not regulate the plant, but the pesticidal substance in the plant (*Bacillus thuringiensis*) and the genetic material used to produce it. The EPA reviews the possible effects on humans, birds, fish, beneficial insects, other plants, and the environment. The Science Advisory Panel of outside experts reviews the EPA’s findings and makes recommendations for Bt crops. The EPA also receives input on pesticide regulations from many other groups, including growers, the US Department of Agriculture, the Union of Concerned Scientists, the International Life Sciences Institute, and Greenpeace.”

Biotechnology developments should be guided by scientific research and a close association with regulatory agencies such as the EPA and the USDA, agreed Murray Robinson, president of Delta and Pine Land Company. “I’m not

a scientist, I'm a businessman," Robinson said. "Our customers have found that Bt crops are good for business and the environment. One customer reduced costs by \$100 per acre and increased production by one bale per acre with Bt cotton. The beneficial insects thrived because he did not use any chemical insecticides. Bt cotton also eliminates pesticide exposure for farm workers and surrounding property. There are also significant advantages with Roundup Ready® soybeans and cotton for growers plagued with weed problems. These crops allow growers to use conservation practices, such as reduced tillage, to preserve the topsoil and reduce erosion."

WORKSHOP RECOMMENDATIONS

This year's workshops focused on three areas: research and development, regulatory and public policy, and industrial and economic perspectives. Participants weighed the many sides of the issues, from profitability to social acceptance, and came to the following conclusions:

- Research and Development Perspectives
(See page 15 for the full workshop report.)
 - Educate growers so they understand and practice resistance management techniques.
 - Enhance basic research to prevent gene escape into non-target organisms.
 - Develop better monitoring techniques.
 - Form a new, independent agency for agricultural biotechnology that would be a coalition of private industry, growers, and government agencies, similar to the National Institutes of Health.
- Regulatory and Public Policy Perspectives
(See page 23 for the full workshop report.)
 - Seek scientific input on all levels of biotechnology development and regulation, and take action to guarantee that this input is free from bias.
 - Develop regional pest management plans.
 - Create a separately funded agency to fill in the gaps in regulatory policy and work to keep this policy scientifically and socially sound.
 - Form a network of product/technology stewardship involving government, industry, and growers to monitor and manage the development of pest resistance.
 - Build trust among growers, industry, consumers, and environmentalists.
 - Include sociological and value considerations in biotechnology development, such as in the Human Genome Project.

- Industrial and Economic Perspectives

(See page 33 for the full workshop report.)

- Encourage cooperation between industry and university scientists to develop a standard method for monitoring genetically engineered crops.
- Rekindle and strengthen industry-university research efforts.
- Impose a penalty for growers who do not comply with biotechnology regulations, similar to the penalties imposed for misuse of chemical pesticides.
- Create an independent oversight committee to set standards and decide research priorities.
- Develop plain-language information for policy makers, news media, civic groups, school children, and the general public.
- Designate land-grant universities to take the lead in disseminating plain-language information to the public.