

NABC

news

Fall 2002 no. 25

*Providing an open forum for
exploring issues in
agricultural biotechnology*



NABC'S PRINCIPAL OBJECTIVES ARE TO:

- provide an open forum for persons with different interests and concerns to come together to speak, to listen, to learn, and to participate in meaningful dialogue and evaluation of the potential impacts of agricultural biotechnology
- define issues and public policy options related to biotechnology in the food, agricultural, biobased industrial product, and environmental areas
- promote increased understanding of the scientific, economic, legislative, and social issues associated with agricultural biotechnology by compiling and disseminating information to interested people
- facilitate active communication among researchers, administrators, policymakers, practitioners, and other concerned people to ensure that all viewpoints contribute to the safe, efficacious, and equitable development of biotechnology for the benefit of society
- sponsor meetings and workshops and publish and distribute reports that provide a foundation for addressing issues.

Ralph W.F. Hardy, President

Allan Eaglesham, Executive Director

Susanne Lipari, Executive Coordinator

Boyce Thompson Institute, Room 419

Tower Road

Ithaca, New York 14853

phone: 607-254-4856 fax: 607-254-1242

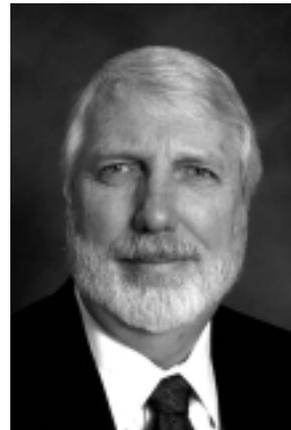
nabc@cornell.edu

<http://www.cals.cornell.edu/extension/nabc>

Letter from the Chair . . .

Prominent on the masthead of this newsletter is the declaration that the NABC exists to provide “an open forum for exploring issues in agricultural biotechnology.” It can fairly be asked, however, whether we, the members of NABC, primarily universities involved in agricultural biotechnology, can be truly open minded about this technology when we stake so much of our research portfolio on its success. One could argue that we have a bias in the outcome of the discussion.

Thus, it is important to clarify the role of universities with agricultural programs—and that of the NABC—in the debate over public-health safety and environmental safety of agricultural biotechnology. In many ways we are similar to private companies in that we protect our intellectual property, license this property to private companies for money, and at times seek to develop our intellectual property into exclusive products. With declining public funds available to support our research programs, most of us dream of products that will return to our budgets more than their research and development costs. In light of this, what distinguishes us from for-profit companies? The primary distinction is our purpose: we exist to educate, to serve the public and to advance knowledge. The protection and use of intellectual property that comes from our research is merely a sideline issue and should not drive our resource-



Neal K. Van Alfen
NABC Chair, 2002—2003

allocation decisions, unlike private companies that prosper or fail from the new knowledge that we generate from our research.

Probably the clearest example of how universities differ from private companies is the, at times vilifying, public debates among faculty members of our universities over research claims and speculations. Such public debate by employees of the same company would not be tolerated, but it is one of the most cherished rights of university faculty. Recently, a high-profile example of such a public debate by members of the same college occurred over published claims that pollen drift from putative unlawfully cultivated transgenic maize resulted in genetic contamination of locally grown maize cultivars in Mexico. Claims, and counter claims, of bias were prominent in the debate. Yes,

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Highlights of NABC 14: *Foods for Health*

Carla Carlson
University of Minnesota,
St. Paul, MN

More than 340 attendees with expertise in agriculture, medicine, biotechnology, business, consumer health and policy representing industry, academe, government, farmers, and public-interest groups, from thirty-seven states and four other countries, convened at the *Foods for Health* conference in Minneapolis, May 19–21, 2002. This conference—hosted by the University of Minnesota’s College of Agricultural, Food and Environmental Sciences and its Academic Health Center—marked a significant effort to expand the circle of discussion on agricultural biotechnology to include nutrition and healthcare professions. Participants explored the implications of better integrating medicine and food production to increase the health value of foods and the potential of therapeutics using plant-derived and technology-based enhancements.

Diet and Health: Challenges and Potentials

Dual keynote addresses set the stage, with descriptions of the challenges presented by diet-related disease and the opportunities at the intersection of agriculture and medicine.

Shiriki Kumanyika, Center for Clinical Epidemiology and Biostatistics at the University of Pennsylvania School of Medicine, cited the

increasing incidence of diet-related chronic diseases in the United States and worldwide, and provided data on direct costs to society. She noted that obesity and type-2 diabetes cost society in the United States \$50 billion per year (1995 dollars) in health services, loss of work, and other factors. In 1995, 13.9 million people in the United States had diabetes, and trends suggest that 21.9 million will be affected by 2025. In India, the country with the highest rate of diabetes, it is projected that 57.2 million will be affected by 2025.

Charles Arntzen, founding director of the Arizona Biomedical Institute at Arizona State University, described the potential for addressing diet-related chronic disease through improvements in foods and in new therapeutics derived from crops. He emphasized that the “transition point” from agriculture to medicine has been reached. Researchers now are evaluating selection processes that could restore natural, beneficial, chemicals in plants—such as cancer-preventing antioxidants—that have been lost through breeding. He provided a glimpse of the future of plant-based vaccines, referencing his own work in potato, that has resulted in three vaccines in stage-1 clinical trials: a hepatitis-B vaccine and two diarrhea vaccines. The production of plant-based vaccines will likely

be more efficient and less expensive, and even could be set up in developing countries to meet critical disease-prevention needs.

Thirty-eight speakers and panelists then addressed the regulatory process, ethics and consumer demand, choice, and health and wellness trends. Historical linkages were described between agriculture and medicine, botanicals as therapeutics, plant-produced antibodies, edible vaccines, functional foods and allergenicity.

Fifty-two individuals served as facilitators and recorders for conference participants as they discussed key issues in fifteen concurrent 2.5-hour workshop sessions (see workshop summary).

Biotechnology as a Tool

The discussion positioned biotechnology squarely as a tool, not as a focal point or goal. Technology also featured in current and historical examples of food as a vehicle to deliver essential nutrition to consumers: from the emergence of nutrient-fortified breads in the mid-1900s to calcium-fortified orange juice. With land grant university agronomists seated amid dieticians and public health service epidemiologists, the goal was articulated as: achieving high-quality, enhanced foods and increased consumer understanding to help improve nutrition.

NABC 14: Workshops Summary

*Janet Bokemeier
Michigan State University
East Lansing, MI*

*Carla Carlson, Catherine Solheim, Joseph Warthesen
University of Minnesota
St. Paul, MN*

*Kevin Kephart
South Dakota State University
Brookings, SD*

The workshop sessions followed the outlines set by the keynote speakers and contributors to the panel sessions, providing foundation for discussions in three broad areas.

- Applying agriculture to health: food to prevent disease.
- Applying agriculture to medicine: therapeutics and treatment.
- Towards healthy people: lifestyles and choice.

The 340 conference attendees chose one of the three workshop sessions for their exchange of information and discussion. Three quarters of the conference attendees chose the session on prevention (applying agriculture to health), perhaps indicating a strong endorsement of benefits to society from further integration of agriculture and medicine. Of the fifteen workshops, eleven focused on prevention, two on therapeutics and treatment, and two on consumer choice.

*Steven Pueppke
University of Illinois
Urbana, IL*

*Maggie Powers
Powers & Associates, Inc.
Minneapolis, MN*

Applying Agriculture to Medicine:

Food to Prevent Disease

There was agreement that **functional foods** have the potential to lower risk of chronic diseases, as can individual changes in behavior relating to diet, exercise, and risk factors such as smoking. In the absence of changes in behavior, functional foods may help address nutrition needs. However, it is difficult to second-guess consumers; although they indicate preference for healthy foods, they do not necessarily buy them.

Consumer education and information must take a holistic approach. Consumers might misinterpret information about a fortified product without weighing other aspects such as caloric or sugar content. More consumer education is needed regarding nutritional synergisms, antagonisms, displacement and cross-reactions across the diet. Additionally, benefits from functional foods may be more visible in developing countries. However, some opinion leaders who are interested in promoting healthy foods may have reservations about the role of biotechnology.

Participants highlighted applications of new technology as

ways to improve detection of **allergens**, and to predict the protein characteristics that might lead to allergic responses. The development of new animal models for allergenicity might be helpful.

Ultimately, **edible vaccines** may be the most highly visible benefit of agricultural biotechnology—a benefit that the consumer will see as directly relevant to daily life. A vaccine as a food product may be perceived as more attractive than needle-based inoculation, with significant benefits particularly in developing countries. Participants suggested that appropriate public education and information programs should make way for new products to ensure that safe, beneficial, and life-saving vaccines are accepted by consumers rather than discounted due to misinformation or confusion. Safety measures will be needed, including physical separation of crops and timing of plantings.

The **prevention of diet-related chronic disease** is beyond the realm of science and technology in important ways. Prevention is linked to psychology and behavior. A key component is integration across agriculture and medi-

cine, and certainly across institutions of higher education that focus on teaching, research, and outreach. Partnerships will be needed among universities and social service providers, across K–12 educational systems, and with federal policy leadership. Connections need to draw upon the capacity of national organizations, corporations and healthcare providers. Broad collaborative efforts will help avoid unintended consequences.

The agriculture and food system can be most responsive to nutrition and health interests by understanding its customer. It has been easy for the system to push agronomic improvements into the market place, because such were readily accepted by the customer, the grower. Now, however, the **real customer** has stepped forward with a growing voice: **consumers** are articulating their preferences. The system, including institutions of higher education, must change its *modus operandi* by listening and understanding consumer messages, by forming new partnerships and by including a wider range of views and perspectives.

Participants acknowledged the critical role of federal policy, noting that the current Farm Bill does not integrate—and perhaps highlights—the chasm between food production and diet and

health. They noted opportunities for addressing prevention through policy relating to school-lunch and food-stamp programs, for example.

Applying Agriculture to Medicine:

Therapeutics and Treatment

Participants saw the accrual of great benefit from further **integration of agriculture and medicine**. They addressed integration on two broad levels: higher education and cross-sector collaboration.

Medical schools and colleges of agriculture should use nutrition as a focal point. Future physicians and other healthcare professionals need an expanded understanding of nutrition as a component of disease prevention and treatment, and healthfulness. Similarly, agricultural colleges should integrate nutrition into curricula to orient students regarding food consumption, consumer preferences, and other end-use outcomes. Also noted was the importance of human-resource issues to ensure attentiveness to new interdisciplinary approaches. Participants highlighted the industry model of structuring teams to approach specific problems; higher education institutions must increasingly encourage interdisciplinary approaches and address the faculty-reward system that can be a barrier to teamwork.

A nutrition emphasis in K–12 education can serve as an important foundation for all students.

Funding is the driver for interdisciplinary collaboration for better integration of agriculture and medicine. Cooperatives and alliances that connect the producer with the consumer in innovative partnerships will be a mechanism for integration.

There is need for a holistic approach to **discussion and application of biotechnology** that accommodates a range of values and societal perspectives and integrates not only agriculture and medicine but also public/private sector relationships and environmental and economic issues. Participants especially noted the importance of inclusive discussion that engages the public on issues of technological advance that intersect with religion-based concerns.

It was agreed that the data on safety, efficacy, and potential of a range of botanical therapeutics is currently insufficient simply because there has not been sufficient supporting public investment. Discussion focused on the regulatory framework and need for improved consumer information and education.

Regulatory aspects of using **plants as vaccine “factories”** were discussed. Some suggested zero tolerance for pollen drift, whereas

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others saw this as an impossible endpoint given detection methods, and suggested instead risk/benefit analysis. The National Research Council should be tasked to develop protocols for producers and to set a framework for combined USDA/FDA guidelines and future legislation.

Participants were divided on the issue of whether “pharming” will herald a **revitalization of rural America**. The production of new crops might benefit small numbers of growers, but is unlikely to be a boon to rural vitality unless processing plants are located near production areas. Some were of the opinion that neither biotechnology nor agriculture itself will revitalize rural America. To date, the value added by biotechnology for farmers has been measured in savings of time and by increased diversity in crop rotations due to herbicide tolerance.

Towards Healthy People: Lifestyles and Choice

There is no monolithic consumer. **Information on food and health** must be accessible and appropriately tailored to a variety of audiences. Improved information for consumers could be developed by increased collaboration among physicians, nutritionists, agriculturalists, and healthcare organizations, but it should not contribute to information overload. Federal agencies and universities are regarded as relatively unbiased sources of information; however, leadership at the federal and state levels will be required to ensure the provision of high-quality, synthesized information for consumers.

Consumers are being offered a wider range of choices based on demand. However, the voices of only some are being heard. Those of limited resources, and certain ethnic and age groups, may not be considered. Some suggested that, indeed, **consumer preferences** and demands are being met—with food that is fast, tasty, and inexpensive, emphasizing the fact that many consumers have not linked food preferences to health preferences. On the other hand, the small but growing market for organic foods is a response to consumer demand.

Participants in the “consumer-choice” workshops echoed those in the “applying agriculture to medicine” workshops: the introduction of pharmaceutical crops will do little to reverse the trends of consolidation in agriculture or to **revitalize rural America**. Overall acreage devoted to “pharming” will be minimal. Pharmaceutical crops might elevate incomes for small numbers of producers and increase the demand for a better-educated workforce in some areas.

Developed countries have a responsibility to address hunger, poor diets, eradication of disease, and inadequate agriculture in developing countries. Participants specified that assistance should:

- help developing countries develop their own solutions to their own problems,
- engage in collaboration with a variety of in-country and international entities specific to an issue or problem, and
- focus on long-term objectives rather than short-term fixes.

In sum, participants in the consumer-choice workshop em-

phasized the importance of information. Quality information will enable consumers to make choices that can enhance rural and urban lifestyles in the United States. Integrated research and improved information can also lead to international collaborations for better health worldwide.

Fuller coverage of the results of the workshop sessions will be provided in the proceedings volume *Foods For Health*, which will be published early in 2003.

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Further, enhancements could contribute to a reduced incidence of diet-related chronic disease, with the long-term goal of disease prevention. The tools of biotechnology could lead to cheaper, more-effective and plentiful vaccines. They could support the development of medicinal components in food to simultaneously treat symptoms and provide nutrition. Biotechnology is already being used to generate pharmaceutical components in commodity and horticultural crops, such as corn and potato.

Focus on Consumers

Speakers addressing consumer interests and demands emphasized that there is, in fact, no average consumer. Tastes, preferences, and cultural bases for food choices vary widely. In sum, although consumers are somewhat confused, they maintain interest in nutrition, food, and health, and desire understandable, useable,

MARK YOUR CALENDARS: JUNE 1–3, 2003

Biotechnology: Science and Society at a Crossroad

OUR FIFTEENTH ANNUAL CONFERENCE WILL FOCUS ON SPECIALTY CROPS

Modern biotechnology is the outcome of decades of public and private investments in basic research on cell biology and molecular genetics. The application of biotechnology to food and agriculture enjoys broad support, in principle in the international scientific community and by some international food and agriculture agencies. The World Food Summit held in Rome in June, 2000, issued a strong, albeit tempered, statement endorsing the use of biotechnology.

On the other hand, as this science and, more particularly, its applications are being incorporated into the world's food systems, there is considerable concern. Consensus among agricultural organizations is limited and there are divisions within universities, agencies and organizations over a range of biotechnology issues. Some of these issues relate to universities partnering with private biotechnology companies, university dependence on industry funding, and private ownership of germplasm. Other concerns relate more to environmental and biological effects, including gene flow across species barriers and unintended environmental effects. Yet other concerns relate to labeling and the right of the public to know. As has happened many times in the past, there is an asymmetry between scientific advance and acceptance by society, and scientists need to recognize

and address this. From many points of view, science and society are truly at a crossroads.

This controversy may be impacting the Pacific Northwest (PNW) more profoundly than any other region in the United States. The PNW grows approximately 200 fruit, vegetable, ornamental, and agronomic crops, and is home to major forest-product, seed, wine, and bulb industries. Agriculture east of the Cascade Mountains includes some of the most productive dryland and irrigated farming systems in the world, while agriculture west of the Cascades includes a diversity of mostly small farms. The region is one of the largest producers of certified organic products. Agriculture in the PNW is heavily dependent on export sales, with up to 90% of some major crops, such as wheat, produced for export. For many reasons—including the potential loss of export markets, the inability of minor crops to justify the high costs of biotechnology development and regulatory approvals, complex intellectual property issues, and decisions by food suppliers and consumers—essentially no transgenic crops are grown in the PNW. The issues faced in the use of biotechnology in the PNW are not unique to the region; many of the same issues are faced by developing countries with economies dependent on a diversity of crops and agricultural trade.

Meanwhile, the explosion of new information, including complete genomic sequences of agriculturally relevant plants and microorganisms, continues to reveal new opportunities and challenges for change in the food and agriculture enterprise.

NABC's fifteenth annual meeting will bring together timely information from major sources on the current and potential impact of biotechnology on food, agriculture, and the environment for specialty crops, especially those grown in the PNW. It will seek to make the process and implications of change, including benefits and risks, more transparent both to science and to society. The conference will be held in Seattle, WA, and will be hosted jointly by Washington State University and Oregon State University.

For current information, please visit

<http://arc.cahe.wsu.edu/nabc>.

Questions or comments may be directed to:

Sandra Ristow

Associate Director

Agricultural Research Center

403 Hulbert Hall

Washington State University

Pullman, WA 99164-6240

phone: (509) 335-4563,

fax: (509) 335-6751

nabc15@wsu.edu

or

Michael J. Burke
 Associate Dean
 College of Agricultural Sciences
 137 Strand Hall
 Oregon State University
 Corvallis, OR 97331
 phone: (541) 737-5657
 fax: (541) 737-2256
 mike.burke@orst.edu

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and credible information.

It will be important for agricultural science to reorient its traditional view of the farmer as its client. Many voiced the need to direct research that is in step with the real client: the consumer.

Regulatory Aspects

Numerous speakers addressed the current regulatory framework, reflecting on examples from the first generation of biotech crops—and speculating on new guidelines that are anticipated jointly from the Food and Drug Administration and the United States Department of Agriculture. It was noted that many companies will not move aggressively in development of new vaccines or enhanced foods until regulatory processes under discussion are clear.

Speakers underscored the important relationship of consumer choice to confidence in the regulatory process and the perception of safety and efficacy of new products.



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we are biased, but, as a community of scholars, we represent a wide range of biases on any subject. The seeming inability of universities to speak with a single voice at times frustrates our supporters and limits our role in most public debates. Just as we are biased toward agricultural biotechnology because of our investment in related research, we can as easily be accused of bias against agricultural biotechnology because of our research in support of organic agriculture, which excludes the use of agricultural biotechnology. Our research interests are so divergent, including production agriculture, organic farming, rural social issues, and environmental issues, that no single vision or voice can dominate our discussions.

I personally feel, however, that universities need to take a position regarding one aspect of the debate about agricultural biotechnology. Because we are education and research institutions we have a strong bias toward pushing back the current boundaries of knowledge with the resultant development and adoption of new technology. Results from our medical and engineering research and development programs are aggressively changing how we live. We actively seek to change nature; we long ago rejected the notion that infectious and congenital diseases of humans must be tolerated, and we use our technological capabilities to greatly change the natural mobility, communication ability, and living space of humans. It is unnatural for humans to fly, yet air

travel has become integral to modern society. Modern transportation brings with it enormous personal risk, social change, and a degradation of environmental quality, but few support a return to transportation based only on our legs.

Likewise, we must encourage the use of the best technology available to meet the challenges of a continually increasing human population that needs to extract food, fiber, shelter, transportation, recreation, and spiritual renewal from the finite resources provided by our planet. Technology plays an important role in protecting our environment while also assuring that the needs of an increasing global population are being met. Agricultural biotechnology offers considerable promise in meeting these goals, and so the debate about this technology needs to shift from one about its intrinsic value to one of risk assessment of its individual products. Yes, to answer the question posed at the beginning of this column, universities should have a bias in this open forum regarding agricultural biotechnology. We exist to educate and to help society explore the unknown. The question of whether we should use technology to change old ways of doing things, in general, was answered centuries ago.

Neal K. Van Alfen
 NABC Chair
 University of California-Davis

UPCOMING NABC EVENT: MARK YOUR CALENDARS!

Bioetchnology: Science and Society at a Crossroads

NABC 15TH ANNUAL MEETING

**June 1–3, 2003
Seattle, WA**

Co-hosted by Oregon and Washington State Universities

<http://www.arc.cahe.wsu.edu/nabc/>

**Boyce Thompson Institute, Room
419
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Ithaca, New York 14853**

