# *Overview of NABC 22: Promoting Health by Linking Agriculture, Food, and Nutrition*

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NABC's twenty second annual conference was held in Davis, CA, June 16–18, 2010, hosted by the College of Agricultural and Environmental Sciences at the University of California, Davis. The conference addressed one of the major issues of this century: promoting health through agriculture, food, and nutrition. With healthcare consuming so much of the developed world's resources, there is a critical need to understand how diet, nutrition, and the underlying agricultural production systems impact human health. Speakers at NABC 22 addressed the science linking agriculture, food, and nutrition to health, with the goal of informing both research priorities and government policies that seek to improve human livelihoods. Agriculture and conventional food systems have provided the basis for long and healthy lives, which have improved dramatically over the last century, and much of that improvement can be traced to healthier diets. At the same time, the current food systems in the United States and other developed countries are faced with a growing critique that they are a significant contributor to the health crisis, particularly related to obesity and diabetes. It was with this dichotomy—agriculture and diet being both the problem and the solution to an increasing health crisis—that this conference was framed, addressing both sides of the issue.

The 159 participants were welcomed by Neal Van Alfen, dean of the College of Agricultural and Environmental Sciences at UC Davis, A.G. Kawamura, Secretary of the California Department of Food and Agriculture and Mark McLellan, Chair of the National Agricultural Biotechnology Council. This welcome was followed by five plenary sessions and the banquet keynote speaker, Martina McGloughlin whose address was titled, *Plant Biotechnology: The Answer to your Nutrition Needs!* The plenary sessions were organized around the following topics and the presentations from each session follow in this volume.

*Session 1: Agriculture, Food and Health: The Problem and the Solution.* This session was structured to present the tremendous health benefits that the current food system has delivered to the public over the last century, food innovation trends and areas where the current food system is not responding to indentified health threats.

*Session 2: Food for Health Successes and Prospects.* The speakers in this session highlighted research-based successes in delivering agricultural and food products that address health benefits.

*Session 3: Choosing Foods for Health.* In spite of the potential to deliver health benefits through diet, people make food choices that are based on a range of factors and the diverse drivers of food choices were explored.

*Session 4: Regulatory Framework for Food Health Claims.* The business of delivering health benefits through food products is strongly influenced by the ways in which these benefits can be communicated to consumers. This session explored the existing and emerging governmental frameworks that regulate food labeling.

*Session 5: Food for Health Strategies and Programs.* The final session explored examples of institutional and governmental frameworks as well as investment strategies to deliver innovations in both research and food products to promote health benefits.

The conference theme is not new—essentially the same topic was addressed in *NABC 14: Integrating Agriculture, Medicine, Food and Health*, but the topic remains timely and important. With the societal healthcare bill in the United States approaching 20% of GDP, we simply cannot afford to treat health and wellness as we have. Movement towards a sustainable national healthcare system must be underpinned by healthier lifestyles as a starting point and diet will be one key element. NABC 22 highlighted the fact that there is no magic bullet to a healthier diet, but emphasized that any solution will require collaboration between agriculture, food companies, regulatory agencies as well as marketing and healthcare professionals. This was one of the major take-home messages of the conference—that real progress in supporting development of healthy diets on a national scale requires progress and collaboration in many dimensions. A number of food companies appear to recognize that their future long-term success is linked to delivering diet and health and they are in perhaps the best position to integrate research that spans the agricultural production systems that produce their raw materials all the way to clinical outcomes of consuming the food products they sell. A few academic institutions recognize the importance of integrating research across this entire spectrum, but a national research agenda is needed to support the developments that will contribute to a dietary shift which supports healthier lifestyles and diminished reliance on an overburdened healthcare system.

## What is Possible

- The role of food and diet has been changing over the last century. Not too long ago, society simply expected its food supply to be ample, safe and affordable. Food then became a vehicle to address essential nutrient deficiencies (*e.g.* iodine)

and is increasingly viewed as a means to protect against age-related diseases and to support optimal health. Whether these are realistic expectations, or not, is certainly debatable, but the early successes in preventing essential nutrient deficiencies and the central role of diet in human metabolism support the concept that diet can be an important determinant of a healthy population. Health is on the front-burner of trends in innovation and product development in the food industry and the interest in whole-food nutrition will be a driver for the food industry in the foreseeable future. As health-promoting food products are developed, will they be treated by regulatory agencies as food or medicine? This question is becoming closely linked to the development of biomarkers for specific health endpoints and the regulatory classification of biomarkers will be an important development to watch. In any case, the answer to the question of how regulatory agencies will treat health-promoting food products will either serve to accelerate or "chill" investment in these products.

- A few problems with food surfaced throughout the conference. The first is that there is too much food in developed countries and too little in developing countries and both conditions have important health consequences. A second problem for developed countries is focused on specific food components such as *trans*-fats or sodium and there is some debate on how to address this type of problem. Voluntary action has a poor track record whereas government mandates have proven effective in greatly reducing *trans*-fats in the US diet and may be needed to regulate other dietary components.
- Agriculture is a vehicle to deliver adequate energy and can also be used to deliver improved nutrition and better health through specific compositional modifications. Compositional modifications can be made through selective breeding and through genetic engineering (GE). Leading examples of the GE approach include a low saturate, high stability and zero-*trans*-fat soy oil, a high omega-3 fatty acid (stearidonic acid) soy oil and high pro-vitamin A rice (Golden Rice) that are near commercialization, following decades of research and development. Many more examples of compositional modifications have been demonstrated at the experimental level and there is little question that researchers will be increasingly able to modify nutritional content of major and minor crops. These modifications have the potential to address broad health benefits in developed countries and to address essential nutrient deficiencies that continue to impact the populations of developing countries, particularly children. The deployment and commercialization of these GE crops will have less to do with technical limitations and more to do with prevailing regulatory frameworks and the ability to gain regulatory approvals in countries where the crops will be produced and consumed.

## Drivers of Choice

- Ultimately, diet is determined by human choice—what individuals choose to

eat. But choice can be limited by availability and in many social contexts healthy choices may simply not be available. An obvious example includes confinement during extended air travel, but a more important and chronic example is found in school lunches. This exemplifies the conflict between price and health/nutrition where there is a glaring negative correlation and where schools need to deliver meals on very limited budgets. One speaker had a simple solution for improving diets: "Make vegetables cheap and junk food expensive," instead of the reverse. The *Farm2School* program provided a concrete strategy to do just that by including a fresh fruit choice in school lunches, at the same time preserving family farms and promoting awareness of where food comes from. Strategies that make fruits and vegetables inexpensive and a viable dietary choice appeared as a major underexploited opportunity to address dietary choices for health and nutrition.

- Food choices are ultimately influenced by a spectrum of factors that are based on three major dimensions of eating: the physical dimension or satiation and nutrition; a social dimension of bringing people together; and a mental dimension of taste and pleasure. When it comes to making healthy choices, there is a health-pleasure paradox which one speaker summed up by this Mark Twain quote: "The only way to keep your health is to eat what you don't want, drink what you don't like and do what you'd rather not." A challenge with functional foods is to engineer a solution to this paradox. There are now many examples of new products that create consumer expectation that good health and nutrition choices can also meet a high threshold for flavor, effectively combining the physical and mental dimensions of eating.
- A key driver for food companies to develop good health and nutrition choices is the ability to distinguish and market these products through labeling. In the United States, the Food and Drug Administration is the legal authority regulating food labeling to ensure that all labels are truthful and non-misleading. The most contentious area relates to health claims of relationships between a food or food component and the risk of disease, and these types of claims must be pre-approved by the FDA. The risk for a food company is in making claims that go too far with respect to cures or prevention of disease. At this extreme, the food should be labeled as a medicine, which would place it in an entirely different regulatory framework. Providing scientific support for health claims can be substantially simplified if there is a validated biomarker for the health outcome, but to date only five biomarkers[1] are validated and approved. In addition to providing the claimed health benefit, the food itself must meet additional criteria to be below a threshold for negative health factors such as fat and sodium and above a threshold for positive health factors; in other words a specific health benefit cannot be claimed if the food vehicle does not meet general health and nutrition thresholds.

[1]See page 140.

The regulations governing food labels, especially health claims, are complex but systematic in the United States, and the good news is that the process is rigorous and science-based. In Europe, the process is also science-based, but also uncertain as the European Union is seeking to harmonize a single EU level approval process. There is the danger of raising the regulatory bar so high as to discourage food companies from making significant health and nutrition product improvements if they will not be allowed to appropriately identify these improvements on the product label or in advertising.

## Research Agenda for the Future

- The issues linking agriculture, food, nutrition and health are dauntingly interdisciplinary and the research agenda to make real progress in delivering health and nutrition through diet is complex. Several university centers or institutes have been established to address this complex research agenda and each appears to be quite distinct. In this conference we heard about the Foods for Health Institute at the University of California, Davis; the Advanced Foods and Materials Network based at the University of Guelph but linking all of Canada; and the Alimentary Pharmabiotic Centre at the University College Cork. Each of these centers has completely different structures and objectives, but share two major programmatic themes: they are highly interdisciplinary and they are closely linked to industry or to a formal commercialization process. Universities still appear to be fertile ground for investors looking for innovations in food and health, particularly where new business ideas exploit the growing convergence between environmental, sustainability and health movements. While some examples of innovations are new food products, others are designed to inform consumers and provide a high degree of transparency on health, social and environmental attributes of products.
- If the United States is serious about addressing the healthcare crisis, it needs to invest in a research agenda that supports a dietary shift to support healthier lifestyles. Clearly, this agenda must be highly interdisciplinary and, as with the centers that have taken a first step in this direction, should be linked to industry or to formal commercialization processes. The research priorities that were identified in the NABC-22 discussion sessions included identification and validation of biomarkers for diseases and conditions, biofortification of crops and analysis of the regulatory infrastructure for biotech crops that deliver health benefits, diversification of crops in the diet and research into the identification of early indicators of success in long-term health-promoting diets.

NABC 22 was a highly interdisciplinary conference underscoring the linkages needed to understand the relationships between agriculture, food, nutrition and health as well the linkages that need to be effectively made in an effective research and development strategy. The benefits of an effective research strategy addresses two of the most important

issues of this decade and century. The most direct impact will be on the healthcare crisis in the United States and other developed countries, but will indirectly contribute to the strategies that are deployed for the benefit of underdeveloped countries globally.