



BIOTECHNOLOGY RESEARCH FOR A COMPLEX WORLD

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FEEDING THE WORLD WITH HEALTHFUL FOOD AND COMBATING OBESITY

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The plant kingdom offers a multitude of potential food products that humans have selected from and attempted to improve upon over the ages. As a group, plant-derived foods can supply almost all of the micro- and macronutrients established as essential for human existence (the exceptions being vitamins B12 and D), as well as a number of unique phytochemicals that have been linked to the promotion of good health. Unfortunately, not all plant foods contain a full complement of these essential nutrients or health-promoting compounds, nor do they usually contain these components at sufficient density to attain recommended dietary intakes in a reasonable serving size. Thus, with these limitations of plant foods, along with the behavioral problems of low fruit and vegetable consumption by many consumers, plant scientists have undertaken efforts to manipulate and enhance the nutritional quality of our plant-based food supply as a means to ensure optimal health and well-being. Often, these efforts have focused on staple food crops, which provide the bulk of daily caloric intake, especially in developing world populations. In addition, there is growing interest in the identification of food components that can influence and reduce chronic disease risk (e.g., cancer, cardiovascular disease, type II diabetes, and obesity), such that these food components can be manipulated in target crops.

Efforts to improve the nutritional or health-beneficial value of plant foods have focused either on qualitative or quantitative changes. Qualitative changes include the introduction and/or overexpression of genes to alter the composition of biochemical end products, without necessarily increasing the total quantity of a class of compounds. Quantitative improvements in plant foods are possible, but can be problematic if the target is a macronutrient, rather than a low abundance micronutrient or phytochemical. Improvements in mineral composition also are being attempted; however, for minerals it is important to remember that these nutrients cannot be 'made' in the plant merely by expressing a single gene.

Developing healthful foods through biotechnological means is an achievable and important undertaking. Future progress in this area will require multi-disciplinary approaches involving not only plant scientists, but also human nutritionists, behavioral scientists, biomedical researchers, food chemists, and others. Active interchange between all of these disciplines will be needed to identify the critical food components for manipulation, the levels that should be targeted for optimal benefit, and the best food crops for deploying new enhancement strategies. This multi-disciplinary approach should ensure that sensible, directed progress is made towards the continued improvement of our food supply.