

## **FY 2009 Annual Report for National Program 107 Human Nutrition**

The Human Nutrition National Program (NP 107) addresses high-priority problems of national importance as outlined in Strategic Goal 5 of the [ARS Strategic Plan for FY 2006-2011](#): Improve the Nation's nutrition and health. Specifically, this program contributes to Objective 5.2: Promote healthier eating habits and lifestyles. The goal of NP 107 is to define the role of food and its components in maintaining health throughout the life cycle. During this cycle there is increased emphasis on obesity prevention research.

This year represents the first full year of our current 5-year research cycle summarized in the [2009-2013 Action Plan](#). There are four research components in the current program:

- Nutrition Monitoring and the Food Supply
- Scientific Basis for Dietary Guidance for Health Promotion and Disease Prevention
- Prevention of Obesity and Related Diseases
- Life Stage Nutrition and Metabolism

Selected accomplishments completed during FY 2009 are listed below. Links to publicly available documentation are provided after each finding.

Effective weight loss strategy developed for minority children. Few studies with the goal of improving health of children through weight loss have actually achieved long-term weight loss. Researchers at the ARS nutrition center in Houston, Texas, conducted a school-based intervention in overweight Mexican-American children, which included a high level of instructor-led intervention and parental involvement and led to sustained weight loss over a two year period. This study may serve as a model for delivering effective interventions to a high-risk population. (NP 107, Component 3, Problem Statement 3B, and Performance Measure 5.2.2)

Publication: Johnston CA, Tyler C, McFarlin BK, Poston WSC, Haddock CH, Reeves RS, Foreyt JP. [Effects of a School-based Weight Maintenance Program for Mexican-American Children: Results at 2 Years](#). Obesity, 2009, [Epub ahead of print].

Food insecurity linked to poor cognitive function. In a study of Puerto Rican adults living in Massachusetts, food insecurity was inversely associated with global cognitive performance. Scientists at the ARS nutrition center in Boston, Massachusetts, found that the prevalence of food insecurity in this group was 12 percent, with about half of that group reporting very low food security, and greater food insecurity was associated with lower scores on several tests for mental performance. As the number of Americans without adequate food supplies increased markedly during the recession, this research emphasizes the

importance of USDA nutrition assistance programs in maintaining health. (NP 107, Component 1, Problem Statement 1B, and Performance Measure 5.2.3)

Publication: Gao X, Scott T, Falcon LM, Wilde PE, Tucker KL. [Food insecurity and cognitive function in Puerto Rican adults](#). Am J Clin Nutr, 2009, 89:1197-1203

“Rolling store” can improve diet and weight of minority women. Improved access to healthy foods, along with recipes on how to prepare them, led to significant increases in vegetable and fruit consumption and significant weight loss over a six month period in rural, overweight African-American women. In cooperation with Baton Rouge researchers, ARS scientists in Little Rock provided the women with fresh fruits and vegetables weekly from a truck parked at a community center, or “rolling store,” and provided monthly lessons with a nutrition educator on preparing healthier meals. This successful intervention could serve as a model for improving the diet and health of people with limited access to supermarkets. (NP 107, Component 3, Problem Statement 3B, and Performance Measure 5.2.2)

Publication: Kennedy BM, Champagne CM, Ryan DH, Newton R Jr, Conish BK, Harsha DW, Levy EJ, Bogle ML, Lower Mississippi Delta Nutrition Intervention Research Initiative. [The "Rolling Store:" an economical and environmental approach to the prevention of weight gain in African American women](#). Ethn Dis, 2009, 19:7-12.

Golden Rice is an effective source of vitamin A. Deficiency of vitamin A is the most prevalent nutritional problem in the world, leading to premature disability and millions of deaths annually. Scientists from the ARS nutrition centers in Houston, Texas, and Boston, Massachusetts proved that the second generation of Golden Rice provides enough beta-carotene that is readily converted to vitamin A to satisfy 90% of the estimated average requirement for this essential vitamin in a reasonable serving size for children. Widespread consumption of this rice would help eliminate this nutrient deficiency. (NP 107, Components 1 & 2, Problem Statements 1D & 2A, and Performance Measure 5.2.2)

Publication: Tang G, Qin J, Dolnikowski GG, Russell RM, Grusak MA. [Golden Rice is an effective source of vitamin A](#). Am J Clin Nutr, 2009, 89:1776-1783.

Omega-3 fatty acids influence cardiovascular development in infants. Infants fed formula supplemented with the omega-3 fatty acid DHA, or breast milk that naturally contains this fatty acid, had lower heart rates than those not getting this lipid. Scientists at the ARS Nutrition Center in Little Rock, Arkansas also identified a positive effect on heart rate variability, suggesting that DHA—regardless of its source—exerts a developmental effect on the nervous system that controls heart function. These results indicated that current infant formulas,

no matter what their protein source, promote normal infant development. (NP 107, Component 4, Problem Statement 4A, and Performance Measure 5.2.2)

Publication: Pivik RT, Dykman RA, Jing H, Gilchrist JM, Badger TM. [Early infant diet and the omega 3 fatty acid DHA: effects on resting cardiovascular activity and behavioral development during the first half-year of life](#). Dev Neuropsychol, 2009, 34:139-158.

Body size shown to affect vitamin D levels. In a study among elderly Americans given vitamin D supplements for one year, scientists at the ARS nutrition center in Boston, Massachusetts, found that increased body weight decreases absorption of vitamin D and results in lower blood levels of this essential vitamin. Since Americans are heavier on average than in the past, vitamin D requirements may have increased, in part, as a result of increased body fat. These data are important for making recommendations about how much vitamin D is needed to raise blood levels to desirable levels. (NP 107, Component 2, Problem Statements 2A & 2B, and Performance Measure 5.2.2)

Publication: Blum M, Dallal GE, Dawson-Hughes B. [Body size and serum 25 hydroxy vitamin D response to oral supplements in healthy older adults](#). J Am Coll Nutr, 2008, 27:274-279.

Diet shown to influence non-gene-based inheritance of obesity. In a phenomenon known as epigenetics, traits such as obesity can be inherited based not on changes in genes themselves but on the shape of DNA strands. In research at the ARS nutrition center in Houston, Texas, epigenetics was shown to influence the inheritance of obesity in mice, but was modifiable by high consumption of methyl donors, which include some B vitamins and some amino acids. If these studies in laboratory animals are confirmed in humans, simple dietary changes could prevent an inherited tendency toward obesity. (NP 107, Component 3, Problem Statement 3A, and Performance Measure 5.2.2)

Publication: Waterland RA, Travisano M, Tahiliani KG, Rached MT, Mirza S. [Methyl donor supplementation prevents transgenerational amplification of obesity](#). Int J Obes, 2008, 32:1373-1379.

Folate helps preserve ends of chromosomes. The ends of chromosomes, called telomeres, regulate the integrity of DNA, and when shortened, contribute to aging and cancer. Telomeres were the subject of the 2009 Nobel Prize in Physiology or Medicine, highlighting their importance in health research. Scientists at the ARS nutrition center in Boston, Massachusetts, reported that folate levels in the blood influence telomere length, affecting both DNA integrity and DNA methylation in white blood cells of healthy men. Higher folate levels combined with longer telomeres are associated with slower aging and less cancer. (NP 107, Component 2, Problem Statement 2B, and Performance Measure 5.2.2)

Publication: Paul L, Cattaneo M, D'Angelo A, Sampietro F, Fermo I, Razzari C, Fontana G, Eugene N, Jacques PF, Selhub J. [Telomere length in peripheral blood mononuclear cells is associated with folate status in men](#). J Nutr, 2009, 139:1273-1278.

New dietary supplement ingredient database created. In a partnership between ARS scientists in Beltsville, Maryland, and the National Institutes of Health Office of Dietary Supplements, researchers released the Dietary Supplement Ingredient Database, Version 1, which is freely available on the Internet. The main purpose of this database will be to help researchers quantify consumption of various nutrients. Since about half of the U.S. population takes dietary supplements, this new information will make estimates of intake more accurate and lead to better dietary recommendations for health. This list of hundreds of multivitamin/mineral products is the first of several steps in providing better assessment of the American diet and nutritional status. (NP 107, Component 1, Problem Statement 1C, and Performance Measure 5.2.1)

Web site: [Dietary Supplement Ingredient Database](#)

Soybean constituents shown to have anti-cancer effects. Soybeans are increasingly popular as both a nutritious and health-promoting food. In cooperation with colleagues from Tulane University, ARS scientists at New Orleans, Louisiana, and Beltsville, Maryland, showed that a newly discovered class of soy compounds called glyceollins has greater activity against human prostate cancer cells in cell culture and inhibit more than one growth pathway when compared to genistein, the more commonly found active ingredient in soy. If this work is confirmed in humans, these compounds could be useful for prevention and possibly treatment of prostate cancer. The scientists are also learning how to increase the concentration of glyceollins in soybeans to provide added health benefits. (NP 107, Components 1 & 2, Problem Statements 1D & 2A, and Performance Measure 5.2.2)

Publication: Payton-Stewart F, Schoene NW, Kim YS, Burow ME, Cleveland TE, Boue SM, Wang TT. [Molecular effects of soy phytoalexin glyceollins in human prostate cancer cells LNCaP](#). Mol Carcinog, 2009, 48:862-871.