

Mushroom Council Nutrition Research Update

April – June 2005

Quarterly updates provide Mushroom Council members, industry and the Nutrition Research Advisory Panel with the latest information on the status of mushroom nutrition research.. For additional information or clarification, contact Mary Jo Feeney, MS, RD, FADA, Nutrition Consultant, mj.feeney@earthlink.net.

Chen, Shiuan PhD. Department of Surgical Research, Beckman Research Institute of the City of Hope, Duarte, CA.

Effect of white button mushroom extract on 5 alpha-reductase suppression and proliferation of androgen-dependent prostate cell lines in mice. Estimated completion date June 30, 2005.

Mushroom extract decreased tumor size in a dose-dependent manner in both hormone resistant as well as hormone dependent prostate cancer cells in a mouse model. There was a significant increase in cancer cell death compared to the control as well as a decrease in cell proliferation.

Molecular characterization of breast and prostate tumor suppressive effects of white button mushrooms by gene array analysis. Estimated completion date June 30, 2005.

This study used gene array analysis to examine changes of gene expression in tumors in animals fed mushroom extract compared to tumors from control animals. More than 22,000 gene expressions were compared. According to the tests applied (two-sample t-tests, and the Benjamini-Yekutieli p-value correction to control the false discover rate) 515 genes were increased and

1805 genes decreased in tumors from mushroom-fed mice compared to the control. Analysis of these results will yield insights into the mechanisms as well as the pathways regulated by the phytochemicals in white button mushrooms.

Dr. Chen delivered the keynote address “Anti-cancer activities of the button mushroom” at the 47th Annual Penn State Mushroom Industry Conference June 13 and is speaking on the “Chemopreventive properties of mushrooms against breast cancer and prostate cancer” at the International Medicinal Mushroom Conference in Port Townsend, WA in October. His research was mentioned in the May issue of *Shape* magazine and Dr. Chen is quoted as saying: “Our studies show that when animals regularly eat mushrooms, mammary tumors shrink.”

**Cheskin, Lawrence J. Johns
Hopkins Bloomberg School of
Public Health, Baltimore, MD**

Does Substitution Of Meat Products With White Button Mushrooms Have Potential For Weight Reduction? Studies Of The Level Of Short And Intermediate-Term Caloric Compensation, Satiety, And Dietary Satisfaction Among Lean And Obese Men And Women. Estimated completion early 2006.

Phase I of this study is completed. Ten test meals with a minimum of 125 calories less than an identical meal using meat have been developed. Recruitment of subjects for Phase 2 to study the palatability, consumer acceptance, and satiating properties of each mushroom-substituted meal using a panel of obese and normal weight men, women, seniors, and teenagers occurred in April.

Dr. Cheskin's research will be mentioned at a symposium entitled "Foodservice industry: Solution to America's obesity problems?" during the Institute of Food Technologists (IFT) Annual Meeting in July. M.J. Feeney will describe how the foodservice industry can substitute mushrooms for more energy-dense foods as a nutrition strategy to help improve the nutrient profile and lower the caloric level of menu offerings.

**Mark Kern, PhD, RD, San Diego
State University, San Diego,
CA.**

Role Of Mushrooms Included In A Low Carbohydrate Diet On Weight Loss, Blood Lipids And Satiety. Estimated completion of the 18 month study is mid 2006.

The randomized balanced cross-over study examines the potential role of mushrooms incorporated into a 4-week low carbohydrate diet on body weight and fat loss, resting and postprandial blood lipid responses, and blood pressure in overweight men and women. The mushroom-based low carbohydrate (low saturated fat) diet will be compared to a more typical low carbohydrate (higher saturated fat) diet using primarily animal sources of protein and fat and to a diet high in carbohydrate and lower in fat and protein representing usual dietary recommendations.

Participants are now in the final third rotation among the test diets. Body weight and body composition data for all participants completing two trials have been analyzed. While still preliminary, the analysis indicates that while all groups have lost weight, the rate of loss has been greatest with those on the low carbohydrate-mushroom based diet. Percent body fat loss assessed by bioelectrical impedance is statistically significant for those on the two-low-carbohydrate trials and approaches significance for those on the high carbohydrate trial. Body fat loss as measured by underwater weighing is statistically significant only for the mushroom trial.

Preliminary information on serum triglyceride concentrations indicates that, as expected, the low carbohydrate diets resulted in significantly lower concentrations compared to the pre-study levels. The high carbohydrate diet elevated serum triglyceride concentrations, which also was expected.

At its May 16 meeting the Council approved an additional \$5,000 to help cover the food costs of the study, which were under-budgeted. In this study, all food is provided to participants and thus

represents a sizeable part of the budget. Dr. Kern prepared a rationale for the request for additional funds, acknowledging the estimate error, and citing other ways in which he applied cost-savings to the study without compromising the design. In addition, Council member Bob Crouch provided 55 pounds of white button mushrooms to help offset food costs. |

The investigators anticipate completing the data sample collection portion of this study by the end of July. Dr. Kern's research will also be mentioned in the July IFT symposium as an example of how mushrooms can be included on low carbohydrate diets that might offer health benefits (loss of body fat and low triglyceride levels) in addition to weight loss.

**David B. Haytowitz, U.S.
Department of Agriculture,
Beltsville Human Nutrition
Research Center, Nutrient Data
Laboratory, Beltsville, MD.**

Nutrient Analysis Of Mushrooms.

All analyses except for ergosterol (being performed early July) have been completed for this project which provides nutrient information on white button raw, stir-fried and microwaved; oyster raw; shiitake stir-fried; crimini raw; portabella raw and grilled; enoki raw; and maitake raw. Dr. Haytowitz will apply the retention value for white raw to cooked to determine the cooked values of the other varieties not specifically analyzed in the cooked state. These values will be published in the U.S. Department of Agriculture's (USDA) Nutrient Data Laboratory (NDL) Nutrient Database for Standard Reference (SR) Release 18 scheduled for late June or July. This food composition database is used widely by the scientific community to monitor food intake and to conduct nutrition research. The data also are

used as the basis of other databases worldwide. In addition, the data are being reviewed to determine implications to any changes in the Mushroom Council Nutrition Labeling Toolkit.

Recently Funded Research

At its May 16 meeting, the Council approved two research proposals to investigate mushrooms' effect on biomarkers of innate immunity and inflammation: "Effect of mushroom supplementation on innate immune response," Dayong Wu, PhD, USDA Human Nutrition Research Center on Aging at Tufts University; and "Modulation of biomarkers of inflammation by mushrooms commonly consumed in the United States" Keith R. Martin, PhD, Penn State University.

The Council also will undertake a pilot study to determine the production feasibility of exposing mushrooms to UV light to activate D2 prior proceeding with a proposal from Mona Calvo, PhD, FDA Center for Food Safety and Applied Nutrition. The FDA proposals seek to investigate the effect of mushrooms optimized with D2 on increased disease resistance to microorganisms and mammary tumor growth in an animal model.

**Nutrition Research Information
Activities**

The Council participated in the June 23 groundbreaking of the Robert Mondavi Institute for Wine and Food Science and will attend the July meetings of the American Institute for Cancer Research and the Society for Nutrition Education.