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Amended FY 2014 Research Plan Narrative National Processed Raspberry Council

FY 2014 Research Tactics

Dietary guidelines around the world recommend daily consumption of 5 to 9 servings of fruits and vegetables for the prevention and/or management of chronic illnesses like cardiovascular disease, cancer and neurological diseases, such as Parkinson's, Alzheimer's disease and Rheumatoid Arthritis. Fruits, and in particular berries, are good sources of several compounds that contribute to good health. Red raspberries, in addition to their attractive color and appealing flavor contain several essential nutrients and beneficial phytonutrients. They are considered a healthy food choice since they are low in total calories and fat, are high in dietary fiber (one of the highest fiber berries), and are a good source of vitamin C, folate, potassium and magnesium.

Studies have demonstrated that polyphenols are absorbed into the body in their bioactive form. Rather than consuming extracts of individual components of foods, nutritionists and other health professionals, recommend that people eat whole foods because the complimentary and synergistic effects among their components far outweigh consuming individual nutrients or bioactive compounds.

In addition to meeting important dietary recommendations, regular consumption of raspberries provides several additional and unique health benefits. A growing body of research suggests that red raspberries, a rich source of bioactive polyphenols, have anti-inflammatory properties and may offer beneficial effects against inflammatory-related diseases. The general consensus is that chronic inflammation is at the root of all chronic illness, and food with anti-inflammatory properties may play an important role in preventing chronic illness and/or helping to manage a whole host of health issues.

There is growing interest in diet and how it can fight inflammation. While inflammation is the body's natural protective response to illness, stress and infection, inflammation can become harmful when the body's immune system malfunctions resulting in chronic inflammation.

Raspberries are a significant source of Vitamin C, a powerful antioxidant and other important health promoting bioactive compounds, including anthocyanins and ellagic acid. They are a particularly rich source of cyanidin and are unique among the berries for their high ellagitannin content, which can be hydrolyzed to yield ellagic acid.

The dense nutritional profile of raspberries and the presence of beneficial phytonutrients that are absorbed by the human body influence several mechanisms and thereby offer health outcomes. For example, the low energy, low fat, no cholesterol and high fiber content of raspberries is consistent with nutritional profiles of foods that support healthy heart function.



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and promote improved glucose response. Fiber helps reduce both hunger and can lead to a feeling of satiety. The potassium and low sodium content of raspberries may also help reduce hypertension. Research findings to date suggest that moderate consumption of raspberries can help to prevent the development of early atherosclerosis and alleviate the symptoms of arthritis in animal studies.

The goal of funded research is to establish a link between red raspberry consumption and its anti-inflammatory potential, and to increase public awareness about the health benefits of raspberries through communications designed to increase demand for raspberries.

During Roundtable meetings with leading scientists, a series of priorities for future research for raspberries were identified and subsequently adopted to guide solicitation of research proposals.

Those priorities are:

1. General Chronic Inflammation as it relates to diabetes, cancer, or CVD
2. Diabetes, to include vascular diseases and metabolic syndrome
3. Cancer, including breast, esophageal, and colon
4. Cardiovascular Disease
5. Osteoporosis
6. Cognitive Function/Motor Skills

Using these often inter-related priorities, discussions were held and proposals were solicited from scientists who had presented findings at the Berry Health Benefits Symposium, a biennial conference of scientists from around the world conducting research on the health benefits of berries.

A table outlining research proposals received as a result is attached as “Table 1”. It lists: the Principal Researcher and the academic institution; project title, objectives and summary; project duration; and proposed budget.

FY 2014 Nutrition Research Project Recommendations

Activities presented below recognize transitioning into the program during the remainder of FY 2014 and a necessity to complete infrastructural elements while beginning to project the new organization to public audiences. New nutrition research projects activity will begin to generate findings that can be incorporated into the Council’s public relations program.

1. **Program Management and Services.** These are expense items that are necessary to support nutrition research projects. Included is a portion of Wellness time and expense to coordinate research activity, part of the Executive Director’s time and expenses to complete



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activities that might otherwise be conducted by a research director, Council travel to attend and participate in Council and committee meetings to discuss nutrition research, and an allocation of direct administrative expenses necessary to support research program functions (printing, phone, supplies, shipping/postage, memberships, subscriptions to professional journals, and legal services for contract review).

2. FY 2014 Nutrition Research Projects.

- a. **Alan Crozier: Identification and Quantification of Potentially Protective Polyphenol Derivatives in the Circulatory System Following Red Raspberry Consumption.** This project draws on Crozier's earlier work funded by the WRRC to gain an understanding of bio-availability and the metabolites responsible for chemo-protection and their impact on cancer cells. It supports other proposed cancer research projects by examining mechanisms, as well as the proposed research at the University of Parma and the University of Ulster. This study has implications not only for cancer therapy and prevention, it also adds evidence that biochemical constituents are absorbed rather than secreted. Proposed as a single year project, funding would be split over two years, with an escape clause such that the FY 2014 budget would not need to carry both years' expense. It is important to begin this project in FY 2014 as multiple other projects will draw on its findings.
- b. **Daniele Del Rio: The Protective Effect of Red Raspberry Polyphenol Metabolites on the Development of Chronic Disease Mechanisms.** Selected phenolic catabolites and urolithin metabolites as supplied from Dr. Crozier's lab, representing actual circulating forms in humans after consumption of raspberries, will be tested for specific bioactivity to address their putative effects and mechanisms of action in the prevention of diabetes and cardiovascular diseases. Diabetes/glucose control is an area of health where raspberries are believed to be the most effective berry. World-wide diabetes rates are rising dramatically as the population ages. Raspberries "owning" diabetes as a whole food approach could dramatically shift demand for the product. Cardiovascular disease and diabetes are two manifestations of chronic inflammation. The study would look at their inter-relationship. Proposed as a two-year study, recommended funding reflects costs in year 1 only. The contract would include an escape clause such that the FY 2014 budget would not need to carry both years' expense.
- c. **Chris Gill: Raspberry Consumption and Colonic Health.** This project would utilize ileostomy patients in Crozier's study. This is a unique opportunity to investigate the impact of a raspberry diet on colonic micro-biota in samples that have been subject to human digestion rather than laboratory-simulated digestive processes, and determine potential protective effects. This is a thorough and well organized low cost proposal that would provide baseline information in a short time frame. This research is important because it can demonstrate that the body absorbs important bio-actives and nutrients at a therapeutic level, as prevailing nutrition



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science indicates that 70% of the body's immune function is associated with digestive health.

- d. **Shanil Juma: Bone Protective Effect of Whole Red Raspberries in Postmenopausal Women.** The short duration of this project, its use of human patients, and its potential to establish a base-line for a clinical trial are intriguing. The project is well conceived and organized. The impact of diet, beyond foods high in calcium, is an emerging area of bone density research. Study results could compliment findings from Dr. Seeram's previous study on raspberries arthritic inflammation, bone and joint health.
3. The remaining proposed research projects and any additionally identified projects will be considered for funding in FY 2015. They include:
 - a. **Navindra Seeram: Anti-Diabetic Effects of Red Raspberry *in vitro* and *in vivo*.** Seeram is effective in delivering results in short time frames that can be published in peer reviewed journals and can be added to health messaging and communications programs. Multiple proposals looking for a link between regular raspberry consumption and diabetes is indicative of the severity and growing prevalence of this malady. The downside of this proposal is the University of Rhode Island's insistence that University overhead be part of the budget, in this case adding almost \$23,000 to the cost of the proposal, making its recommendation in FY 2014 difficult.
 - b. **Gary Stoner: The Role of Red Raspberries in Colon Cancer Prevention.** Stoner has an extensive background on cancer research and berries, having previously conducted research funded by the WRRRC. This *in vivo* project using an animal model addresses a priority research area for raspberries. Data could support potential future human clinical trials and potentially support qualified health claims. In addition, there is tremendous potential for several study results which would yield multiple published journal articles and conference presentations. Dr. Stoner's research has received a great deal of media coverage targeting general consumer audiences as well as health professionals. As this is proposed as a three-year study with Stoner, it is recommended to defer consideration for funding to FY 2015.
 - c. **Ara Kirakosyan: The Cardio-protective Benefit of Red Raspberries.** This project recognizes the significance of and draws from earlier work completed by Crozier on metabolism and metabolic by-product chemoprotection. It would validate raspberry consumption for antioxidant activity, anti-inflammatory, and cholesterol reduction activity beyond cardio-protective effects, and which raspberry phytochemicals are the most cardio-protective. As a two-year project, it is recommended to delay funding consideration to FY 2015.
 - d. **Harini Ayer: The Potential for Red Raspberry to Increase Sensitivity and Reverse Resistance to Endocrine Therapy in Breast Cancer.** Breast cancer cells can become de-sensitized to drug therapy leading to mortality. It is hypothesized that the anthocyanins in red raspberries can re-sensitize cells such



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that they are receptive to treatment. The results of this study could help generate significant news for the industry. The study is novel and cutting edge in the treatment of breast cancer. Proposed as a 1-1/2 year study, recommended funding reflects costs in year 1 only. The contract would include an escape clause such that the FY 2014 budget would not need to carry both years' expense.