Discovering the Role of Prunes in Health and Nutrition

Mary Jo Feeney, MS, RD, FADA
Nutrition Advisor
California Prune Board
May 23, 2012

Introduction

I thank the California Prune Board and the International Prune Association for the opportunity today to describe the Board's Nutrition Research Program, results of current research (other than bone health which Dr. Halloran will present), and some projects in the research pipeline.

The prune industry conducts nutrition research to build the credible scientific base to increase consumer awareness of the health benefits of eating prunes. The importance of nutrition information has evolved over the years from 'nice to know' guidance on what to eat to a 'life skill' essential to improve health and to lower the risk of chronic disease. Increasingly, health professionals focus on whole foods, rather than individual nutrients in order to help consumers prevent chronic disease.

The California Prune Board's Nutrition Research Program has made considerable progress in discovering and understanding the health effects related to eating prunes. Many health effects are interrelated and the individual prune components may act in synergy or combination to produce observed effects – the 'whole' food approach to better health.

Since 1998, the California Prune Board, through the Nutrition Research Program, has funded over 30 projects resulting in over 20 publications, abstracts or presentations in various areas of health promotion including digestive health, bone health, heart health, satiety, immune function and reduction of oxidative stress. To ensure credibility and maintain scientific integrity, the Nutrition Advisory Panel (Panel) helps guide the Nutrition Research Program. The Panel evaluates current research activities, helps develop the research agenda, reviews proposals, assists in disseminating research results, and helps identify key contacts to leverage research. Members of the Panel represent expertise in a variety of research areas/disciplines including phytonutrients/antioxidants; energy and sports nutrition; food science; nutrition education/communications; dietary fiber and digestive health; and immune function and inflammation.

Nutrition Research Discovers

Nutrition research is undertaken to discover what is in prunes (composition), the health benefits of eating prunes (consumption), and communicates these benefits so that prunes are top-of-mind when consumers choose to eat for health.

- Composition research focuses on the presence, bioavailability, quantity and functions of core nutrients (for example, soluble and insoluble dietary fiber, and potassium) and phytonutrients (phenolic compounds). These analytical values appear in national nutrient databases (http://ndb.nal.usda.gov), in refereed journals and often are used to determine values for nutrition labeling and nutrient content claims.

- Consumption research focuses on the health benefits of eating prunes particularly in the areas of digestive health, heart health, satiety, immune function and reduction of oxidative stress, and more recently, bone health.

- Communication of these nutrient and health benefits is carried out through public relations activities, media relations and presentations to health influencers.
-

Research Highlights

For summary abstracts and references on prune nutrient composition and research; visit http://www.californiadriedplums.org/nutrition/health-professionals/research.

Digestive Health

Although prunes and prune juice have been traditionally used for the treatment of constipation, they have not been systematically assessed in patients with well-defined constipation. The laxative effect of prunes is thought to be due to the combined action of soluble and insoluble dietary fiber, sorbitol and possibly phenolic compounds, although the exact mechanism(s) has not been established. Also, the efficacy, palatability and tolerability of prunes in the treatment of chronic constipation had not been examined until recently. Research at the University of Iowa by Dr. Satish Rao investigated and compared the effects of prunes and psyllium (Metamucil) on the overall relief of constipation symptoms, taste and quality of life in adult men and women with functional constipation in a randomized crossover controlled trial.

Participants consumed 50 g prunes or 11 g psyllium each containing 3 g dietary fiber twice daily (6 g dietary fiber total per day) for three weeks. The number of spontaneous bowel movements per week was significantly higher with the prune treatment than with psyllium although both treatments improved constipation symptoms without causing any adverse effects. The investigators concluded that prunes are safe, palatable and more effective than psyllium for the treatment of mild to moderate constipation, and should be considered as first line therapy.

Managing Hunger/Satiety

About 87 percent of women report eating snacks – which can contribute more than 20 percent of daily energy intake. Appropriate snacking may promote a healthy body

weight – so it is important to determine which snack foods are most effective for appetite control.

Research at the Agricultural University of Athens by Dr. Antonis Zampelas investigated the effect of prunes compared to bread as a snack before a meal on short-term satiety in normal weight men and women. The study measured hunger by using rating scales and measured reduced appetite for a dessert offered shortly after lunch. When subjects ate the prune snack before lunch, they ate less of the dessert and had lower total energy intake at the meal. In addition, subjects reported lower feeling of hunger, desire and motivation to eat between the snack and the meal. Since the macronutrient content of both before meal snacks were similar, the satiating power of prunes could be due to their fiber content.

Other research at San Diego State University by Dr. Mark Kern compared the effect of snack foods on satiety, plasma glucose (blood sugar) and appetite hormone responses. Snack foods included prunes, low-fat cookies, white bread and water only. The satiety index as measured by rating scales was significantly higher for prunes versus the low-fat cookies. The rises of plasma glucose and insulin after the prune snack were lower than after the low-fat cookies. Results suggest that consuming prunes as a snack suppresses hunger relative to a low-fat cookie as evidenced by lower glucose and/or satiety-regulating hormone concentrations.

Improving Diet Quality and Antioxidant Status

In this same study, Dr. Kern investigated the effect of eating the 100 kcal snacks (prunes or low-fat cookies) twice daily on energy and nutrient intake. While neither snack changed energy/calorie intake or weight during the two-week study, the prune snack resulted in greater intake of fiber, potassium, riboflavin, and calcium. Total fat and cholesterol intake tended to decrease with prune consumption. Plasma triglyceride levels (a type of fat in the blood) did not change with prune intake but was higher after consumption of the low-fat cookies. The blood antioxidant levels (as measured by TEAC, Trolox equivalent antioxidant capacity) of participants increased significantly when consuming prunes compared to when they ate the low-fat cookie.

Updated Literature Review

Over 195 publications linking the consumption of prunes and prune products to health effects were reviewed to update the original work of Stacewicz-Sapuntzakis (*Crit Rev Food Sci Nutr* 2001). The updated review, in press in the same journal, contains many tables on nutrient composition – and Dr. Sapuntzakis' summary of the possible health of effects of prunes is found in the table in the Appendix. A more accurate representation may be that of a complicated web, since many health effects are interrelated and the prune components may act in synergy.

New Research in Progress

Role of Prunes in Glucose Regulation

There is increasing media attention as well as research on the role of carbohydrates in chronic disease prevention. Consumers hear about good/bad carbs and slow/fast carbs – referring to the rate of digestion, metabolism and effect on blood sugar, sometimes referred to as the glycemic load or insulin response. "Sugar" is increasingly positioned negatively and there often is little distinction made between "added sugar/s" and sugars that occur naturally in fruits such prunes. Dried fruit has also been characterized as concentrated sugar that causes a spike in blood glucose, although the glycemic index of prunes is considered low, and the presence of dietary fiber helps slow digestion. The prevalence of obesity has resulted in more consumers at risk for the development of type 2 diabetes. Nearly all individuals with type 2 diabetes first are considered to be pre-diabetic.

New research by Dr. Mark Kern, San Diego State University, will investigate the effect of prunes compared to a low-fat cookie on risk factors related to chronic diseases as well as antioxidant status and overall dietary quality in individuals with prediabetes or metabolic syndrome, a condition that includes 3 of the 5 following risk factors:

1. Increased waist circumference
2. Elevated blood levels of triglycerides (type of fat in the blood)
3. Low blood levels of HDL (good) cholesterol
4. High blood pressure
5. Elevated levels of blood glucose.

To help answer the question whether prunes cause a rapid rise in blood sugar, the research also will investigate the short term/after meal response to a 240 kcal (100 g) serving of each snack food at the beginning and end of the 8-week study.

Participants will consume twice daily 100 kcal servings of either prunes or a low-fat cookie having a similar protein and fat content – and will be matched closely for total carbohydrate including fructose. The fructose in prunes is naturally occurring; the fructose in the snack will be from a mixture of high fructose corn syrup and corn syrup. The research will help discover whether the multiple components of prunes positively affect metabolism by any one or a combination of effects:

- Reducing body weight through improved satiety
- Preventing elevated plasma triglycerides
- Potentially altering cholesterol metabolism
- Reducing blood pressure due to greater potassium intake and possible weight loss
- Reducing blood glucose responses
-

Research News from the United Kingdom

The acute effect of two fruit-based snacks on hunger, satiety and food intake
University of Liverpool

A randomised controlled trial investigating the dose dependent effect of prunes on gastrointestinal health in adults with infrequent bowel movements
Kings College, London

Appendix

Potential health effects of prune components

Prune components	Laxative	Gastro-intestinal	Anti-cancer	Cardio-vascular	Anti-diabetic	Bone	Anti-bacterial	Immune function	Neural & Cognitive
Dietary fiber	√	√	√	√	√			√	
Sorbitol	√	√	√		√	√	√		
Inositol				√					√
Phenolic compounds	√	√	√	√	√	√	√	√	√
Quinic acid							√		
Vitamin K1				√	√	√			
Boron					√	√			√
Copper				√	√	√			
Potassium				√		√			

Source: Dried Plums and Their Products: Composition and Health Effects – An Updated Review
Maria Stacewicz-Sapuntzakis; *Critical Reviews in Food Science and Nutrition 2012 in press*

The Role of Prunes in Health and Nutrition

Mary Jo Feeney, MS, RD, FADA
IPA Conference
Davis, California
May 23, 2012

California Prune Board Nutrition Research Program

- Scientific base
- Increase awareness
- Benefits of whole food
- Improve consumer health

Over a Decade of Accomplishments

- 30 + funded projects
- 20 + publications/abstracts
- Publications in press and planned
- Industry reports

Nutrition Advisory Panel

- Phyllis Bowen, PhD University of Illinois
  - Antioxidants
- Kristine Clark, PhD Penn State University
  - Sports Nutrition
- Daniel Gallaher, PhD University of Minnesota
  - Dietary Fiber

Nutrition Advisory Panel

- Bruce German, PhD, Foods for Health Institute University of California
  - Food Science
- Connie Rogers, PhD, Penn State University
  - Energy Balance Related to Chronic Disease
- David Q. Shih, MD, Cedars-Sinai
  - Digestive Health and Immune Response

May 23, 2012 MJ Feeney • IPA Davis, CA

Nutrition Research Discovers…

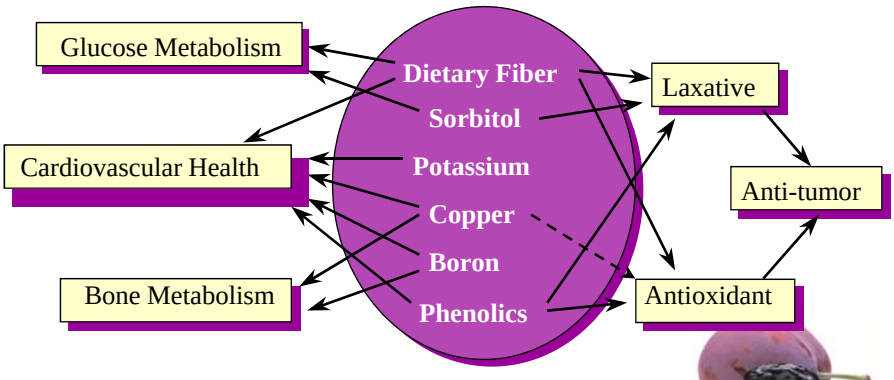
- What's in prunes?
  Composition
- What do these compounds do?
  Consumption
- What can we say?
  Communication

May 23, 2012 MJ Feeney • IPA Davis, CA

Composition

- Dietary fiber: soluble and insoluble
- Potassium
- Other minerals: boron, copper
- No added sugar
- Low glycemic index
- No cholesterol
- Low in fat, *trans* fatty acids
- Low in sodium

How Nutrients Relate to Health



Source: Stacewicz-Sapuntzakis et. al. *CRFSN* 2001

Abstracts/Summaries

- Nutrition composition
- Health research
- www.californiadriedplums.org/nutrition/health-professionals/research

May 23, 2012 MJ Feeney • IPA Davis, CA

Research Highlights

- Digestive health/laxation
- Managing hunger/satiety
- Improving diet quality and antioxidant status
- Updated literature review

May 23, 2012 MJ Feeney • IPA Davis, CA

Normalization of Laxation

- Convenient, tasty alternative to laxatives and supplements
- Prunes/prune juice traditionally used but not systematically examined

Digestive Health

- Satish Rao MD, Univ. of Iowa
- Prunes (50 g 2xd) compared to fiber supplement (Metamucil) matched for 6 g fiber
- Subjects with chronic constipation
- Relief of constipation symptoms

Results - Prunes

- More effective than psyllium in the management of chronic constipation
- Safe, tolerable and palatable
- Effective option in the management of (mild to moderate) chronic constipation and should be considered as first line therapy

Manage Hunger &Weight

- Snacking may control hunger and contribute to nutrient intake
- Can prunes help manage hunger and decrease amount of food eaten at another meal or over time?

Snack Effect on Lunch & Dessert

- Antonis Zampelas, PhD, Agricultural University of Athens
- Effect of prune or bread snack on lunch, dessert and 1 day's intake
- *Eating Behavior*

May 23, 2012 MJ Feeney • IPA Davis, CA

Results

- Tended to eat less at lunch after prune snack and ate much less of cake dessert
- Hunger and desire to eat lower with prune snack
- Feeling of satiety higher with prune snack

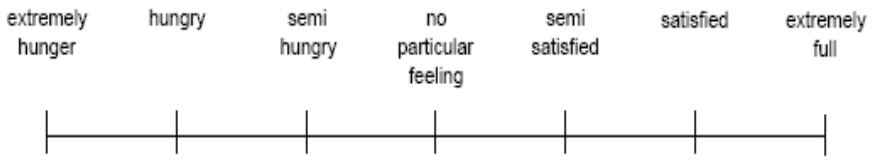
May 23, 2012 MJ Feeney • IPA Davis, CA

Snacking, Satiety, Nutrient Quality

- Mark Kern PhD, RD, San Diego State
- Satiety responses in adult women
  - *Appetite*
- Snack selection influences nutrient intake, triglycerides and bowel habits of adult women
  - *Journal of the American Dietetic Association*

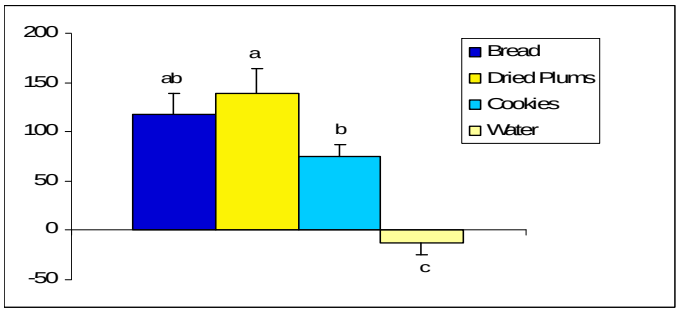
May 23, 2012 MJ Feeney • IPA Davis, CA

Hunger Scale



May 23, 2012 MJ Feeney • IPA Davis, CA

Prunes Higher in Satiety



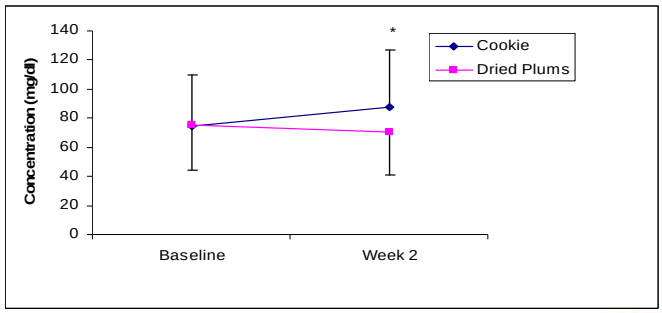
May 23, 2012 MJ Feeney • IPA Davis, CA

Improved Diet Quality Nutrient Intake

- Higher fiber, potassium, riboflavin, niacin and calcium
- Lower fat and cholesterol intake
- Increased blood antioxidant levels

May 23, 2012 MJ Feeney • IPA Davis, CA

Lower Triglycerides



*P<0.05)

May 23, 2012 MJ Feeney • IPA Davis, CA

Literature Review

- Maria Stacewicz-Sapuntzakis PhD, U. Illinois
- In Press: *Critical Reviews in Food Science and Nutrition* • 195 articles reviewed
- Extensive composition tables
  - Carotenoids, antioxidant capacity, phenolic compounds,
- Potential health effects
  - Components act in synergy

May 23, 2012 MJ Feeney • IPA Davis, CA

Glucose Regulation

- Effect on blood sugar
- Carbohydrates and 'sugars' differ
  - Sugar – Bad for you?
  - Dried fruit – Concentrated sugar?
- Increase in obesity increases risk for type 2 diabetes

May 23, 2012 MJ Feeney • IPA Davis, CA

Pre-diabetes Metabolic Syndrome

- Large waist
- High levels of fat in blood
- Low 'good' cholesterol
- High blood pressure
- High levels of blood sugar

May 23, 2012 MJ Feeney • IPA Davis, CA

Pre-diabetes Metabolic Syndrome

- Mark Kern PhD, RD, San Diego State Univ.
- Do prunes cause rapid rise in blood sugar? Compare 2xd snack of prunes and carbohydrate snack
  - Matched for carbohydrate/fructose
- 8 week study
- 72 participants: men and women

May 23, 2012 MJ Feeney • IPA Davis, CA

Discover if Prunes

- ?reduce weight through satiety
- ?prevent rise in fats in blood
- ?change cholesterol metabolism
- ?reduce blood pressure through potassium in prunes and weight loss
- ?reduce blood glucose response

May 23, 2012 MJ Feeney • IPA Davis, CA

Research News United Kingdom

- Satiety research: University of Liverpool
  - Results presented at European Congress on Obesity, Lyon, France
  - More filling between meal snack based on calories
  - Could help reduce calorie intake if replace other rapidly digested carbohydrate snacks

Gastrointestinal health

- Kings College London

EU Nutrition and Health Claims

- Generic digestive health claim resubmitted and outcome imminent
- Authorized and rejected generic health claims published during May
  - Prunes and antioxidants
  - Prune juice and digestive health
  - Lack research to support the claim NOT that benefit is invalid

Prunes…

- Offer food-based approach to health
  - Tasty
  - Convenient
  - Versatile
  - Nutritious