The Scientific Newsletter

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« NEW FRUIT & VEGETABLE LITERATURE REVIEWS »

Editorial

Produce for Better Health Foundation (PBH) periodically conducts a review of the literature on a variety of topics relating to fruits and vegetables (FV) to aid practitioners, policy makers, and other researchers in our collective effort to increase FV consumption. Three recent reviews were conducted and are outlined in this newsletter.

The first was a review on how FV impact disease risk. The number of studies suggesting an association between fruit and vegetable intake and reduced risk of major chronic diseases has continued to grow over time. These studies have demonstrated that several nutrients and other components in FV are associated with beneficial outcomes related to disease. There is also a growing body of basic research suggesting that fruit and vegetable intake may reduce oxidation, inflammation, cell proliferation, and other important disease-related processes. A comprehensive and critical analysis of mechanistic experimental studies was beyond the scope of this review, but the evidence from mechanistic studies found during this review suggests that FV may have an even greater role to play in human health than the already positive results from observational studies outlined in this report. The body of literature is so great that additional reviews should be done by disease state, including more of the mechanistic studies.

The second review looked at human intervention trials in the US related to FV intake and behavioral approaches. The review suggests that statistically significant increases in fruit and vegetable intake are demonstrated when behavior-based interventions are employed. However, these increases in fruit and vegetable intake are small compared to that necessary to achieve recommended intake levels. Among the most supported are interventions applying Motivational Interviewing or Stages of Change at the individual level and Social Ecological or Social Contextual Theories at the group (e.g., worksite, church) level. Only with a multifaceted approach that integrates individual, group, governmental, industry, and social involvement and includes all ages, including early life exposure, is it expected that substantial and clinically relevant improvements in fruit and vegetable intake will be achieved. Achieving and sustaining fruit and vegetable intake at currently recommended levels across the population also will require stronger interventions that are strategically combined with other approaches, including efforts to address taste, convenience, availability and access, and competitive foods, as well as enhance the perceived value of habitually adopting this behavior.

The third review was an effort to determine if the US government was financially supporting FV to their level of importance as outlined in the US Dietary Guidelines. The review found that FV remain a low US federal spending priority. This low-priority status is inconsistent with the large fruit and vegetable consumption gap, the enormous economic costs and substantial health risks associated with that gap, and statements of high-level federal officials warning that the impact of diet-related diseases has reached a crisis in this country. The report has been used to help justify federal allocation or reallocation of funding to better support FV consumption. A similar analysis could be done by other countries.

For all reports go to http://www.pbhfoundation.org/about/res/pbh_res/

Elizabeth Pivonka
President & CEO, Produce for Better Health Foundation, USA

HEAD OFFICE
International Fruit And Vegetable Alliance
c/o Canadian Produce Marketing Association
162 Cleopatra
Ottawa, Canada, K2G 5X2

IFAVA CO-CHAIR
Colleen Doyle - USA
e-mail : colleen.doyle@cancer.org

IFAVA CO-CHAIR
Paula Dudley, New Zealand
e-mail: paula@5aday.co.nz

Fruits, Vegetables, and Health: A Scientific Overview, 2011

— Dianne Hyson —

Associate Professor, Family and Consumer Sciences, California State University, Sacramento, CA, USA

Research related to fruits and vegetables (FV) over the past five years has expanded and added to earlier evidence supporting a positive association between FV intake and human health. Several encouraging trends are noteworthy, including a greater number of investigations being conducted in countries beyond America and Europe to include non-Western groups, demonstrating potential benefits of FV intake across populations. There is also an important shift toward recognizing the value of the composite of nutrients and components in FV, rather than attributing observed outcomes to isolated or single compounds. Several investigators acknowledged that mixtures and interactions in foods are difficult to mimic with isolated compounds, and that native FV are often more effective.

Variety important

A few new studies have suggested that the variety of FV consumed might be as important as the quantity. Although national guidelines, health professionals, and organizations advocate variety based on nutrient composition, the emphasis in most scientific studies has historically been placed upon quantity.

Provocative new work in humans has built upon animal data suggesting that consuming FV may improve cognitive performance in both healthy individuals and those with neurodegenerative conditions. Promising studies of the effect of FV on disease-related processes, including inflammation and oxidation, advance our understanding of these conditions and others. There is also support for a positive effect of FV on pulmonary function, particularly in CO PD, and the potential of FV to attenuate the adverse effects of environmental pollutants on lung health.

Positive impact on body weight

A number of new studies have demonstrated that body-weight regulation and related conditions, including diabetes and hypertension, might be positively impacted by FV consumption, an important and timely focus given the need for more effective strategies to promote weight loss. There are promising but inconsistent data related to the effects of FV on bone mass in humans. However, there is still much work to be done to determine the independent effect of FV on health and to expand upon preliminary findings that hint at positive effects of FV intake on arthritis and eye health.

In spite of these findings, a number of large prospective trials have been published and the results have not consistently supported the outcomes of earlier observational and case-control studies, particularly related to cancer, and to a lesser extent, cardiovascular disease. While the impressive numbers of subjects in these studies are important, methodological limitations are still present. Many large trials rely upon self-administered Food Frequency Questionnaires to determine FV intake at periodic intervals, often two or more years apart. Although most assessment tools have been validated, it is possible that there is systematic under- or over-reporting of food groups. Infrequent assessment also increases the chance of missing dietary shifts between measurement periods.

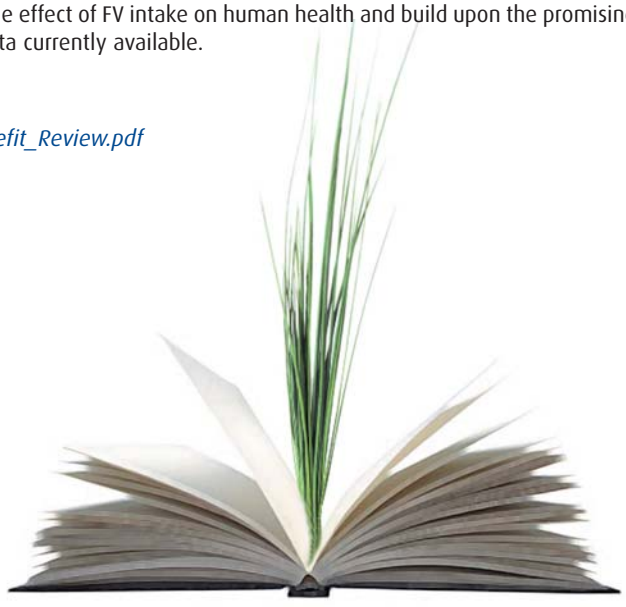
Inconsistent findings related to FV and cancer, cardiovascular disease, and bone health have also been reported in meta-analyses and recent pooled reports. However, as acknowledged by the authors of many of these, there is a significant degree of heterogeneity between studies examining FV intake and human health. A number of assumptions are made when data are pooled to reconcile the great variety of approaches to dietary assessment, inconsistent stratification and classification of FV intake and quantities, diverse outcome measures, highly variable duration periods, and different exposures to FV.

Further work required to answer questions

It is important to be cautious in interpreting the outcomes of recent reports and to recognize the need for further work using well designed, tightly controlled and standardized approaches across multiple conditions and populations. There are numerous plausible mechanisms by which FV might be protective and many unanswered questions regarding the potential importance of variety, quantity, duration, and nature of FV effects on disease-related processes. Thus, the study of FV must remain an active area of research to confirm the true effect of FV intake on human health and build upon the promising data currently available.

The full report can be found at:
http://www.pbhfoundation.org/pdfs/about/res/pbh_res/PBH_Health_Benefit_Review.pdf

Data for the review were collected from database searches of PubMed and Medline for peer-reviewed articles published between July 1, 2006, and January 5, 2011. Key search terms included full and truncated forms of the words fruit(s), vegetable(s), fruits and vegetables, and (in alphabetical order) age, aging, Alzheimer's, arthritis, asthma, bone, birth defects, body weight, brain, cardiovascular disease, cataracts, chronic obstructive pulmonary disease, cognitive, dermatological, diabetes, diverticulosis, eye, gastrointestinal, hypertension, inflammation, life span, longevity, neurodegenerative, obesity, oxidation, skin, weight.



Fruits, Vegetables, and Behavior Change: A Scientific Overview, 2011

— Cynthia Thomson —

Associate Professor, Department of Nutritional Sciences, University of Arizona

Fruit and vegetable intake in American adults remains well below recommended levels, despite evidence of the health benefits of diets high in fruits and vegetables. Efforts to increase fruit and vegetable intake include behavioral-based interventions. Generally, these interventions have demonstrated small increases in intake during the duration of the study, although the behavioral approaches providing the greatest increase in intake have not been clearly established. Several common behavioral theories and approaches have been employed to promote change in health behavior, including greater fruit and vegetable intake (Table 1). Interventions that apply behavior theory are delivered, using a variety of delivery settings (schools, churches, community centers, healthcare organizations, etc.), as well as with a diversity of approaches including face-to-face counseling, telephone-based delivery, printed materials (including tailored and non-tailored documents), and more recently, computer-based, technology-driven strategies for delivery of interventions targeting behavioral change.

Review of intake and behavioral approaches

A systematic review of MEDLINE PubMed and PsycINFO databases was conducted to identify all reported human intervention trials related to fruit and vegetable intake and behavioral approaches since 1995. Using predetermined limits and selection criteria, 65 manuscripts were identified, providing 57 study samples for inclusion in this systematic review. The purpose of this systematic review is to provide a description of selected literature reporting the effect of behavior-based interventions on fruit and vegetable consumption, including special subgroups within the population such as children and minorities. Although the initial intent was to identify "best practices" in relation to behavioral approaches/theories applied and reported change in fruit and/or vegetable intake, the lack of consistency and detail in reported study design made this aim unachievable at this time.

Statistically significant change achieved

The most frequently applied behavioral approach was Stages of Change. Current evidence suggests that statistically significant change in fruit and vegetable intake is achieved with behavior-based interventions, as currently designed and delivered. Behavioral interventions in adult population samples resulted in increased fruit and vegetable intake averaging 1.06 servings/day; in older-adult intervention studies, the same mean change in intake was suggested. Interventions involving minority adults demonstrated a mean increase in daily fruit and vegetable consumption of 0.9 servings. In studies of low-income groups, only three of the five studies provided daily serving data, and the average increase in fruit and vegetable intake was 0.15 servings/day. Behavioral interventions in children have demonstrated an average increase in intake of 0.65 servings/day. Worksite interventions generally demonstrated less of an increase in mean daily fruit and vegetable intake, with a 0.54 increase in servings/day across 12 studies. There is limited evaluation of or current evidence for sustained change in fruit and vegetable intake with behavioral interventions. No studies have compared two or more specific behavioral theories with regard to differences in change estimates for fruit and vegetable intake.

Integration of strategies required

New and novel approaches are needed to more extensively evaluate behavior-based theories in relation to promoting significant increases in fruit and vegetable consumption in Americans. Efforts to integrate behavior-based strategies with social marketing, social networking, and/or technology-based behavioral control should be more extensively pursued in order to increase fruit/vegetable intake in the population, beyond what is achieved with current, behavioral-based interventions alone. Finally, achieving and sustaining fruit and vegetable intake at currently recommended levels across the population will require stronger interventions, coupled with other approaches including efforts to address taste, convenience, availability and access, competitive foods, and value perceptions.

The full report can be found at:
http://www.pbhfoundation.org/pdfs/about/res/pbh_res/PBH_Behavior_Change_Review.pdf

TABLE 1

Diffusion of Innovations Theory
Goal Attainment and Self-regulation Theory
Health Belief Model/Health Promotion Model
PRECEDE-PROCEED
Social Cognitive Theory (SCT)
Social Influence Theory; Social Communication Theory; Media Exposure Theory
Social Ecological Model
Social Learning Theory
Theory of Reasoned Action/Theory of Planned Behavior
The Trans-theoretical Model (TTM)/Stages of Change

The Fruit and Vegetable Consumption Challenge: How Federal Spending Falls Short of Addressing Public Health Needs

— Allen Rosenfeld —

Senior vice president and economist at M&R Strategic Services - USA

This report was developed to determine the extent to which the United States federal government has made fruits and vegetables (FV) a national public health priority. High-level federal officials from the US Department of Agriculture (USDA) and the US Department of Health and Human Services (HHS) have extolled the health benefits of increased fruit and vegetable consumption and reiterated the need to commit additional federal resources to close the consumption gap that exists. Whether or not federal actions have been consistent with that rhetoric can largely be answered through an examination of federal spending data. The results:

There is an Ongoing Fruit and Vegetable Consumption Gap

An analysis of the latest USDA food-use data shows that the average American consumes only 43% of the daily intake of fruit and only 57% of vegetables, as recommended in the Dietary Guidelines, an average of 51% of the recommended levels for FV combined. Fruit and vegetable consumption has remained relatively flat for the past 20 years.

The Public Health and Economic Stakes Associated With the Fruit and Vegetable Consumption Gap Are Very High and Growing Rapidly

An economic analysis in the report shows that the health care and other costs of inadequate fruit and vegetable consumption for just three diet-related, chronic diseases—coronary heart disease, stroke, and cancer—grew by 92% between Fiscal Year (FY) 1999 and FY 2008 and currently stands at $56 billion a year.

The Large USDA Fruit and Vegetable Spending Gap Parallels the Consumption Gap and Is Inconsistent with Dietary Guideline Priorities

The analysis found that USDA spends more than twice the amount of its funds on the meat group, which comprises only 8% of the daily servings recommended in the Dietary Guidelines, than it spends on FV, which comprise 41% of the daily recommended food servings. USDA would have to more than double its spending for FV (by adding $3.6 billion) to bring USDA food group spending in line with Dietary Guideline recommendations.

A Large Gap in Spending on Nutrition Education Reinforces the Fruit and Vegetable Consumption Gap

USDA spending on nutrition education for low-income Americans, which promotes the consumption of FV, represents only 1.3% of total spending on nutrition assistance programs, despite the fact that the fruit and vegetable consumption gap has historically been higher than average for that segment of our population. At the National Institutes of Health (NIH), nutrition education research also continues to be a very low funding priority. As a percentage of its nutrition projects, NIH nutrition education projects overall comprise 1%, while nutrition education projects specifically promoting fruit and vegetable consumption comprise less than 1%.

Fruits and Vegetables Are a Low Priority at HHS Despite the Health Risks of the Consumption Gap

NIH spending for fruit and vegetable research associated with three major chronic diseases (i.e., cancer, coronary heart disease, and stroke) accounted for 0.78% (less than one percent) of total research spending on those diseases, despite the fact that inadequate fruit and vegetable consumption accounts for 6%-20% of the risk associated with those illnesses. A comparison of the respective health risks of inadequate fruit and vegetable consumption with tobacco use found that both NIH and CDC grossly under-fund fruit and vegetable related programs and that both spend a higher, disproportionate amount on anti-tobacco projects.

Nearly $5 Billion in Cost-Effective Annual Spending Would Be Needed to Close the Total Federal Fruit and Vegetable Spending Gap

In the financial year 2008, USDA, NIH, and the CDC spent about $126 billion on activities related to food, agriculture, and public health. Less than 3% of those combined budgets was spent on programs and projects related directly to FV. Closing the fruit and vegetable consumption gap will require closing the fruit and vegetable spending gap. USDA and HHS would have to more than double their spending on fruit and vegetable related projects, an increase of about $4.8 billion, to close the total fruit and vegetable spending gap. By comparison, the $56.3 billion annual economic cost of the fruit and vegetable consumption gap with respect to cancer, coronary heart disease, and stroke is nearly 12 times the amount needed to close the fruit and vegetable spending gap.

The full report can be found at:
http://www.pbhfoundation.org/pdfs/about/res/pbh_res/2010gapanalysis.pdf

Data for most of the analyses undertaken in this report were obtained from federal sources or secondary sources that provided federal data and estimates. Recommended levels of daily servings of each of the major food groups for the average American were derived from the 2005 U.S. Dietary Guidelines for Americans. Per capita food consumption data were obtained from the "U.S. Per Capita Loss-Adjusted Food Availability" website of USDA's Economic Research Service. USDA spending data for food group specific programs were drawn from federal budget documents, the websites of the Agricultural Marketing Service, the Farm Security Agency and the Food and Nutrition Service, USDA's CRIS research website, the Environmental Working Group's Farm Subsidy Database, and numerous USDA agency documents. NIH and CDC spending data were obtained from federal budget and appropriations documents and the NIH Reporter website. Other data on NIH research projects were drawn from the NIH Reporter website. Estimates of the contributions of diet and the fruit and vegetable consumption gap to the risk of coronary heart disease, cancer, and stroke were obtained from the scientific literature, nonprofit public health organizations' websites, and federal sources. Inflation factors used throughout the report were computed from the Bureau of Labor Statistics' Consumer Price Index website.