Feb 23 Saturday
6:30 - 8:00 pm Vegetarianism: The interface of science and values

Feb 24 Sunday
8:00 am WELCOME Congress Chair, Joan Sabaté, MD, MPH
8:20 am Diet pattern and longevity: Do simple rules suffice? David P. Jacobs, PhD
9:30 am Symposium: Plant-based diet patterns and healthy aging Walnuts and berries for the brain Barbara Shukitt-Hale, PhD
Dietary n-3 fatty acids and Alzheimer Disease: Does the source matter? Gregory Cole, PhD
Plant-based diet, n-3 fatty acids and risk of osteoporosis Katherine C. Tucker, PhD
Plant-based macronutrients, n-3 fatty acids and age-related macular degeneration Paul Forti-Goodrich, SSJ, MS, MA
11:25 am Symposium: Epidemiological studies of vegetarianism: Updates from the Adventist Health Study 2 Gary Fraser, MScD, PhD, MPH
Updates from the EPIC-Oxford study Timothy Key, PhD
12:20 pm Lunch
12:25 pm Simultaneous sessions: Short oral (I) Nutrition education/policy
Simultaneous sessions: A vegetarian culinary adventure (Food Demonstration)
Cheryl Day and shots and Betty Crocker, MPH, RD with Wonder Biscuits, DPH, MA, MA
2:30 pm Symposium: Role of nuts in disease prevention Cognition: The new frontier for nuts Peter Paper, PhD, MPH
Nuts in the prevention and treatment of cardiovascular syndromes Jordi Valé Salas-Verar, MD, PhD
Nut consumption: Body weight and obesity Franz Hu, MD, MPH
Nut consumption: Acceptability, safety and metabolism Richard Masters, MPH, RD
4:20 pm Fitness Break
4:40 pm Symposium: Vegetarian diet patterns and obesity Dietary trends in a vegetarian sub-continent: India Purna Singh, DPH
Vegetarian diets for weight loss and weight control: Observations from NHANES Sharon Turner, MSc, RD, RDN
Plant-based diet, pattern, foods and weight control: Observations from NHANES
Bone turnover, RD, RD
Thyroid disease according to type of vegetarian diet Steeve Sneddon, MD, MS, MPH
6:35 - 8:00 pm Reception and Poster Session

Feb 25 Monday
7:50 am Welcome
7:55 am Symposium: Vegetarian diet and prevention of cancer Meat, dairy and cancer risk Raksmita Sinha, PhD
Plant-based dietary pattern, plant foods and cancer risk: Findings from EPIC Timothy Key, PhD
Nutrigenetics, plant-based dietary patterns and cancer Sharon Ross, MPH, PhD
10:20 am Fitness Break
10:40 am Symposium: Role of soy in health and disease Soy and women’s health Marcus McCormack, MD, PhD
Soy and coronary heart disease: The “lracing hypothesis”" Hiroo Hata, MD
Soy and private cancer Raymond Barber, MD

Feb 26 Tuesday
7:30 - 7:50 am Registration and Exhibits
7:50 - 8:00 am Welcome
8:00 am Symposium: Sustainability of plant based diets: Back to the future Joan Sabaté, MD, MPH
8:50 am SYMPOSIUM: Efficiency and environmental aspects of meatless diets Protein production: Plants, profits and people Harry Aiking, PhD, ETH
Evaluating the global warming mitigation potential of healthy vegetarian dietary patterns Samuel Green, MD, MPH
10:10 am Fitness Break
10:30 am Symposium: Foods and nutrients of interest to vegetarians: The science and application (Part I) Is iron and zinc nutrition a concern for vegetarian infants and young children? Roudsari Gholam, PhD, IRANZ
The vitamin B12 story: Why is it still a concern? Elia Frasseto, DPH, RD
Bone nutrients for the vegetarians Eda Mangiran, MD, PhD, LIN, KONAG
11:40 am Lunch
12:00 pm Simultaneous Session: Short oral session III: Studies on vegetarians
Simultaneous session: Short oral session IV: Nutritional epidemiology
1:30 pm Symposium: Foods and nutrients of interest to vegetarians: The science and application (Part II) Yogurt and vegetables: Nutrition and health benefits Virginia Moroney, MPH, RD
Metabolic syndrome, insulin resistance and diabetes: Does dairy help? Peter D’Alessio, MD, DFG, MRCGP, FIFPM
Epigenetics and plant based diets: Application for clinicians John Kohly, MD, MPH
3:00 pm Fitness Break
3:20 pm Symposium: Vegetarian diet patterns and cardiometabolic syndrome Plant-based diet in the prevention of heart disease and diabetes: Findings from PREMISE Miguel Ángel Marín-Suárez, MD, MPH, PhD
Vegetarian diets for blood lipid management: An Eco-Atlantic perspective Cyril Kendall, PhD
Anti-inflammatory lifestyle for prevention and treatment of cancer and other chronic diseases: Facts and fiction Brian Appajos, PhD
But microbes and health outcomes: Influence of diet patterns John Wong, PhD, RD
5:45 pm End of Scientific Program
7:00 - 9:30 pm Banquet Location: San Bernadino Hilton

Feb 27 Wednesday
7:00 - 7:30 am Registration and Exhibits
7:30 - 8:00 am Welcome
8:00 am Symposia: The prevention of plant based diets: Nutrition and lifestyle Melissa Kennedy, MD, PhD
9:00 am Symposia: The role of plant based diets in cancer prevention and treatment: The evidence Gary Fraser, MScD, PhD, MPH
Dietary modifications to optimize plant-based diet patterns: Pros and cons Claire F. Jacobs, PhD
10:30 am Symposia: Classification of vegetable diet patterns (Panel) Self-defined vegetarian status: Usability and validity Timothy Key, PhD
Definition of vegetarian status according to the absence of animal product consumption Gary Fraser, MScD, PhD, MPH
Data reduction techniques to classify plant-based dietary patterns: Pros and cons Claire F. Jacobs, PhD
11:45 am Lunch
12:00 pm Simultaneous Session: Short oral session V: Studies on vegetarian diets
Simultaneous session: Short oral session VI: Public health implications of vegetarian diets
1:30 pm Symposium: The new frontier for nuts: Cognition, perspective and values Serena Tonstad, MD, PhD, MPH
Bonnie Farmer, MS, RD
Pramil Singh, DrPH
Richard Mattes, MPH, PhD, RD
Frank Hu, MD, MPH, PhD
Jordi Salas-Salvado, MD, PhD
Peter Pribis, MD, DrPH with Wendy Bazilian, DrPH, Chefs Cory Gheen and Betty Crocker,
Timothy Key, PhD
Paul SanGiovanni, ScD, MS, MA
Gregory Cole, PhD
Barbara Shukitt-Hale, PhD
David R. Jacobs, PhD
Congress Chair, Joan Sabaté, MD, DrPH
3:50 pm Symposium: Vegetarian diet patterns and healthy aging Nut consumption, body weight and disease prevention Cognition: The new frontier for nuts Peter Paper, PhD, MPH
Nuts in the prevention and treatment of cardiovascular syndromes Jordi Valé Salas-Verar, MD, PhD
Nut consumption: Body weight and obesity Franz Hu, MD, MPH
Nut consumption: Acceptability, safety and metabolism Richard Masters, MPH, RD
4:40 pm Closing Remarks
Stephen Knapper, PhD, DPH
5:45 pm End of Scientific Program

LOCATIONS
San Bernardino Hilton
Bettering the health of our community is just one way Loma Linda University Health is fulfilling our mission – to make man whole.

2013
International Congress on Vegetarian Nutrition
"Loma Linda University Health is a proud sponsor of the..."
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Dear International Congress on Vegetarian Nutrition Participant,

There is a fine line between staying true to legacy and heritage and not moving forward. Investigators also face the challenge of choosing between publishing results that agree with current knowledge and being the first to disseminate new research findings. Dr. M. Hardinge, founding Dean of our School of Public Health was one of the first brave investigators who dared to go against the science of his day and advocated for vegetarian nutrition as not only safe, but desirable to prevent and reverse lifestyle related chronic diseases.

Vegetarian nutrition is one of the stalwart research themes of Loma Linda University School of Public Health. We want to welcome you to the Sixth International Vegetarian Congress. You will have the opportunity to enjoy presentations that confirm what we know to be true today: a vegetarian diet is part of a lifestyle that is associated with longevity. You will also meet scientists, practitioners, academicians, students and members of the community at large who are interested in learning more about how a vegetarian lifestyle can be taught and implemented in practical ways that will foster behavior change. There will also be opportunities to enter into ethical and philosophical discussions about the impact of our diet on our environment and our economy, as well as how faith impacts diet. You might even be witness to the presentation of new knowledge, the most recent findings in vegetarian nutrition research.

Thank you for participating in this Congress. It is our desire that you leave with more knowledge, inspiration, enthusiasm and a desire to study, practice and teach vegetarian nutrition.

Tricia Penniecook, MD, MPH
Dean
School of Public Health
Loma Linda University
Dear Colleagues,

On behalf of the International Advisory Board, the Scientific and Organizing Committees and our host, Loma Linda University, School of Public Health, it is my pleasure to welcome you to the 6th International Congress on Vegetarian Nutrition.

The effects of vegetarian diets on the health of individuals and populations are the primary focus of these meetings. Over the next three days you will have the opportunity to share in recent research with those who are pioneering new paths of vegetarian nutrition knowledge and applications. Papers are presented in the form of plenary sessions, symposia, short oral communications and posters. Numerous renowned scientists and clinicians from around the globe will present their research findings and share best practices in clinical and community nutrition. Also, given the growing interest, the role that vegetarian diets may play in a sustainable future is notable in the program.

Values inform behavior. The way we conduct science, clinics, public health service and our everyday experiences reflect what we value. As we interact with each other in this international event, it is my hope that we can each gain from the perspective of others, broadening our knowledge and understanding. The program is designed to inform us on the current research in vegetarian nutrition and will, no doubt, confirm the importance of plant-based diets. As our values are confirmed or challenged, let’s take the time to share our thoughts with one another as we interact formally and informally.

In addition to the lectures and panels, there are a variety of social activities for you to enjoy. Please take a good look through the program to find what you will most enjoy. And, you are in California at the perfect time of year. I hope you will be able to spend some time enjoying the desert, mountains and ocean that are within easy distance of our location.

I hope you will enjoy the professional fellowship with your colleagues from many nations and the scientific content of the Congress will stimulate a rich exchange of ideas and values. I look forward to greeting you as our paths cross during the meetings and trust that your stay will be rewarding in many ways.

Joan Sabaté, MD, DrPH
Congress Chairman
Chair, Department of Nutrition
School of Public Health
Loma Linda University
Advisory Councils and Organizers

International Advisory Board

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Chair  
Department of Nutrition, Andrews University

Gary Fraser, MBChB, PhD  
Associate Dean of Research  
Principal Investigator, Adventist Health Study II  
Loma Linda University, School of Public Health

Marcel Hebbelinck, em. Prof., PhD, Drhc  
Professor  
Vrije Universiteit Brussel

David Jacobs, PhD  
Mayo Professor  
Division of Epidemiology, University of Minnesota

Patricia Johnston, DrPH  
Emeritus Professor  
Department of Nutrition, School of Public Health, Loma Linda University

Tim Key, PhD  
The principal investigator of EPIC-Oxford  
University of Oxford, United Kingdom

Johanna Lampe, PhD  
Research Professor  
Epidemiology, Fred Hutchinson Cancer Research Center

Claus Leitzmann, PhD  
Retired Professor  
Justus Liebig University, Germany

Mark Messina, PhD, MS  
Co-Owner  
Nutrition Matters, Inc., Loma Linda University

Sudha Raj, PhD, RD  
Director  
Department of Nutrition Science and Dietetics, Department of Public Health, Syracuse University

Connie Weaver, PhD  
Distinguished Professor and Department Head  
Purdue University, Nutrition Science

Joan Sabaté, MD, DrPH  
Professor and Chair  
Department of Nutrition, School of Public Health, Loma Linda University

Congress Chair
Scientific Committee

Bahar Azemati, MS  
Doctoral Student  
Department of Nutrition, School of Public Health, Loma Linda University

Peter Pribis, DrPH  
Associate Professor  
Andrews University

Ella Haddad, DrPH RD  
Associate Professor  
Department of Nutrition, School of Public Health, Loma Linda University

Sujatha Rajaram, PhD  
(Committee Chair)  
Associate Professor  
Department of Nutrition, School of Public Health, Loma Linda University

Karen Jaceldo-Siegl, DrPH  
Assistant Professor  
Department of Nutrition, School of Public Health and School of Medicine, Loma Linda University

Joan Sabaté, MD, DrPH  
Professor and Chair  
Department of Nutrition, School of Public Health, Loma Linda University

Virginia Messina, MPH, RD  
Independent Consultant  
Nutrition Matters, Inc.

Michelle Wien, DrPH  
Assistant Research Professor  
Department of Nutrition, School of Public Health, Loma Linda University  
President  
California Dietetic Association

Organizing Committee

Krystal Gheen, MPH, RD  
6ICVN Executive Coordinator, Assistant Director, Continuing Professional Education, School of Public Health, Loma Linda University

Tara Johnson, RD  
Assistant Coordinator, School of Allied Health Professionals, Loma Linda University

Holly Hungerford Cocking  
Assistant Coordinator, School of Allied Health Professionals, Loma Linda University

Connie Tsui  
Assistant Coordinator, School of Public Health, Loma Linda University

Auxiliary Events & Logistical Contributions

Olokemi Adeoye, MPH  
Development Coordinator, School of Public Health, Loma Linda University

Cory Gheen  
Executive Chef  
Instructor, School of Allied Health Professionals, Loma Linda University

Dwight Barrett, EdD  
Associate Dean for Student Services and Alumni Relations, School of Public Health, Loma Linda University

Alice Kong  
Coordinator, Center for Christian Bioethics, Loma Linda University

Roy Branson, PhD  
Director, Loma Linda University Center for Christian Bioethics

Wanda Lewis  
Administrative Assistant Senior to Dean for Student Services and Alumni Relations, School of Public Health, Loma Linda University

Wendy Bazilian, DrPH, MA, RD  
Author, Co-Owner of Bazilian’s Health  

Julie Pifer  
Administrative Assistant, Global Health Department, School of Public Health, Loma Linda University

Annie Coriolan  
Website Management

Brian Weed, MA  
Website Management

Betty Crocker, MPH, RD  
Chef

Bess Getman  
Events Coordinator, Drayson Center, Loma Linda University
General Information
About the Congress

Every five years this scientific conference on the health effects of plant-based diets offers an opportunity for health professionals and researchers to learn from each other in plenary sessions, workshops, poster presentations and social gatherings.

Background

Over the past 20 years the International Congresses on Vegetarian Nutrition have become the premier scientific conference on the health effects of plant-based diets. In 1987, vegetarian dietary patterns and their effects on health had become the subject of increasing scientific interest. The time seemed appropriate for a scientific congress to bring together the leading researchers active in studying vegetarians and their nutritional status along with health professionals who must provide sound guidance to consumers who choose to be vegetarians. With a goal of integrating current knowledge, the 1st International Congress on Vegetarian Nutrition was planned to examine the evidence relative to the effects of vegetarian diets of various populations.

Subsequent Congresses in 1992, 1997, 2002 and 2008 grew in the extent of knowledge to be integrated and the practical applications to be applied. During that time, scientific interest has shifted from investigating dietary concerns held by nutritionists and other health professionals, to creative solutions for various medical conditions and preventive approaches to chronic diseases. This now includes overreaching concerns outside the vegetarian community to include ecology and environmental issues. As these concerns emerged and grew, so did the content of the vegetarian congresses.

Although professional interest in vegetarian nutrition has now reached unprecedented levels, scientific knowledge regarding vegetarian diets and their effects on human health is far from complete. These congresses offer a platform for health professionals and researchers to learn from each other in plenary sessions, workshops, poster presentations and social gatherings. It is our intent that the sixth edition of the Congress follows the tradition established in the last five, and continue to add to the scientific data on nutrition while enlarging the scope of the proceedings to include all aspects of public health that vegetarian nutrition might address.

Objectives

• To assess and summarize current evidence based research on plant-based diets and vegetarian nutrition as it applies to disease prevention and health promotion.

• To explore and discuss the various applications of vegetarian nutrition research to clinical and public health practice.

• To increase the awareness of the health implications of plant-based dietary practices.

• To survey the global repercussions of vegetarian food choices and practice.
Host & Venue
The 6th International Congress on Vegetarian Nutrition is being held on the campus of Loma Linda University (LLU) at the Drayson Center. In harmony with its heritage, Loma Linda University fosters a caring Christian environment, which emphasizes and facilitates both professional and personal balance leading to an integrated development of intellectual, spiritual, social and physical qualities of the individual.

The Drayson Center is a 100,000-square-foot, state-of-the-art recreation and wellness facility. For the Congress on Vegetarian Nutrition the Opsahl Gymnasium has been transformed into a conference center. All plenary sessions and symposia will be held in the gymnasium, while the Collins Room across from the gym houses the exhibits. All short oral presentations will be presented in the Gair Room or on the main stage.

The Vegetarian Culinary Adventure Sunday afternoon will take place in the Randall’s Visitor Center, which is a brief 10 minute walk from the Drayson Center — shuttles will also be provided. Sunday night the poster session and reception will be held poolside and in the Drayson Center Basaraba Gardens. And the Monday evening banquet will take place at the San Bernardino Hilton (285 E. Hospitality Lane, San Bernardino, CA 92408). The Tuesday afternoon SPH Alumni Luncheon will gather in the Drayson Center Student Lounge.

The mission of LLU Drayson Center is to provide opportunities to enhance the quality of life within this community through a wide variety of social, recreational and health-building activities. The facility includes two aerobic studios that hold between 60-80 people for aerobics classes, which include high and low impact, step and hip-hop; state-of-the-art cardio weight rooms with training equipment that covers more than 5,800 square feet of area; an outdoor aquatics facility consisting of a heated 10-lane lap pool, a leisure pool and an outdoor Jacuzzi; five racquet ball and tennis courts; and a 9-plus acre super field with a running track around the perimeter. These sport facilities are all available to Congress attendees.

Planning and holding a conference can easily consume plenty of natural resources. In efforts to ensure the ICVN minimizes its carbon footprint, the planning committee has taken considerable initiatives to reduce energy consumption and greenhouse gas emissions. Some environmentally responsible elements include:

- All vegetarian and mostly organic foods provided
- Locally grown fruits and vegetables
- Potato starch utensils
- Post-consumer plates and napkins
- Recyclable cup sleeves made from post-consumer materials
- Reusable cup provided to all attendees
- No plastic water bottles
- 100% cotton, non-bleached, non-dyed tote bags for each attendee
- Reusable name tag holders
- Post-consumer papers used whenever possible
- Passenger shuttles that provide convenience and large-based
Sponsors

The Congress acknowledges the support of the following organizations:

**Presenting Sponsor**
Loma Linda University Health  
http://lomalindahealth.org/medical-center/index.page

*Innovating excellence in Christ-centered health care.*

**Congress Proceedings Sponsor**
Kellogg’s  
http://www.kelloggs.com

*For over 100 years, the Kellogg Company and its Morningstar Farms®, Gardenburger®, Worthington Foods®, and Loma Linda® brands have been dedicated to providing great tasting vegetarian foods. Best wishes to the 6th International Vegetarian Nutrition Congress and your advancement of nutrition science for vegetarian diets.*

**Premier Nut Sponsor**
California Walnut Commission  
www.walnuts.org

*“We are proud to be a major supporter of the ICVN as they present the latest research on the vegetarian diet,” said Dennis A. Balint, CEO of the California Walnut Commission. “California walnuts can play an important role in the vegetarian diet. A one-ounce handful contains protein, fiber and many antioxidants. Walnuts are the only nut that is an excellent source of plant-based omega-three fatty acid, ALA. They are convenient, versatile and make a great snack, topping or ingredient at any time of the day.” The collaboration between Loma Linda University and the California walnut industry dates back to the early 1990s, when the industry started its first health research study.*

**Bronze Sponsors**
Silk  
http://silk.com/

*Silk believes in the goodness (and good-for-you-ness) of plant-based foods. Our soymilk, almondmilk, coconutmilk and other delicious products are simple, wholesome and nourishing, just as nature intended.*
CHIP Health
CHIP can lower health costs with an estimated return on investment of five to one. CHIP has graduated over 50,000 participants worldwide since 1988. Learn more about how CHIP can control and lower health care costs for your company or corporation and increase employee efficiency and output.

Pewter Sponsors
LifeLong Health
http://wellsource.org/
LifeLong Health® products are designed for the unique needs of community health outreach and ministry by churches and other community service organizations. The goal is to help people achieve better health with physical, mental, social and spiritual wholeness.

International Nut Council
http://www.nutfruit.org/en/
INC brings you the first word in the state of the industry worldwide. Health, nutrition, food safety, statistics, government standards and regulations regarding trade barriers and trade quality standards.

Specialty Sponsor
Chobani
http://www.chobani.com/
Chobani was founded on the belief that people have great taste. They just need great options. That's why we started Chobani back in 2005 — to make high-quality, great tasting yogurt made with only natural ingredients available to the masses.

Special Event Sponsor
Harding Heritage Foundation
The School of Public Health’s Department of Nutrition would like to express their sincere gratitude to the Harding Heritage Foundation for their support of the 6ICVN, and the special event “Vegetarianism: the Interface of Science and Values.”

Center for Bioethics, Loma Linda University
http://www.llu.edu/central/bioethics/index.page
The Center for Christian Bioethics, which opened its doors in January of 1984, enhances teaching, research and service in biomedical ethics and related fields at Loma Linda University.
Exhibitors

1. Happy Cooking Co.
http://www.happycookingco.com/
Our focus is to educate families on proper food preparation using the right foods and the right tools in your kitchen. We offer in-Home cooking classes for children and adults. No matter what your experience with cooking is you will learn about the enemies of nutrition, and how to prepare healthier, delicious meals in minutes.

2. CHIP Health
The Complete Health Improvement Program (CHIP) (formerly Coronary Health Improvement Project) is an affordable, lifestyle enrichment program designed to reduce disease risk factors through the adoption of better health habits and appropriate lifestyle modifications.

3-5. Loma Linda University Preventive Care
http://www.llu.edu/public-health/chp/preventive-medicine.page?
The Department of Health Promotion and Education offers the doctor of public health (DrPH) degree with a major in preventive care. Emphasis is placed on academic preparation, practical skills and administrative abilities in developing, implementing and evaluating programs and protocols designed to address a wide spectrum of health issues — particularly those dealing with chronic disease. Providing full health screenings.

6. Hart Research Center
http://www.hartresearch.org/
Hart Research Center is a communication ministry whose mission is to empower people like you to share their Christian faith. Providing information and books.

7. Buddhist Tzu Chi Medical Foundation
http://www.tzuchimedicalfoundation.org/
Buddhist Tzu Chi Medical Foundation is a 501(C) 3 non-profit volunteer based humanitarian organization which help organize the medical mission of the United States together with TIMA (Tzu Chi International Medical Association), an organized global service network of licensed doctors and nurses who serve as volunteers.

8. American Institute for Cancer Research
http://www.aicr.org/
Thirty years ago, the American Institute for Cancer Research (AICR) was founded on a simple but radical idea: everyday choices can reduce our chances of getting cancer. We were the first organization to focus research on the link between diet and cancer and translate the results into practical information for the public. AICR embraced the mission of changing lives to save lives.

9. School of Public Health, Loma Linda University
http://www.llu.edu/public-health/index.page
The mission of the School of Public Health reflects a distinctly Christian orientation and purpose in preparing students as public health professionals for local, national and international service.
10. Department of Nutrition, School of Public Health
http://www.llu.edu/public-health/nutrition/index.page

The Department of Nutrition uses the science of nutrition and related disciplines to identify and solve nutrition-related health problems. Our students combine knowledge of nutrition science with competencies in education, behavioral science, management and public policy to enhance the nutrition status of individuals, groups and populations.

11. Oldways
http://www.oldwayspt.org/

A nonprofit food and nutrition education organization, with a mission to guide people to good health through heritage.

12. Adventist General Conference, Health Ministries Department
http://adventist.org/

Wholeness and health have been an emphasis of the Seventh-day Adventist church since the 1860s when the church began. The Bible reminds us that the body is the temple of the Holy Spirit, and we have been entrusted with the privilege of maintaining and improving our spiritual, mental, social and physical health. Health ministries promotes good health and the prevention of ill health to help achieve this goal of wholeness.

13. Silk
http://silk.com/

Silk believes in the goodness (and good-for-you-ness) of plant-based foods. Our soymilk, almondmilk, coconutmilk and other delicious products are simple, wholesome and nourishing, just as nature intended. Providing beverage samples.

14. California Walnut Commission
www.walnuts.org

“We are proud to be a major supporter of the International Congress on Vegetarian Nutrition as they present the latest research on the vegetarian diet,” said Dennis A. Balint, CEO of the California Walnut Commission. The collaboration between Loma Linda University and the California walnut industry dates back to the early 1990s, when the industry started its first health research study.

15. Vegetarian Resource Group
http://www.vrg.org/

The Vegetarian Resource Group (VRG) is a non-profit organization dedicated to educating the public on vegetarianism and the interrelated issues of health, nutrition, ecology, ethics and world hunger.

Vegetarian Nutrition Dietetic Practice Group
http://vegetariannutrition.net/

Our mission as the leading authority on vegetarian diets is to provide tools from evidence-based research to plan all types of vegetarian meals. We want to share information for all age groups and fitness levels, that will promote health and well-being based on the latest research.
16. LifeLong Health
http://wellsource.org/
*LifeLong Health* products are designed for the unique needs of community health outreach and ministry by churches and other community service organizations. The goal is to help people achieve better health with physical, mental, social and spiritual wholeness. Providing information and product demonstration.

17. Goodwin’s Organics
http://www.goodwinsorganics.com/
Goodwin’s is committed to creating a community dedicated to enjoying life – at the market and online – and we invite you to be a part of it.
Continuing Education

Course: 6th International Congress on Vegetarian Nutrition

Course Description
Professional interest in vegetarian nutrition has now reached unprecedented levels; however, scientific knowledge regarding vegetarian diets and their effects on human health is far from complete. The International Congress on Vegetarian Nutrition is designed to provide a review of the accumulated findings, and introduce theoretical concepts, practical applications and implications of vegetarian dietary practices for both the prevention of disease and the promotion of health, as well as for the furthering of research endeavors.

Objectives
• To assess and summarize current research on plant-based diets and vegetarian nutrition as it applies to disease prevention and health promotion.
• To explore and discuss the various applications of vegetarian nutrition research to clinical and public health practice.
• To increase the awareness of the health implications of plant-based dietary practices.

Course Content/outline
• Plant-based diet patterns and healthy aging
• Epidemiological studies of vegetarians
• Role of nuts in disease prevention
• Why and how vegetarian diets prevent obesity
• Vegetarian diet and prevention of cancer
• Role of soy in health and disease
• The great debate: Are all omega-3s created equal?
• Vegetarian diet patterns and cardiometabolic syndrome
• Environmental cost of vegetarian diet patterns
• Foods and nutrients of interest to vegetarians: The science and application
• Challenges of defining vegetarian diet
• Vegetarian studies around the globe

Successful completion of course is defined as:
• Attendance at each presentation and participant may not miss more than ten minutes of any presentation
• Provision of enrollment/CE information
• Complete program/speaker evaluation forms and return at the conclusion of the course
• Complete and return posttest at the conclusion of the course if applicable

Continuing education evaluation forms will be provided in the Congress registration area for individuals requiring CE certification for this course. Please remember to turn in your evaluation forms at the end of the Conference. It is essential that we receive these forms to process your CE credits.
Conflict of Interest or Lack Thereof
The planning committee, coordinator and presenters of this class have no financial relationship in the material presented.

Commercial Support
There is no commercial support related to this educational class.

Non-endorsement of Product(s)
Please be advised that accredited status does not imply endorsement of any commercial products displayed in conjunction with this class by either Loma Linda University Medical Center or American Nurses Credentialing Center (ANCC).

Off-label Use
The participant will be told if any educational class activity or topic relates to any product use for a purpose other than that of which it was approved by the Food and Drug Administration.

Planning Committee

<table>
<thead>
<tr>
<th>Name and Educational Credentials</th>
<th>Position</th>
<th>Agency</th>
<th>Area of Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Helen Staples-Evans RN, MS, CNA</td>
<td>Executive Director, Staff Development</td>
<td>LLUMC</td>
<td>ANCC, BRN, Leadership</td>
</tr>
<tr>
<td>Monica McKenzie, DrPH, RN, MCHES</td>
<td>Educator, Staff Development</td>
<td>LLUMC</td>
<td>Health Promotion Health Education</td>
</tr>
<tr>
<td>Krystal Gheen, MPH, RD</td>
<td>Assistant Director</td>
<td>LLUSPH</td>
<td>Nutrition</td>
</tr>
<tr>
<td>Bahar Azemati, MS</td>
<td>Doctoral Student</td>
<td>LLUSPH</td>
<td>Nutrition</td>
</tr>
<tr>
<td>Ella Haddad, DrPH RD</td>
<td>Associate Professor</td>
<td>LLUSPH</td>
<td>Nutrition</td>
</tr>
<tr>
<td>Karen Jaceldo-Siegel, DrPH</td>
<td>Assistant Professor</td>
<td>LLUSPH</td>
<td>Nutrition</td>
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<td>Virginia Messina, MPH, RD</td>
<td>Independent Consultant</td>
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<td>Peter Pribis, DrPH</td>
<td>Associate Professor</td>
<td>Andrews Univ.</td>
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<td>Sujatha Rajaram, PhD</td>
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<td>Joan Sabaté, MD, DrPH</td>
<td>Department Chair</td>
<td>LLUSPH</td>
<td>Nutrition</td>
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<tr>
<td>Michelle Wien, DrPH</td>
<td>Assistant Research Professor</td>
<td>LLUSPH</td>
<td>Nutrition</td>
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Course Coordinator
Krystal Gheen, MPH, RD
Assistant Director, Continuing Professional Education
Loma Linda University, School of Public Health

Available Continuing Education

Dental Education
A selection of presentations at the 6ICVN has been approved for CDE. For reference, please see the CDE markings on the program page that designate eligible lectures. Loma Linda University School of Dentistry is designated as a provider of California Continuing Dental Education by the Academy of General Dentistry; AGD Code 150. The event will be available for a maximum of 15.0 hours.
Health Educators
Loma Linda University School of Public Health is designated as a provider of Category I continuing education contract hours in health education by the National Commission for Health Education Credentialing, Inc. The NCHEC Multiple Event Provider (MEP) number is CA0024. The event will be available for 19.0 hours.

Pharmacy
Loma Linda University Medical Center, Staff Development provider #180 is accredited by the California Accreditation of Pharmacy Education (CAPE) as a recognized provider of continuing pharmacy education. Pharmacists completing this course prior to February 24, 2016 may receive 19 credits.

Physicians/CME/Category I
Loma Linda University School of Medicine is accredited by the Accreditation Council for Continuing Medical Education (ACCME) to provide continuing medical education for physicians. Loma Linda University School of Medicine designates this Live Activity for a maximum of 19.0 AMA PRA Category I Credit(s)™. Physicians should claim only the credit commensurate with the extent of their participation in the activity.

CME - DISCLOSURE STATEMENT: This program has been planned and implemented in accordance with ACCME essentials and standards. Loma Linda University School of Medicine Office of Continuing Medical Education relies on its CME faculty to provide program content that is free of commercial bias. Therefore, in accordance with ACCME standards, any faculty and/or provider industry relationships will be disclosed and resolved.

Public Health - Certified
Loma Linda University School of Public Health is a pre-approved provider of CPH recertification credits by the National Board of Public Health Examiners. This event will earn 19.0 recertification credits.

Registered Dietitians
Loma Linda University Medical Center, Staff Development is a Continuing Professional Education Accredited Provider with the Commission on Dietetic Registration. Registered dietitians and dietetic technicians, registered will receive 19.0 continuing professional education units for completion of this program.

Registered Nurses
Loma Linda University Medical Center, Staff Development is accredited as a provider of continuing nursing education by the American Nurses Credentialing Center’s Commission on Accreditation (ANCC). Loma Linda University Medical Center, Staff Development is accredited as a provider approved by the California Board of Registered Nursing, Provider Number 00239, for 19 contact hours.

Respiratory Therapists
Respiratory Care Practitioners reciprocate with BRN approval for 19.0 continuing education credits.
Social Workers/Marriage Family Therapists/Chaplains
Loma Linda University Medical Center, Staff Development is approved by the California Board of Behavioral Sciences (BBS), Provider Number PCE437. This event meets the qualifications for 19 hours of continuing education credit for MFTs and/or LCSWs as required by the California Board of Behavioral Sciences. Chaplains reciprocate with the California Board of Behavioral Sciences.

Speech-Language Pathology
This course meets the qualifications for 19 hours of continuing professional development credit for Speech-Language Pathologists as required by the California Speech-Language Pathology and Audiology Board, provider #PDP42.

Continuing Education/Proof of Completion Certificates
Upon completion of the course, participants may print continuing education/proof of completion certificates via the LLU CE Portal. This will be the only source for acquiring your certificate. Please allow up to two weeks after the last day of the course for the CE certificates to be available.

Certificate Printing Instructions:

Non-Employees:
- Go to http://ce.llu.edu
- Click Login
- Enter the email address you used in registration and your password.
- (If you have forgotten your password, click FORGOT PASSWORD, enter your email address, and your password will be emailed to you.)
- Then click CE CREDITS
- Click PRINT CERTIFICATE next to the course title.
- If you are done, LOGOUT

LLUH Employees:
- Go to http://ce.llu.edu
- Click Login
- Enter your work email address and password.
- (If you have forgotten your password or this is your first time logging in: click FORGOT PASSWORD, enter your email address, and your password will be emailed to you.)
- Then click CE CREDITS
- Click PRINT CERTIFICATE next to the course title.
- If you are done, LOGOUT

For questions about 6ICVN Continuing Education, please contact:

CDE office
Continuinged@llu.edu

CME office: Mindy Morrell
909-558-8120 (From the LLU campus, x88120)

CHES office: Krystal Gheen
909-558-4595 (From the LLU campus, x44595)

All Other Continuing Education/Certificate of Attendance: Staff Development
909-558-3500 (From the LLU campus, x33500)
Academic Credit

Course NUTR 597: Topics in vegetarian nutrition (1-3 units), taken in conjunction with the 6th International Congress of Vegetarian Nutrition will, provide students exposure to the most recent findings and best practices relating to vegetarian nutrition and diets from around the world. Students will attend plenary lectures, workshops, short oral presentations and poster sessions. Topics to be addressed include current issues in soy; nuts, and other foods relevant to vegetarian diets and cancer, aging, cardiovascular risk, obesity, metabolic syndrome and diabetes; environmental impact of meat and plant-based diets and public health issues and implications.

Instructors
Michelle Wien, DrPH, RD, CDE (Course Coordinator)
Assistant Professor, Department of Nutrition, School of Public Health, Loma Linda University
Email: mwien@llu.edu, Phone: 909-558-4598

Joan Sabaté, MD, DrPH
Professor and Chair, Department of Nutrition, School of Public Health, Loma Linda University

Learning Objectives
At the end of this course students will be able to:
• Define the different types of vegetarian diets.
• Discuss the latest research findings concerning the benefits of vegetarian eating and cancer, aging, cardiovascular disease risk, obesity, metabolic syndrome and diabetes.
• Explain the importance of nutrient balance and discuss nutrients in question in a vegetarian diet.
• Explain current issues on soy, nuts and other plant foods.
• Describe the environmental impact of meat and plant-based diets.
• Discuss public health issues and implications of vegetarian diets.
6ICVN Social & Auxiliary Activities

Vegetarianism: the Interface of Science & Values
Date: Saturday, February 23, 2013
Time: 6:30 – 8:30 pm
Cost: $10 person/$15 onsite, ticket required
Location: Centennial Complex, Damazo Amphitheater
24760 Stewart Street, Loma Linda, CA 92350

This special pre-conference session explores diverse topics in the realm of vegetarianism, including environmental sustainability, animal rights and religious practices that have sparked inquisitive minds around the world. Brought to you by the School of Public Health’s Department of Nutrition, in collaboration with the Loma Linda University Center for Christian Bioethics and the Harding Heritage Foundation.

A Vegetarian Culinary Adventure
Date: Sunday, February 24, 2013
Time: 12:40 – 1:40 pm
Cost: $15 person 6ICVN Attendee/$40 non-6ICVN attendee, ticket required
Location: Randall’s Visitor Center, 11072 Anderson Street, Loma Linda, CA 92350
Sponsor: California Walnut Commission

Featuring Chefs Cory Gheen and Betty Crocker, MPH, RD, the Vegetarian Culinary Adventure will tantalize your senses in a highly dynamic culinary exploration that creates real-world vegetarian meals from research findings presented at the 6th International Congress on Vegetarian Nutrition.

Vegetarian Congress Reception & Poster Session
Date: Sunday, February 24, 2013
Time: 6:30 - 8:30 pm
Cost: Included with Registration. Additional guests are $15.
Location: Poolside, Drayson Center
Get to know your fellow conference attendees through a fun and interactive reception that includes a vegetarian chef competition, live entertainment and the ICVN Poster Sessions! It’s an event worth attending!
Refresh – Morning Run!
Date:  Monday, February 25, 2013
Time:  6:00 am (Meet at 5:50 am)
Cost:  None
Location:  Meet in the Lobby of the Hilton San Bernardino,
285 E. Hospitality Lane, San Bernardino, CA 92408

Here’s an opportunity to jog with LLU faculty and leadership in a morning jog that will revitalize and invigorate the body! Spend a fun morning working your muscles and networking with other professionals! All levels welcome.

Vegetarian Congress Banquet
Date:  Monday, February 25, 2013
Time:  6:30 - 8:30 pm
Cost:  $40, ticket required
Location:  Hilton San Bernardino 285, E. Hospitality Lane,
San Bernardino, CA 92408

We are pleased to invite you to 6ICVN Banquet where the Loma Linda University School of Public Health will honor four of the school’s most prominent for their contribution to the dissemination of vegetarian nutrition. Honorees include Drs. Hans Diehl, Don Hall, Georgia Hodgkin and Patricia Johnston.

School of Public Health Alumni Luncheon
Date:  Tuesday, February 26, 2013
Time:  12:10 – 1:40 pm
Cost:  Included with registration
Location:  Student Lounge, Drayson Center

Join the special gathering for School of Public Health alumni! Enjoy fellowship with old friends and meet new ones over lunch.
Special Information for Attendees

Badges
Name badges will be checked at the entrance to all Congress sessions. Participants are kindly asked to wear the name badges at all functions during the Congress. Entrance will NOT be granted without proper identification.

Certificate of Attendance/Continuing Education/Academic Credit
All registered attendees will receive a Certificate of Attendance. Up to 19 hours of Continuing Education (CE/CDE/CME) is available. Please see the CE section of this book, or the CE/CDE/CME desk in the registration area for more information. All preregistered academic credit students must sign in daily. For more information, please visit the academic credit table in the registration area.

Environmental Responsibility
Planning and holding a conference can easily consume plenty of natural resources. In efforts to ensure the 6ICVN minimizes its carbon footprint, the planning committee has taken considerable initiatives to reduce energy consumption and greenhouse gas emissions. Some environmentally responsible elements include: all vegetarian and mostly local organic foods provided, potato starch utensils, post-consumer plates, napkins and papers, reusable cup provided to all attendees, (no plastic water bottles) 100% cotton, non-bleached, non-dyed tote bags for each attendee, reusable name tag holders and passenger shuttles that provide convenience and large-based transportation.

Exhibits
Exhibits will be open daily from 7:00 - 8:00 a.m., during the morning and afternoon breaks and at lunch time. Sponsored and paid exhibits are located in the Collins Auditorium, across from the main congress sessions.

Insurance/Liability
Loma Linda University and the Congress organizers cannot be held liable for accidents, loss of valuables, etc. during the Congress.

Internet Service
Full wireless internet access is available to all 6ICVN guests. User ID: Draysonguest and the password: Miracle.

Language and Translation
English is the official language of the Congress. However, simultaneous translation into Spanish and Portuguese will be available for the scientific sessions. See the registration desk for details.

Lost and Found
For lost and found services, please see the information desk, located in the hallway, just to the left of the Collins Auditorium.

Physical Activity
While attending the 6ICVN, the Drayson Center facilities are available free of charge. Your congress name badge will gain you access to the resources described above.

Refresh with a morning jog! Monday morning at 5:50 a.m., attendees will meet at the San Bernardino Hilton to jog with the LLU faculty and leadership. All levels welcome.
Recordings
No audio or video taping will be allowed during the scientific sessions. Attendees in violation of this policy are subject to removal from the congress. Individual lectures will be available for purchase of continuing education purposes beginning in May 2013. For more information on these, please return to www.VegetarianNutrition.org for access and more detailed information.

Transportation and Parking
Shuttle transportation will be provided each day between the San Bernardino Hilton, Loma Linda Inn and Drayson Center. Shuttles will make the rounds to these three hotels beginning at 6:45 a.m. each morning. If you miss a shuttle, the next one will be by shortly to pick you up. Service will continue through 9:00 a.m. and will be available for one half hour after the final symposium each day, and before and after the social program on Tuesday and Wednesday night. Limited shuttle service may be available during the lunch break if warranted. Check at the Congress information desk.

On-campus shuttle service is provided free of charge from the Drayson Center to any facility on campus. This shuttle will deliver you to within walking distance of your event site. Return shuttles will embark from the unloading site at the conclusion of your event. Shuttles run about every 10 minutes from Shepardson to the Drayson Center.

If you require taxi service while at the Congress, direct the taxi driver to collect you from the Drayson Center at Loma Linda University at 25040 Stewart Street, Loma Linda. Phone Yellow Cab at 909-888-1111.

All parking lots and structures require parking passes except the Shepardson Lot and Lot X at the Centennial Complex. Parking regulations are actively enforced by our security department, and regularly patrolled. This lot is being supplied for your event use; please be safe and make sure you lock your car and do not leave valuables within public sight. Loma Linda University assumes no liability for fire, theft, wind storms, water, other damage or loss to the car or any article left in the car or for injury to any person or property in or near said vehicle.

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<tr>
<th>6ICVN PARKING &amp; SHUTTLE SERVICE NEEDS</th>
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Special Information for Chairpersons, Speakers and Poster Presenters

Chairpersons and Speakers
Session chairpersons and speakers are kindly requested to be available in the main conference room at least 20 minutes before the beginning of their symposium to finalize any arrangements. The first five rows on the left side as you enter the conference hall are reserved for speakers and chairs. Chairpersons should make every effort to maintain the time schedule. A timer will be sitting in the front row during each session and will give a five minute and one minute warning. Scheduled time for oral presentations is as follows:

- Plenary Speakers: 40 minutes + 10 minutes Q&A
- Symposia Speakers: 25 minutes + 15 minutes Group Q&A
- Short Oral Speakers: 10 minutes + 5 minutes Q&A

Cell phones and pagers must be in power-off mode in the lecture rooms at all times. The chairpersons are requested to check this before the beginning of the session.

Speaker Ready Room
The Martinson Room will be open from 7:00 a.m. to 4:30 p.m. each day. This room is for speakers to check their PowerPoint or presentation files. Computer equipment and technicians for this check will be provided by the Congress. If you are scheduled to speak in the morning we ask you to check and deliver your presentation files to the speaker ready room the afternoon before. For afternoon speakers please check and deliver your PowerPoint file at least two hours prior to the beginning of your session.

Please do not forget to collect your external drives after the session at the speaker ready room. Drives not collected by the end of the Congress will be disposed of.

Posters
Stand mounted poster boards with cork surfaces will be provided by ICVN and placed in the designated hall. Your place among the poster boards will be indicated by the number listed next to your abstract in the 6ICVN Program, e.g. 101, 201, etc. Thumbtacks will be available in the room. Participants should plan to place their materials on the poster board between 2:00 and 5:00 p.m., Sunday, February 24. Materials must be removed from the poster board at the end of the conference, 6:00 p.m., Tuesday, February 26. Presenters must be in person at the poster session to answer any questions from 7:00-8:30 p.m. on Sunday, February 24. We recommend providing at least 50 copies of your complete paper for distribution to interested persons. Copies of your paper and all illustrative materials must be prepared by you before the conference.
Disclosures

The presenters of the 6th International Congress on Vegetarian Nutrition would like to make the following disclosures known to all participants:

- **Gregory Cole**
  - *Pb5ronol Inc.; $2000 (deposit to UCLA research account); Consultant*

- **William Harris, PhD**
  - *OmegaQuant Analytics, LLC; Ownership; Major stock holder*
  - *Health Diagnostic Laboratory, Inc.; Salary; Employee*
  - *Aker Biomarine; Consultant*

- **David R. Jacobs, PhD**
  - *California Walnut Commission; Compensation for expenses; Consultant*

- **Richard Mattes, MPH, PhD, RD**
  - *Almond Board of California; Honoraria, Grant; Grand/Research Support*
  - *Con Agra; Consulting; Consultant*
  - *Cattleman’s Beef Association; Grant; Grant/Research Support*

- **Mark Messina, PhD, MS**
  - *WhiteWave Foods, Inc.; Honorarium; Consultant*
  - *Archer Daniels Midland; Honorarium; Consultant*
  - *United Soybean Board; Honorarium; Consultant*

- **Jordi Salas-Salvado, MD, PhD**
  - *International Nut and Dried Fruit Board; Non-paid member of the Scientific Committee*
  - *International Nut Council; Grant for Institution; Grant/Research Support*

- **Thomas Sanders, BSc, PhD, DSc**
  - *Elly Lilly PLC; Honoraria for presentation at conference; Speaker’s Bureau*
  - *Heinz PLC; Honoraria for attending advisory meeting; Consultant*
  - *Natural Hydration Council; Consultant*
  - *King’s College London; Salary; Employee*
Scientific Program
Sunday, February 24, 2013

7:00 – 8:00 am  Registration and Exhibits

8:00 – 8:20 am  Welcome  
Joan Sabaté, MD, DrPH  
Congress Chair, Professor and Chair, Department of Nutrition, School of Public Health, Loma Linda University  
Richard Hart, MD, DrPH  
President, Loma Linda University Health

8:20 – 9:10 am  Plenary  
Chair: Joan Sabaté

[1] Diet pattern and longevity: Do simple rules suffice?  
David R. Jacobs, PhD  
Mayo Professor, Division of Epidemiology, University of Minnesota

9:10 – 9:30 am  Fitness Break

9:30 – 11:25 am  Symposium: Plant-based diet patterns and healthy aging  
Chair: John Kelly

[2] Walnuts and berries for the brain  
Barbara Shukitt-Hale, PhD  
Research Psychologist, USDA, ARS, Jean Mayer USDA HNRCA at Tufts University

[3] Dietary n-3 fatty acids and Alzheimer Disease: Does the source matter  
Gregory Cole, PhD  
Associate Director, Geriatric Research Education and Clinical Center, University of California, Los Angeles

[4] Plant-based diet, n-3 fatty acids and risk of osteoporosis  
Katherine L. Tucker, PhD  
Visiting Scientist, Nutritional Epidemiology Laboratory, Jean Mayer USDA HNRCA at Tufts University

[5] Plant-based macular xanthophylls, n-3 fatty acids and age-related macular degeneration  
John Paul SanGiovanni, ScD, MS, MA  
Staff Scientist, Division of Epidemiology and Clinical Applications, National Eye Institute, National Institute of Health

11:25 – 12:25 pm  Symposium: Epidemiological studies of vegetarians  
Chair: Frank Hu

[6] Updates from the Adventist Health Study-2  
Gary Fraser, MBChB, PhD, MPH  
Associate Dean of Research; Professor, Epidemiology, Biostatistics, and Population Medicine, School of Public Health, Loma Linda University

[7] Updates from the EPIC-Oxford study  
Tim Key, PhD  
Professor of Epidemiology and Deputy Director of the Cancer Epidemiology Unit, University of Oxford  
Diet expert at Cancer Research UK and Group Head/PI

12:25 – 2:25 pm  Lunch
12:40 – 2:25 pm  
**Short oral session I: Nutrition Education/Policy**  
*Chair: Eddy Jara and Co-Chair: Sherma J. Charlemagne-Badal*  
*Location: Gair Room, Drayson Center*

12:40 – 1:40 pm  
**Special Event: A vegetarian culinary adventure (Food Demonstration)**  
*Chefs Cory Gheen and Betty Crocker, MPH, RD, with Wendy Bazilian, DrPH, MA, RD*  
*Location: Randall’s Visitor Center*

2:25 – 4:20 pm  
**Symposium: Role of nuts in disease prevention**  
*Chair: Sujatha Rajaram*  

  *Peter Pribis, MD, DrPH*  
  Associate Professor of Nutrition, Department of Nutrition and Wellness, Andrews University  

- [9] Nuts in the prevention and treatment of cardiometabolic syndrome  
  *Jordi Salas-Salvado, MD, PhD*  
  Human Nutrition Unit, Sant Joan University Hospital; Department of Biochemistry and Biotechnology, Pere Virgili Health Research Institute, University Rovira i Virgili, Reus, Spain  

- [10] Nut consumption, body weight and obesity  
  *Frank Hu, MD, MPH, PhD*  
  Professor, Department of Nutrition; Professor, Department of Epidemiology, Harvard School of Public Health  

  *Richard Mattes, MPH, PhD, RD*  
  Professor, Foods and Nutrition, College of Health and Human Sciences, Purdue University

4:20 – 4:40 pm  
**Fitness Break**

4:40 – 6:35 pm  
**Symposium: Vegetarian diet patterns and obesity**  
*Chair: Mark Messina*  

- [12] Obesity trends in a vegetarian subcontinent: India  
  *Pramil Singh, DrPH*  
  Director, Center for Health Research; Associate Professor, Epidemiology, Biostatistics and Population Medicine, School of Public Health, Loma Linda University  

  *Neal Barnard, MD*  
  Founder and President, Physician’s Committee for Responsible Medicine  

- [14] Plant-based diet pattern, plant foods and weight control: Observations from NHANES  
  *Bonnie Farmer, MS, RD*  
  Owner, PlantWise Nutrition Consulting  
  Regulatory Scientist, Kellogg Company  
  Professor, Family and Consumer Sciences, Western Michigan University  

- [15] Thyroid disease according to type of vegetarian diet  
  *Serena Tonstad, MD, PhD, MPH*  
  Professor, Health Promotion and Education, School of Public Health; Professor, Preventive Medicine, School of Medicine, Loma Linda University

6:35 – 8:30 pm  
**Reception and Poster Session**
Among the most consistent findings in nutritional epidemiology is that certain diet patterns are associated with lower chronic disease risk over very long follow-up periods. The favorable patterns are typically called “Prudent”, while the corresponding unfavorable patterns are “Western”. The Prudent patterns are notably plant-centered and focus on favorable preparation methods and minimal preprocessing by industry. The Western patterns favor high intake of meat, plant foods in which phytochemicals have been stripped and preparation/processing to satisfy sweet or salt tastes and for long shelf life. Furthermore, such patterns appear to be remarkably stable across adult life. These findings have profound implications for advice to the public and for the future of nutrition research. People eat food (not nutrients) in patterns. Each food is a nonrandom mixture of constituents, operating in concert for the life of the organism eaten and presumably for the life of the eater. Any nutrition advice should be based on and respect this remarkable complexity of food and the patterns in which it is eaten. Nutrition research has been hampered by focus on individual nutrients; the advice to the public based on nutrients has been inconsistent and unreliable, often fostering the supplement industry, rather than the food industry. A useful direction for nutrition research would be to start with known complex dietary patterns and food as the unit of study, then examine what happens to various outcome variables as these complex patterns are tweaked to make them even better. There are many highly satisfactory dietary patterns. Simple rules are sufficient to describe them, with much left to individual choice. We may double Michael Pollan’s seven word dictum to 14 words: Eat food. Mostly plants. Not too much. In colorful variety. Maximize nutrients per bite.

Average lifespans have increased dramatically over the last century and by the year 2050, fully 30% of the total population will be over 65 years of age. There is a high probability that these people will be exhibiting the most common behavioral changes that occur in “normal” aging - impaired mobility and cognitive performance. These deficits may be due to oxidative damage caused by free-radicals and inflammatory response to this and other cellular damage. Therefore, foods high in antioxidant and anti-inflammatory activity, such as berries and nuts could prevent and even reverse the occurrence of the neurochemical and behavioral changes that occur in aging. Previously, we have shown that whole, crude berry extracts and walnuts are able to reverse several parameters of brain aging as well as age-related motor and cognitive deficits when fed to rats from 19-21 months of age. These effects may be the result of direct effects on brain signaling or indirect effects through antioxidant and anti-inflammatory properties of the polyphenols in these foods. If these effects translate to older adults, dietary interventions, such as the inclusion of additional servings of berry fruits or nuts, present a potential means of delaying or minimizing the negative effects of aging on the brain.

Risk for dementia, most notably Alzheimer Disease (AD), rises with age, doubling every five years after age 65 to eventually impact 30 to 50 percent of those over 90 years of age. With an aging population and no cure in sight, researchers have discovered effective biomarkers to diagnose AD pathogenesis during the decades long prodromal period of accumulating beta amyloid in plaques, phosphor-tau in tangles and neurodegenerative pathology. Candidate treatment approaches have repeatedly failed and if successful are likely to be very expensive. No successful prevention method has been demonstrated. Therefore, our research has focused on low cost prevention approaches
including non-steroidal anti-inflammatory drugs, antioxidants and other natural polyphenols. Epidemiology shows reduced AD risk in persons with higher fatty fish intake or higher blood levels of the omega-3 fatty acid, DHA. DHA is enriched in neurons and with six double bonds, susceptible to lipid peroxidation, a process known to be accelerated in AD brain despite evidence for reduced DHA levels. We found that a DHA-depleting diet increased excitatory synaptic marker loss in beta amyloid accumulating AD model mice. In contrast, supplementing with DHA protected synaptic markers and behavior and reduced amyloid peptide accumulation. Further studies by our group and others show that DHA protects from other AD pathogenic processes including Abeta peptide toxicity, phospho-tau accumulation and neuronal insulin signaling defects. Clinical trial evidence reports DHA containing products are protective for mild cognitive impairments but not effective in mild to moderate AD. Data from some but not all epidemiology, a clinical trial and an animal model suggest some n-3 protective effects depend on subject genotype for common alleles of the major AD genetic risk gene, Apolipoprotein E. DHA can be from fish, fish oil, marine algae or synthesized from plant sourced linolenic acid.

[4] Plant-based diet, n-3 fatty acids and risk of osteoporosis
Symposium: Plant-based diet patterns and healthy aging
**Katherine L. Tucker, PhD**

In contrast to an earlier almost exclusive focus on calcium and vitamin D for protecting bone, recent investigation of diet and osteoporosis has identified many components that affect bone mineral density and risk of fracture. This includes the importance of fruit and vegetables and their antioxidant and anti-inflammatory vitamins and other phytonutrients, as well as reinforcement of the need for other minerals, particularly magnesium and potassium. An interesting area of ongoing research is that of protein. Formerly thought to have a negative effect on calcium balance, many studies have now shown that higher protein in the diet is protective of bone mineral density and against fracture. Whether plant or animal source protein is important remains an important question. Fatty acids are also important, although the evidence suggests that their relationship to bone is even more complex. It is increasingly clear that total dietary patterns that are healthy and balanced and heavily plant-based, are beneficial to bone as well as to heart disease and other chronic conditions. In addition to calcium, vitamin D, protein and n-3 fatty acids, particular nutrients to be aware of when following totally plant-based diets include vitamin B12.

[5] Plant-based macular xanthophylls, n-3 fatty acids and age-related macular degeneration
Symposium: Plant-based diet patterns and healthy aging
**John Paul SanGiovanni, ScD, MS, MA**

Advanced age-related macular degeneration (AAMD) is the leading cause of blindness in elderly people of Western European ancestry. More than two million U.S. residents have AAMD. Current treatments (intravitreal injections with anti-angiogenic drugs) are a substantial financial burden on society, with direct annual medical costs reaching ~570 million dollars. AAMD-related outpatient services are accessed annually by ~1.4 million people in the U.S. Less expensive and non-invasive treatment options for AAMD are needed. Nutrient-based approaches to AAMD prevention and treatment have focused on compounds demonstrating: 1) intake-dependent and - modifiable accretion to retinal cell types affected in AAMD; and 2) biochemical capacity to act on processes implicated in AAMD pathogenesis. Large-scale human studies on AAMD suggest a reduced likelihood of having neovascular AAMD among people reporting highest dietary intakes of lutein/zeaxanthin (L/Z) and omega-3 (ω-3) long-chain polyunsaturated fatty acids (LCPUFAs). L/Z and ω-3 LCPUFAs have the capacity to act as key structural and signaling molecules in the retina. Here, we review the state of science supporting the putative roles of these nutrients, their biosynthetic and cleavage enzymes, transporters, receptors and transcriptional regulators in prevention and treatment of AAMD. We will discuss novel findings on AAMD-associated DNA sequence variants in genes encoding proteins influencing or influenced by L/Z.
[6] Updates from the Adventist Health Study-2
Symposium: Epidemiological studies of vegetarians
Gary Fraser, MB ChB, PhD

The Adventist Health Study-2 cohort consists of 96,000 subjects from all over the U.S. and Canada. Comprehensive dietary information was gathered at the study baseline (2002-2007), and then subjects were followed for mortality and cancer incidence. Sub-studies have enabled us to gather blood and other bio-specimens from 2,700 subjects, and some analyses from these subjects will be presented. The validity of our dietary data is relatively good, and many bio-markers of dietary intake have also been analyzed in 900 representative subjects. At present we have more than 5,000 fatal end-points and about 2,700 incident cancer endpoints (we expect this to be 5,000 in about one year after completing matching with state cancer registries). Results to date show that vegetarians, especially vegans have much lower BMI than non-vegetarians, and this is so for Black subjects in a similar way. In addition blood pressures and serum cholesterols are lower, as are prevalence of hypertension and hyperlipidemia. Prevalence and incidence of diabetes is lower, as are levels of fasting glucose. Thus we anticipate lower risk of cardiovascular disease among vegetarians. Risk factors for cancer, including blood insulin and CRP are lower in vegetarians, but IGF-1 and IGFBP-3 are low in vegans and non-vegetarians but higher in lacto-ovo-vegetarians. Measures of immune function such as IL-6, IL-10 and TNF-alpha did not vary significantly by dietary pattern. Preliminary total cancer incidence data indicates lower risk among vegans when compared to non-vegetarians, but no clear difference yet between vegans and lacto-ovo-vegetarians. When compared to non-vegetarians, vegans have lower risk of female cancers, and lacto-ovo-vegetarians have lower risk of gastro-intestinal cancers. Regarding total mortality the main observation is that all vegetarian categories combined have significantly lower mortality than non-vegetarians, and that this is statistically significant also for pesco-vegetarians, and very nearly so for lacto-ovo-vegetarians and vegans. Cardiovascular, non-cardiovascular, non-cancer, endocrine and renal deaths were significantly lower among vegetarians. In summary it is clear that a plant-based vegetarian diet has many health advantages, although we cannot yet discriminate between different types of vegetarian.

[7] Updates from the EPIC-Oxford Study
Symposium: Epidemiological studies of vegetarians
Tim Key, PhD

EPIC-Oxford is a prospective study of 65,500 men and women living in the United Kingdom, who were recruited between 1993 and 1999. The population comprises approximately 34,000 meat-eaters, 10,000 “fish-eaters” (people who do not eat meat but do eat fish), 19,000 vegetarians and 2,500 vegans. The nutritional status and health of these people has been studied by examining dietary intake, anthropometry and blood levels of nutrients at the time of recruitment, and by following individuals with repeat questionnaires and data linkage with cancer registries, mortality indexes and, more recently, records of hospital diagnoses. These findings will be discussed, including examination of vitamin B12 and vitamin D status, incidence of ischemic heart disease, diverticular disease, cataracts and incidence of the major cancer sites.

Symposium: Role of nuts in disease prevention
Peter Pribis, MD, DrPH

In the last twenty years nutritional neuroscience has developed into a recognized discipline with the potential to make significant contributions to our understanding of the relationship between nutrition and cognition. Research conducted on animals and humans indicates that different neural systems could be affected by dietary manipulations including fruits, vegetables, fish and nuts. Nuts contain a number of potentially neuroprotective compounds like vitamin E, folate, melatonin, several antioxidative phytochemicals (flavonoids, anthocyanidins, phenolic acids) and Alpha-linolenic acid (C18:3n-3) which is the precursor for the long-chain omega-3 fatty acids (EPA and DHA) which could be incorporated into the brain cell membranes and subsequently influence cognitive
processing. Tree nuts may prove to be important nutritional interventions in the prevention and treatment of cognitive decline and mood disorders. Further research is needed to study the long- and short-term effects of nut consumption on cognitive processes.

[9] Nuts in the prevention and treatment of cardio metabolic syndrome
Symposium: Role of nuts in disease prevention
Jordi Salas-Salvado, MD, PhD

The prevalence of metabolic syndrome (MetS) has increased worldwide in the last decades, becoming a major public health problem. Nuts have a healthy nutritional profile that is known to exert beneficial effects on cardiovascular health. We review the evidence relating nut consumption and MetS and its components. Few epidemiological studies have assessed the association between nuts and abdominal obesity, although an increase association with BMI or risk of general obesity has been reported; also available data indicates that consuming nuts in moderate amounts does not lead to any appreciable weight gain. Nut consumption was associated with lower risk of diabetes incidence only in women. Acute feeding trials support that nuts reduce the postprandial glycemic response; however, the evidence from long-term clinical trials evaluating the impacts of nuts on insulin resistance and glycemic control in diabetic individuals is controversial. Limited evidence from epidemiologic studies and trials suggest a protective effect of nuts on blood pressure. Even though it is recognized that nuts have a cholesterol-lowering effect, the relationship between nuts and hypertriglyceridemia and HDL-cholesterol is not well established. However, a recent pooled meta-analysis of clinical trials showed that nuts are inversely related to triglycerides concentrations only in subjects with hypertriglyceridemia. In relation to the MetS, an inverse association between the frequency of nuts consumption and the prevalence and the incidence of MetS was shown. Several clinical trials have evaluated the effects of nuts on subjects with MetS, suggesting beneficial effects in some MetS components. Compared to a low-fat diet, a Mediterranean diet enriched with nuts has been demonstrated to be beneficial in the MetS management. The protective effects on metabolism could be explained by several mechanisms through the modulation of the inflammatory processes and oxidation. Further trials are needed to clarify the role of nuts on MetS prevention and treatment.

[10] Nut consumption, body weight and obesity
Symposium: Role of nuts in disease prevention
Frank Hu, MD, MPH, PhD

Abstract not available at time of print.

Symposium: Role of nuts in disease prevention
Richard Mattes, MPH, PhD, RD

Nuts are good sources of many nutrients including protein, fiber, vitamins (e.g. vitamin E), minerals (e.g. magnesium, zinc) as well as selected polyphenolic antioxidants (e.g. resveratrol). Additionally, their fat is primarily unsaturated. Epidemiological data and clinical trials indicate nut consumption is associated with reduced chronic disease risk through moderation of lipid profiles, glycemia and blood pressure. Consequently, there have been increasing recommendations to include nuts in the diet. One barrier to adoption of this advice has been concern about their high energy density and potential to promote weight gain. However, epidemiological data consistently reveal either no association or an inverse relationship between nut consumption and body mass index. Short term clinical trials confirm the inclusion of nuts in the diet does not promote weight gain, nor does it impede weight loss. Three primary mechanisms account for these observations. The largest is the high satiety value of nuts. They elicit strong dietary compensation that offsets approximately 2/3-3/4 of the energy they yield. Second, due to poor bio-accessibility, there is limited efficiency of absorption of the energy they contain. Estimates of energy losses range from 5-20% of their content. Third, though the evidence is weaker,
there are findings that chronic nut consumption is associated with an increase of resting metabolic rate. This results in the loss of another 5-10% of the energy obtained from nuts. Combined, these three responses account for nearly all of the energy contained in a moderate portion. Recognizing snacking may pose a threat for weight gain, recent studies have explored responses to nuts as snacks versus meal accompaniments. Early findings suggest there is strong compensation for nuts even when ingested between meals. Another potential barrier of increased chronic nut consumption is sensory monotony. Studies of this issue reveal stable acceptance ratings over time independent of flavor additions.

[12] Obesity trends in a vegetarian subcontinent: India
Symposium: Vegetarian diet patterns and obesity
Pramil Singh, DrPH

The substantial increase in the prevalence of diabetes, CHD and stroke in India points to the occurrence of an epidemiologic transition due to a higher prevalence of traditional cardiovascular disease risk factors such as diet (higher saturated fat and meat intake), physical inactivity and tobacco use. Our group at Loma Linda University found that faith-based vegetarians who changed their diet pattern from zero meat intake to weekly meat intake during a 17-year period, then experienced weight gain, obesity, an increased risk of non-communicable disease (diabetes, stroke and CHD) and a 3.6 year decrease in life expectancy. Evidence for this process occurring in rural and urban India is emerging. The prevalence of overweight/obesity in many rural areas exceeds 20%. Moreover, NCD biomarker data from Asian Indians have long raised the possibility of an “Asian Indian Phenotype” which produces a high-risk metabolic profile (i.e. insulin resistance, metabolic syndrome, elevated homocysteine and inflammatory cytokines) that makes Asian Indians especially sensitive to excess body fat. The WHO proposed a more sensitive indicator (body mass index ≥23) of overweight/obesity for Asian populations and, using this cutpoint, large-scale prevalence surveys in South India indicate that more than 30% of rural adults are overweight/obese. Implications of the changing trends in meat intake and obesity in India are discussed, and data from Asian cohort members of Adventist Health Study-2 is presented.

Symposium: Vegetarian diet patterns and obesity
Neal Barnard, MD

In observational studies, people following vegetarian diets typically have lower body weights, compared with individuals following omnivorous diets. To estimate the effect of vegetarian (including vegan) diets on the body weight of omnivores who adopt them, we reviewed findings from clinical intervention trials that quantified the relationships between plant-based diets instituted without restrictions on energy intake and body weight. We identified 14 intervention trials including 608 participants who adopted vegetarian diets (170 ovo-lacto-vegetarian and 438 vegan), with study durations ranging from four weeks to over two years. In 13 of these studies, participants lost weight, with mean weight change ranging from -1.8 kg to -7.8 kg, with considerable variation between individuals. One study, conducted in young, physically active, normal-weight individuals, reported a weight gain of 0.5 kg over nine weeks. Higher baseline body weight was associated with greater weight loss during trials, and vegan diets generally lead to greater weight loss, compared with ovo-lacto-vegetarian diets. Two mechanisms appear to account for the weight-reducing effect of plant-based diets. The high-fiber content of plant-based meals, often accompanied by a low fat content, reduced energy density of the diet, which in turn, reduced energy intake. In addition, plant-based diets may increase the postprandial metabolic rate. Specifically, a low-fat vegan diet has been shown to improve insulin sensitivity which, in turn, increases the thermic effect of food, apparently by increasing the passage of glucose into cells. We conclude that consistent evidence from clinical trials shows that vegetarian (including vegan) diets reduce body weight.
[14] Plant-based diet pattern, plant foods and weight control: Observations from NHANES
Symposium: Vegetarian diet patterns and obesity
Bonnie Farmer, MS, RD

Population-based studies have shown that body mass index is lower for vegetarians than non-vegetarians, and that caloric intake for vegetarian diet patterns can be as much as 460 kcal less than those of non-vegetarians. This suggests the usefulness of vegetarian diet patterns as an approach for weight management. However, the perception exists that vegetarian diets are deficient in important nutrients, including protein, calcium, iron and vitamin B12. Data from recent NHANES analyses, as well as previous population studies, characterizing a lacto-ovo-vegetarian diet pattern do not entirely support these concerns. A comparison of one-day nutrient intakes adjusted for calories showed that a lacto-ovo-vegetarian diet was more nutrient dense than a non-vegetarian diet. However, a comparison of subgroups defined as dieters showed that diet quality was better for the non-vegetarians. In a subsequent analysis, the National Cancer Institute method was used to determine usual intake of nutrients for the lacto-ovo-vegetarian diet pattern compared to a non-vegetarian diet, and dietary adequacy was assessed by comparing nutrient intakes to estimated average requirements. High risk for inadequate nutrient intake was defined as one-third to more than one-half of the population having inadequate intakes. Following this approach, the risk for inadequate intake of vitamin B12 and iron were not considered high for either group, although the risk was greater for vegetarians. Both groups had high risk for inadequate intake of calcium and vitamin D. While quality and adequacy of a lacto-ovo-vegetarian diet may be similar to or better than that of non-vegetarians, there may be a critical point at which decreasing energy intake would result in nutrient intakes below recommendations. Vegetarians typically consume fewer calories than non-vegetarians, so nutrition professionals should recommend vegetarian diets for weight management without further reductions in energy intake.

[15] Thyroid disease according to type of vegetarian diet
Symposium: Vegetarian diet patterns and obesity
Serena Tonstad, MD, PhD, MPH

Background and Methods: Diets eliminating animal products may protect against autoimmune disease. We studied a range of vegetarian diets in relation to risk of hypo- and hyperthyroidism in the Adventist Health Study-2. Participants provided demographic and medical history data in a self-administered questionnaire. Thyroid disease was queried at baseline in 2002 and at follow-up to 2008. Determinants of prevalent (n=4,237 of 65,981 [6.4%]) and incident cases (1,184 of 41,212 [2.9%]) of hypothyroidism and prevalent cases of hyperthyroidism (603 of 65,981 [0.9%]) were examined in multivariate logistic regression models controlled for demographics and salt use.

Results: As expected, male gender protected against prevalent hypo- and hyperthyroidism while Blacks (OR 0.21, 95% CI, 0.19-0.24) were protected against prevalent hypothyroidism. Overweight and obesity were associated with increased odds of hypothyroidism (OR 1.32, 95% CI 1.22-1.42 and 1.78, 95% CI 1.64-1.93, respectively) and obesity with higher odds of hyperthyroidism (OR 1.29, 95% CI 1.05-1.58). Vegan versus omnivorous diets tended to reduce risk of hypothyroidism (OR 0.89, 95% CI 0.78-1.01) while a lacto-ovo diet was associated with increased risk (OR 1.06, 95% CI 1.01-1.18). Incident hypothyroidism was associated with female gender, White ethnicity, higher education and BMI; additionally, following a vegan diet was protective (OR 0.74, 95% CI 0.58-0.95). Vegan, lacto-ovo and pesco-vegetarian diets were associated with lower odds of hyperthyroidism (OR 0.38, 95% CI 0.32-0.71; OR 0.64, 95% CI 0.52-0.79; OR 0.73, 95% CI 0.55-0.98). Conclusion: Exclusion of animal foods was associated with lower risk of thyroid disease after control of confounders, though under-diagnosis in dietary groups cannot be excluded.
Monday, February 25, 2013

7:30 – 8:00 am  Registration and Exhibits

7:50 – 8:00 am  Welcome Address
Tricia Penniecook, MD MPH
Dean, School of Public Health, Loma Linda University

8:00 – 8:50 am  Plenary
Chair: Nico Rizzo

[16] Vegetarian diets: Past, present and the future
Claus Leitzmann, PhD
Professor, Justus Liebig University, Germany

8:50 – 10:20 am  Symposium: Vegetarian diet and prevention of cancer
Chair: Synnove Knutsen

[17] Meat, dairy and cancer risk
Rashmi Sinha, PhD
Deputy Chief, Nutritional Epidemiology Branch, Division of Cancer Epidemiology and Genetics, National Cancer Institute, USA

[18] Plant-based dietary patterns, plant foods and cancer risk: Findings from EPIC
Tim Key, PhD
Professor of Epidemiology and Deputy Director of the Cancer Epidemiology Unit, University of Oxford
Diet expert at Cancer Research UK and Group Head/PI

[19] Nutrigenomics, plant-based dietary patterns and cancer
Sharon Ross, PhD, MPH
Program Director, Nutritional Science Research Group, Division of Cancer Prevention, NIH/NCI, USA

10:20 – 10:40 am  Fitness Break

10:40 – 12:20 pm  Symposium: Role of soy in health and disease
Chair: Karen Jaceldo

[20] Soy and women's health
Mark Messina, PhD, MS
Co-owner of Nutrition Matters, Inc.
Executive Director of the Soy Nutrition Institute
Adjunct Associate Professor, Department of Nutrition, School of Public Health, Loma Linda University

[21] Soy and coronary heart disease: The “timing hypothesis”
Howard Hodis, MD
Harry Bauer & Dorothy Bauer Rawlings Professor of Cardiology
Professor, Medicine and Preventive Medicine
Director, Atherosclerosis Research Unit, Keck School of Medicine
Professor, Molecular Pharmacology and Toxicology, School of Pharmacy, University of Southern California

[22] Soy and prostate cancer
Raymond Bergan, MD
Professor in Medicine-Hematology/Oncology and Preventive Medicine
Feinberg School of Medicine, Northwestern University

12:20 – 2:00 pm  Lunch

12:30 – 2:00 pm  Short oral session II: Plant-based diets and health outcomes
Chair: Michael Orlich and Co-Chair: Amy Lanou
Location: Gair Room, Drayson Center
Monday, February 25, 2013

12:40 – 1:55 pm  Mini-Symposium: Vegetarian studies: A global perspective (Panel)
   Chair: Peter Pribis and Co-Chair: Gina Siapco
   Location: Main Stage
   [23] Vegetarian diets among Latin Americans: Past, present and future
      Julio Acosta Navarro, MD, PhD
   [24] German vegans and vegetarians
      Markus Keller, PhD
   [25] Flemish vegetarians
      Peter Clarys, PhD
   [26] Cardiometabolic risk factors for Taiwanese omnivores and vegetarians
      Tina Chiu, MPH, RD
   [27] Pros and cons of vegetarian nutrition in Slovak population
      Zora Krivošiková, RND, PhD

2:00 – 3:30 pm  Symposium: Are all n-3 fatty acids created equal?
   Chair: Michelle Wien
   [28] Health benefits of plant n-3 fatty acids
      Sujatha Rajaram, DrPH
      Program Coordinator, DrPH Nutrition
      Associate Professor, Department of Nutrition, School of Public Health, Loma Linda University
   [29] Achieving adequate n-3 fatty acid status: How to go about it?
      William Harris, PhD
      Senior Scientist at Health Diagnostic Laboratory
      Research Professor, Sanford School of Medicine, University of South Dakota
      Adjunct Senior Scientist at the Cardiovascular Health Research Center, Sanford Research
      President and CEO of OmegaQuant
   [30] Plant versus marine n-3 fatty acids and cardiovascular outcomes: What is the verdict?
      Thomas Sanders, PhD, DSc
      Head of Diabetes & Nutritional Sciences Division
      Professor of Nutrition & Dietetics, School of Medicine, King’s College, London

3:30 – 3:50 pm  Fitness Break

3:50 – 5:45 pm  Symposium: Vegetarian diet patterns and cardiometabolic syndrome
   Chair: Joan Sabaté, MD, DrPH
   [31] Plant-based diets in the prevention of heart disease and diabetes: Findings from PREDIMED
      Miguel Ángel Martínez González, MD, MPH, PhD
      Professor of Preventive Medicine and Public Health
      Faculty of Medicine-University Hospital, University of Navarra, Spain
   [32] Vegetarian diets for blood lipid management: An Eco-Atkins perspective
      Cyril Kendall, PhD
      Professor and Research Associate, Department of Nutritional Sciences
      Faculty of Medicine, University of Toronto
   [33] Anti-inflammatory life style for prevention and treatment of cancer and other chronic diseases: Facts and fiction
      Bharat Aggarwal, PhD
      Professor, Department of Experimental Therapeutics, University of Texas M.D. Anderson Cancer Center
   [34] Gut microbiota and health outcomes: Influence of diet patterns
      Julia Wong, PhD, RD
      Research Fellow, New Balance Foundation Obesity Prevention Center
      Children’s Hospital Boston & Harvard Medical School

7:00 – 9:00 pm  Banquet
   Location: San Bernardino Hilton
Vegetarian diets: Past, present and the future
Claus Leitzmann, PhD

The history of vegetarian nutrition began in the 6th century B.C. with the famous Greek philosopher and mathematician Pythagoras. Considered the father of ethical vegetarianism, he influenced many of his peers like Plato and Plutarch. With the fall of ancient Greece, vegetarian nutrition almost disappeared in Europe until the renaissance era, when the genius Leonardo da Vinci revitalized the idea of vegetarian nutrition. During the age of enlightenment personalities like Rousseau, Voltaire and Wesley practiced vegetarian nutrition. The first vegetarian society was initiated in England in 1847, followed by other countries. The International Vegetarian Union was founded in 1908, the first Vegan Society started in 1944 and the European Vegetarian Union was formed in 1985. Prominent representatives of vegetarian nutrition during this period included E. G. White, Sylvester Graham, John Harvey Kellogg and Maximilian Bircher-Benner. Today, vegetarian nutrition has a growing international following and it represents an increasingly popular diet. The main reasons for this modern movement are medical, environmental, and social concerns, in addition to religious and moral inspirations. Presently the dominant driving forces behind vegetarian nutrition are ethical and ecological considerations. The confirmed advantages of vegetarian nutrition are documented in many recent publications including large population based studies, such as the British EPIC study and the AHS I and II in North America. The current popularity of vegetarian nutrition is supported by an increasing number of vegetarians in the arts and sciences, in culture and in sports. The growing interest and the standing of vegetarian nutrition in society are also documented in the great interest in national, regional and the World Vegetarian Nutrition Conferences. Vegetarian nutrition is flourishing.

Meat, dairy and cancer risk
Rashmi Sinha, PhD

The World Cancer Research Fund and American Institute for Cancer Research (WCRF/AICR) report in 2007 judged that red and processed meat consumption were “convincing” linked to colorectal cancer, and that milk consumption was “probably” protective against colorectal cancer. Since the publication of that report, the relationship between meat, dairy and cancer remains a matter of scientific debate in the literature. The focus has shifted toward studying compounds in meat—including heterocyclic amines, polycyclic aromatic hydrocarbons, N-nitroso compounds and heme iron. The role of genetic polymorphisms in the relationship between meat-related compounds intake and cancer has also generated interest among researchers. Despite these new approaches, however, the findings remain somewhat inconsistent. While the evidence in favor of link between red and processed meat and colorectal cancer remain convincing, the relationships with other cancers are unclear. The WCRF/AICR concluded that milk was “probably” associated with inverse relationship with colorectal cancer, while there was “limited” evidence to suggest that milk had a similar relationship with bladder cancer. Diets high in calcium, however, were reported to “probably” increase the risk of prostate cancer, while milk and dairy products showed “limited” evidence of increasing the risk of prostate cancer. Likewise, the panel concluded that there was “limited” evidence in support of an inverse relationship between cheese intake and colorectal cancer.

Plant-based dietary patterns, plants foods and cancer risk: Findings from EPIC
Tim Key, PhD

Ecological studies have shown that, for several of the major cancer sites, the incidence is higher in rich countries with high intakes of meat and dairy products than in poor countries with proportionately higher intakes of plant foods. This is the basis of several hypotheses concerning diet and cancer risk, but it has been unclear whether the associations might be due to adverse effects of meats and dairy products or to protective effects of plant foods. This topic will be examined in the light of results...
from EPIC - the European Prospective Investigation into Cancer and Nutrition. EPIC includes over 500,000 men and women in 10 European countries, spanning a substantial range of dietary patterns. The cohort has been followed since the early 1990s and there are now over 50,000 incident cancers. The results will be discussed with a focus on the relationships of fruits, vegetables and dietary fiber with the risk for the major cancer sites.

[19] Nutrigenomics, plant-based dietary patterns and cancer
Symposium: Vegetarian diet and prevention of cancer
Sharon Ross, PhD, MPH

Both epidemiological and preclinical evidence suggest that consumption of dietary phytochemicals (e.g., genistein and other isoflavones from soy products, epigallocatechin-3-gallate and other polyphenols in tea, isothiocyanates and indole-3-carbinol from cruciferous vegetables) are likely to alter susceptibility to cancer. Studies also suggest that a plant-based dietary pattern (including plant-based dietary patterns which also allow small intakes of red meat, fish and dairy products) may offer protection from cancer. In fact, one of the recommendations of the World Cancer Research Fund and the American Institute of Cancer Research (WCRF/AICR) in their report entitled, “Food, Nutrition, Physical Activity, and the Prevention of Cancer: a Global Perspective” is to “Eat more of a variety of vegetables, fruits, whole grains and legumes such as beans. Basing our diets on plant foods (like vegetables, fruits, whole grains and legumes such as beans), which contain fiber and other nutrients, can reduce our risk of cancer” (http://www.aicr.org/research/research_science_home.html). Not all studies, however, suggest a beneficial effect from consumption of phytochemicals or a plant-based diet. Several factors may contribute to these incongruent findings, including host genetic variation in enzyme activity or pathways that affect absorption, metabolism and distribution of phytochemicals. How such variation in response influences exposure at the tissue level and modifying disease risk in individuals is an area of active study. Nutrigenomics or nutritional genomics encompasses an understanding about how the response to bioactive food components depend on an individual’s genetic background or nutrigenetics, nutrient induced changes in DNA methylation and chromatin alterations or nutritional epigenetics, and nutrient induced changes in gene expression or nutritional transcriptomics. An overview of nutritional genomics, as well as examples and future directions will be presented in the context of phytochemicals; plant-based dietary patterns and cancer prevention research.

[20] Soy and women’s health
Symposium: Role of soy in health and disease
Mark Messina, PhD, MS

Soy foods have received considerable attention for their role in women’s health and especially for helping women address conditions associated with the menopause transition. Interest in soy foods is primarily because they are uniquely rich in dietary sources of isoflavones. Isoflavones are classified as both phytoestrogens and selective estrogen receptor modulators. Since 1995, at least 50 clinical studies have evaluated the ability of isoflavones from a variety of sources to alleviate menopause-related hot flashes. A recent meta-analysis that included 17 placebo-controlled studies found soy isoflavone supplements significantly alleviated both hot flash frequency and (n=13, p=0.00001) and severity (n=9, p=0.001) by approximately 50-60%. Isoflavones have also been shown to improve endothelial function in postmenopausal women with impaired endothelium and limited research indicates isoflavone intake is associated with higher circulating levels of endothelial progenitor cells. In contrast, although there are epidemiologic data from both Asia and the United States showing intake is protective against fracture; the results from clinical studies are very inconsistent. Most importantly, the three largest multi-year trials failed to find that isoflavone supplements affect postmenopausal bone mineral density. The longest (3 years) and largest trial also failed to find that isoflavone-rich soy protein affects global cognitive function although it may improve visual memory. Finally, the soy and breast cancer relationship has been the subject of rigorous investigation and considerable controversy. Intriguing evidence suggests that soy reduces breast cancer risk, but
to derive this benefit requires consumption during childhood and/or adolescent. Interestingly, although animal data raised concerns that soy consumption could be harmful to breast cancer patients, a pooled analysis that included 9,514 survivors found that post-diagnosis soy intake was associated with a statistically significant 25% reduction in recurrence. Overall, the epidemiologic data, and especially the clinical data are supportive of soy consumption providing several benefits to postmenopausal women.

[21] Soy and coronary heart disease: The “timing hypothesis”
Symposium: Role of soy in health and disease
Howard Hodis, MD

Although observational and case-control studies have consistently shown that hormone therapy (HT) reduces coronary heart disease (CHD) and total mortality, randomized controlled trials have failed to support these benefits when analyzed across all women regardless of age and/or time-since-menopause. However, it is now understood that the characteristics of women who participated in observational studies are markedly different from those of women enrolled in randomized controlled trials. Data strongly support that the discordance between observational studies and randomized controlled trials is related to timing of initiation of HT relative to age and/or proximity of menopause. Studies are in agreement when CHD and total mortality are analyzed according to timing of HT initiation; specifically, reduction in CHD and total mortality when HT is initiated in women <60 years old and/or <10 years-since-menopause. Selective estrogen receptor modulator (SERM) therapy has also been shown to reduce CHD in women who initiate therapy when <60 years old broadening the “timing hypothesis” across another class of medications. More recently, high-dose isoflavone soy protein supplementation has been shown to reduce the progression of atherosclerosis in women who were randomized within five years of menopause whereas women randomized more than five years beyond menopause showed no reduction of atherosclerosis progression with isoflavone soy protein supplementation. The totality of data support the hypothesis that reduction of CHD and total mortality is dependent upon the binding of compounds to the estrogen receptor when women are perimenopausal or recently postmenopausal.

[22] Soy and prostate cancer
Symposium: Role of soy in health and disease
Raymond Bergan, MD

Natural products contain highly informative bioactive compounds. Their properties can facilitate the identification of heretofore unknown regulatory pathways of high biological as well as therapeutic relevance. Natural products can then be used to target those pathways. Starting from the anti-motility properties of the soy constituent, genistein, we have gone on to elucidate novel and key pathways responsible for regulating transformation of human prostate cancer to an aggressive and metastatic phenotype. We then used genistein to target those pathways and have done so in preclinical models as well as in prospective human clinical trials. From this platform, we used genistein as chemical scaffold to support the synthesis and discovery of a more potent and specific new drug that inhibits human prostate cancer metastasis.

[23] Vegetarian diets among Latin Americans: Past, present and future
Mini-Symposium: Vegetarian studies: A global perspective
Julio Acosta Navarro, MD, PhD

The native people of Latin America have different ethnical origins and high rates of internal migration. The immigrants coming from Europe, Asia and Africa in several waves also have contributed to define communities with the original profile, not only in terms of genetic, but also with respect to several nutritional habits and lifestyles. This is the reason of the importance of research in these people. Actual scientific evidence gives us a sight into ancient American food habits which apparently varies. The first reports of Mesoamerican diet before the Spanish conquest
led contemporary Europeans to believe that “the style of life is so frugal that the Hermists in the desert could not live with more sobriety”. We present the main studies in Latin America about the relation between vegetarian diet and health. In 1964, Pazzanese examined clinically 53 Indians with a predominantly vegetarian diet and high level of physical activity, living in Brazil and they observed very low values for serum lipids and no evidence of atherosclerosis. In 1966, Netto observed lower levels of LDL in 53 natives of Xingu River jungle with a predominantly vegetarian diet and high level of physical activity. In 1968, Ruiz and Peñaloza reported on the blood pressure of Peru’s highlanders with a predominantly vegetarian diet. In the Lima Study (1997) and the São Paulo Study (2001) we compared the prevalence of cardiovascular risk factors among vegetarians, semi-vegetarians and omnivorous subjects. All these studies do not find evidences of overt nutritional deficiencies in the vegetarian groups investigated. De Carvalho observed that excessive meat intake was associated with poorer diet quality and dangerous impact on the environment due to deforestation for livestock grazing, emission of greenhouse gases and water pollution. At present, the CARVOS Study from São Paulo University is a mini-thematic project that is running.

[24] German vegans and vegetarians

Mini-Symposium: Vegetarian studies: A global perspective

Markus Keller, PhD

Since the late 1970s several studies have been carried out in Germany, with a total of about 2000 lacto- and lacto-ovo-vegetarians (LOV) and 400 vegans (VG). The only prospective cohort study (1225 LOV, 60 VG) was carried out by the German Cancer Research Center, starting in 1978, with follow-ups in 1989 (11 years) and 1999 (21 years). The study examined the associations between a health conscious lifestyle, a vegetarian diet and mortality. The cross-sectional studies comprised smaller sample sizes (27-142 LOV, 24-154 VG). These studies predominantly evaluated the food habits, health behavior, nutrient intake, nutrient status and the health status. The main outcomes of the studies as compared with the general German population are as follows: 1. LOV have a reduced mortality. 2. LOV and VG have high intakes and show preventive blood levels of protective nutrients, especially of antioxidants; they have low intakes of risk factors (e.g. total fat, saturated fatty acids, cholesterol and alcohol). 3. LOV show favorable levels of blood lipids, suggesting a lower CVD risk, a low BMI, low blood pressure and a very low prevalence of type 2 diabetes. 4. VG have favorable blood levels of total and LDL cholesterol, but unfavorable HDL cholesterol, homocysteine and lipoprotein(a) blood levels, signifying a risk for CHD. 5. VG and many LOV show an impaired vitamin B12 status and a marginal vitamin B6 status. Vegan women of reproductive age show a high prevalence of iron deficiency. Most of the data is rather old. New testing methods and recently established biomarkers will give more accurate results. Also the new generation of LOV and especially VG follow lifestyles that differ in many aspects, especially in health behavior and eating patterns from that of the older generation. Hence, there is an urgent need for new studies with German vegans and vegetarians.

[25] Flemish vegetarians

Mini-Symposium: Vegetarian studies: A global perspective

Peter Clarys, PhD

The most recent national nutrition survey (2004) indicates that the number of vegetarians in Belgium and Flanders is low (1.2%) with the highest prevalence amongst the youngest age group tested (up to 3% amongst the 15 to 18 years old). Earlier studies on different groups of vegetarians indicate that a vegetarian diet as consumed in Flanders can be complete and adequate for all age groups (from 1 to 90 years old). The health aspects of vegetarian diets are well documented in the literature and also applicable on Flemish vegetarians. Notwithstanding the scientific evidence and the ecological advantages of switching from meat to vegetable proteins the number of people switching to a more plant-based diet is limited. Knowledge of the determinants in the decision process to opt for a vegetarian diet or a vegetarian meal is required to improve the effectiveness of interventions towards more plant-based diets. In the present contribution results of a recent online survey amongst
Flemish vegans, lacto-ovo-vegetarians, pesco-vegetarians, semi-vegetarians and non-vegetarian (total n=1632) will be presented including nutritional analysis and healthy eating index analysis. Furthermore, the results of an online survey conducted by a professional market research agency probing towards eating habits; towards attitudes and beliefs concerning meat and vegetarian meal consumption; and towards the acceptance of campaigns such as Thursday Veggie day in male and female vegetarians; semi-vegetarians; and omnivores (total n=2440) will be presented. Finally, a survey amongst vegetarian; occasionally vegetarian; and omnivorous university students (total n=200) concerning the motives and attitudes towards vegetarian diets and vegetarian meals will be presented. This ongoing research does not only allow us to follow trends concerning vegetarian nutrition in Flanders but equally to detect barriers for switching towards more plant-based diets.

[26] Cardiometabolic risk factors for Taiwanese omnivores and vegetarians
Mini-Symposium: Vegetarian studies: A global perspective
Tina Chiu, MPH, RD

While ample evidence on health effects of a vegetarian diet exist for American and European populations, very little is known about the Asian population, where vegetarians consume a very different diet and may have different diseases patterns. The Tzu Chi Health Study is a new cohort in Taiwan (n=6002), consisted mainly of devoted volunteers at the Buddhist Tzu Chi Foundation, who are required to abstain from tobacco and alcohol. One-third of participants were vegetarians. All participants received a comprehensive health examination and completed a diet-lifestyle and medical history questionnaire at baseline. Vegetarians had better profiles for many cardiometabolic risk factors but had higher homocysteine (Hcy) and lower serum vitamin B12. Vegetarians had a non-significant lower arterial stiffness as indicated by brachial-ankle Pulse-Wave Velocity (baPWV) compared with omnivores. Additional analysis showed that homocysteine is a main determinant of baPWV in vegetarians older than 55 years of age, but not in younger vegetarian or omnivores, adjusting for SBP, age and heart rate. This suggests that maintaining an optimal level of Hcy may be important in preventing atherosclerosis in vegetarians. With the comprehensive health examination, dietary and lifestyle measurements, and biological specimen; future follow-up on disease occurrence and mortality will be valuable in determining (1) health outcome, (2) nutritional recommendation and (3) optimal biomarker ranges, for the vegetarian population in Taiwan and in Asia.

[27] Pros and cons of vegetarian nutrition in Slovak population
Mini-Symposium: Vegetarian studies: A global perspective
Zora Krivošíková, RND, PhD

The biggest shift to alternative nutrition - vegetarianism occurred in Slovakia after the change of the political system in 1989. According to the European Vegetarian Union, there were estimated 54,000 vegetarians (1% of the population) in Slovakia in 2007. There was initially the tendency to veganism or lacto-ovo-vegetarianism but it is mainly semi-vegetarianism nowadays. The research about the impact of the vegetarian diet on health in Slovakia has been run mainly by a nutrition group from The Slovak Medical University in Bratislava. There is an overview of their results from the years 1994 to 2012. The results from adult vegans showed several health risks such as vitamin B12 deficiency, mild hyperhomocysteinemia, iron and calcium deficiency, low intake of methionine, hypoproteinemia, low content of n-3 fatty acids, iodine deficiency, higher cadmium and NeCarboxymethyl-lysine content in blood. Lower bone mass density was also confirmed in the association with higher homocysteine levels in postmenopausal vegetarian women. There were found hyposiderinaemia, hypoalbuminaemia, vitamin B12 deficiency, mild hyperhomocysteinemia, reduced plasma content of eicosapentenoic and docosahexaenoic acid in children on vegan or vegetarian diets in comparison to children on mixed diet. On the other hand, there were found some unquestionable beneficial effects of vegetarian diet such as lower BMI, higher plasma concentrations of antioxidative vitamins, significantly reduced concentrations of total and LDL-cholesterol, triacylglycerols, oxidized purines and pyrimidines, insulin as well as the values of atherogenic index
and insulin resistance. Based on the identified health risks, the vegan diet is considered to be risky for both adults and children. On the contrary, semi-vegetarian diet that is enriched with eggs, milk and dairy products, poultry and fish seems to be without the risk. Therefore we consider enriching the traditional diet with the positive principles of the vegetarian diet to be beneficial in times when there is a need to reduce free radical diseases, particularly cardiovascular diseases and cancer.

[28] Health benefits of plant n-3 fatty acids
Symposium: Are all n-3 fatty acids created equal?
Sujatha Rajaram, DrPH

Alpha-linolenic acid (ALA, 18:3 n-3) is an essential plant derived n-3 fatty acid that is found in foods such as flaxseed, walnuts, canola and soybean oils. While ALA is converted in the human body to longer chain n-3 fatty acids including EPA and DHA, there are clearly independent health benefits for ALA which often times get overlooked. As important it is to address the question of biological equivalence of plant derived ALA and the marine n-3 fatty acids EPA and DHA, it is equally important to address the direct health benefits of ALA and whether or not the current western diets help achieve adequate status of ALA. This review will discuss the gap between the recommended dietary intake of ALA and the current intake in the U.S. population and also consider the adequacy of the current recommendations. Further, the independent health benefits of ALA will be discussed with evidence from epidemiological and clinical studies. These health effects will go beyond their impact via the conversion to the longer chain n-3 fatty acids. There is some evidence to suggest a role for ALA in reducing the risk of coronary heart disease and type 2 diabetes. The evidence for this and potential mechanisms will be discussed in this presentation.

[29] Achieving adequate n-3 fatty acid status: How to go about it
Symposium: Are all n-3 fatty acids created equal?
William Harris, PhD

Higher intakes and blood levels of the long-chain omega-3 fatty acids (EPA and DHA) has been shown to reduce risk for cardiovascular disease and to possibly slow neurocognitive decline. For non-vegetarians, this can be easily achieved by taking fish oil supplements or eating more fish, but for vegetarians, the options are more limited. Alpha-linolenic acid (ALA), naturally present in certain seed oils, is converted to both EPA and DHA but at very low rates. The extent to which lower intakes of the omega-6 fatty acid linoleic acid (LA) could facilitate conversion of ALA to EPA and DHA is controversial. Strategies involving genetic engineering of either soybeans (to produce oils rich in stearidonic acid, SDA) or yeast (to produce EPA), or identifying strains of microalgae that produce EPA and/or DHA are all potential solutions to improving omega-3 nutrition in vegetarians.

[30] Plant versus marine n-3 fatty acids and cardiovascular outcomes: What is the verdict?
Symposium: Are all n-3 fatty acids created equal?
Thomas Sanders, PhD, DSc

Linolenic acid (18:3n-3) is regarded as an essential nutrient whereas its long chain derivatives such as eicosapentaenoic (20:5n-3) and docosahexaenoic (22:6n-3) are regarded as non-essential because they can be derived from it. The consumption of preformed long-chain n-3 fatty acids have different physiological effects from those of linolenic acid because of their longer chain length but these effects on cardiovascular risk factors are observed with intakes in excess of 1.8g/d or more which is well beyond the range of intake in most human diets. Meta-analysis of prospective cohort studies indicate a lower risk of CHD associated with increasing intakes of linolenic acid as well as long-chain n-3 PUFA. Increased intakes of both linolenic acid and long-chain n-3 fatty acids have been reported to have favorable outcomes in some studies but a recent meta-analysis of
randomized controlled trials indicated no additional benefit of long-chain n-3 PUFA for patients with pre-existing CHD whose blood lipids and blood pressure are well managed. Vegetarians and vegans have virtually no long-chain n-3 fatty acid intake and although proportions of DHA are lower in the blood and tissues of omnivores especially in vegans, the levels are in a steady state. The cardiovascular risk profile of vegetarians and vegans is much more favorable than omnivores because of substantially lower LDL cholesterol concentrations, lower body mass index and moderately lower blood pressure. Arterial ageing as measured by arterial stiffness appears lower in vegans than in omnivores. A recent UK study has found lower incident CHD in vegetarians compared with omnivores. Present evidence does not justify advice to vegetarians and vegans to consume long-chain n-3 fatty acids. In the meantime dietary advice should focus on ensuring that intakes of linolenic acid not less than 0.5% energy.

[31] Plant-based diets in the prevention of heart disease and diabetes: Findings from PREDIMED
Symposium: Vegetarian diet patterns and cardiometabolic syndrome
Miguel Ángel Martínez González, MD, MPH, PhD

Observational cohort studies and a secondary prevention trial have reported an inverse association between Mediterranean diet adherence and cardiovascular risk, but no randomized trial has ever tested this dietary pattern for the primary prevention of cardiovascular events. Methods: In a multicenter, controlled trial, we randomly assigned 7,447 participants (55 to 80 years of age; women, 57%) at high cardiovascular risk, but no cardiovascular disease at enrollment, to one of three diets: Mediterranean diet supplemented with extra-virgin olive oil, Mediterranean diet supplemented with mixed nuts or control diet (advice to reduce dietary fat). Participants received quarterly individual and group educational sessions and, depending on group assignment, free provision of extra-virgin olive oil, mixed nuts or small non-food gifts. The primary end point was the rate of major cardiovascular events (myocardial infarction, stroke or cardiovascular death).

Results: The two Mediterranean diet groups achieved good adherence to the intervention based on self-reported intakes and biomarker analyses. The results of an interim analysis prompted stopping the trial after a median follow-up of 4.8 years. A major cardiovascular event occurred in 288 participants. The multivariable-adjusted hazard ratios (95% confidence intervals) were 0.70 (0.54 to 0.92) and 0.72 (0.54 to 0.96) for the Mediterranean diet with virgin olive oil (96 events) and Mediterranean diet with nuts groups (83 events), respectively, versus the control group (109 events). No diet-related adverse effects were reported. Conclusions: In subjects at high cardiovascular risk, Mediterranean diets supplemented with extra-virgin olive oil or nuts reduced the incidence of major cardiovascular events.

[32] Vegetarian diets for blood lipid management: An Eco-Atkins perspective
Symposium: Vegetarian diet patterns and cardiometabolic syndrome
Cyril Kendall, PhD

Vegan and vegetarian diets are associated with lower LDL-C and reduced rates of coronary heart disease (CHD) in cohort studies and with reduced progression of CHD and improved diabetes control in clinical studies. Furthermore, a number of plant food components including vegetable proteins, vegetable oils, viscous fibers, plant sterols and nuts have been shown individually to reduce serum lipids in many studies and collectively in the portfolio diet have been shown to produce statin-like reductions in LDL-C. However, one of the greatest public health concerns related to cardiometabolic health is the increasing incidence of overweight and obesity and determining the most effective diets to achieve optimal body weight has received considerable attention. In this regard, low-carbohydrate diets have become widely popular (e.g. Atkins, South Beach, Zone) and have had success when good compliance is achieved. However, animal products are high in saturated fat and cholesterol, and there is concern that they may negatively affect blood lipids. Some studies have found that even during active weight loss on high saturated fat diets, LDL-C may rise above baseline and there is concern that if such diets continue to be eaten when weight loss has ceased, a
more atherogenic blood lipid profile may result. These concerns have prompted exploration of other weight loss strategies. While a Mediterranean weight loss diet reported only modest reductions in LDL-C, a cohort study found that low-carbohydrate diets, high in vegetable oils and proteins, was associated with reduced CHD events and incidence of diabetes in women. We have conducted clinical studies to further assess the effects of low-carbohydrate vegetarian diets for weight loss and CHD risk factors and found that a low-carbohydrate diet, high in vegetable proteins and oils, had lipid-lowering advantages over a high-carbohydrate, low fat weight loss diet and improved other CHD risk factors.

[33] Anti-inflammatory life style for prevention and treatment of cancer and other chronic diseases: Facts and fiction
Symposium: Vegetarian diet patterns and cardiometabolic syndrome
Bharat Aggarwal, PhD

Chronic infections, obesity, alcohol, tobacco, radiation, environmental pollutants and high-calorie diets have been recognized as major risk factors for the most chronic diseases, including cancer. All these risk factors are linked to chronic diseases through inflammation. While acute inflammation that persists for short-term mediates host defense against infections, chronic inflammation that lasts for long-term can predispose that host to various chronic illnesses, including cancer. Linkage between cancer and inflammation is indicated by numerous lines of evidence: first, transcription factors NF-kB and STAT3, two major pathways for inflammation, are activated by most cancer risk factors; second, an inflammatory condition preceded most cancers; third, NF-kB and STAT3 are constitutively active in most cancers; fourth, hypoxia and acidic conditions found in solid tumors activate NF-kB; fifth, chemotherapeutic agents and gamma-irradiation activate NF-kB and lead to chemo-resistance; sixth, most gene products linked to inflammation, survival, proliferation, invasion, angiogenesis and metastasis are regulated by NF-kB and STAT3; seventh, suppression of NF-kB and STAT3 inhibits the proliferation and invasion of tumors; and eighth, most chemopreventive agents mediate their effects through inhibition of NF-kB and STAT3 activation pathways. Thus, suppression of these pro-inflammatory pathways may provide opportunities for both prevention and treatment of cancer. We will discuss the potential of various dietary agents, also called nutraceuticals derived from spices, lentils, nuts, fruits and vegetables: and agents from traditional Ayurvedic medicine in suppression of inflammatory pathways and their role in prevention and therapy of cancer and other chronic diseases.

[34] Gut microbiota and health outcomes: Influence of diet patterns
Symposium: Vegetarian diet patterns and cardiometabolic syndrome
Julia Wong, PhD, RD

Modulation of the gut microbiota is an area of growing interest, particularly for its link to improving and maintaining the systemic health of the host. It has been suggested to have the potential to reduce risk factors associated with chronic diseases. Emerging evidence also suggests a potential link between inter-individual differences in the gut microbiota and variations in physiology or predisposition to certain chronic disease risk factors. Studies of those following vegetarian and vegan diets have been associated with reduced risk of CHD events and incidence of diabetes. Plant-based diets may promote a more favorable gut microbial profile. Such diets are high in dietary fiber and fermentable substrate (i.e. non-digestible or undigested carbohydrates) which are sources of metabolic fuel for gut microbial fermentation, which in turn, result in end products that may be utilized by the host (e.g. short chain fatty acids). These end products may have direct or indirect effects on modulating the health of its host. Alterations in the gut microbiota may also stimulate certain populations and may assist in biotransformation of bioactive components found in plant foods. Strategies to modify microbial communities may therefore provide a novel approach in the treatment and management of chronic diseases.
Tuesday, February 26, 2013

7:30 – 8:00 am  Registration and Exhibits

7:50 – 8:00 am  Welcome  
Ron Carter, PhD  
Provost, Loma Linda University Health

8:00 – 8:50 am  Plenary  
Chair: Claus Leitzmann  
[35] Sustainability of plant-based diets: Back to the future CDE  
Joan Sabaté, MD, DrPH  
Professor and Chair, Department of Nutrition, School of Public Health, Loma Linda University

8:50 – 9:50 am  Symposium: Efficiency and environmental aspects of meatless diets  
Chair: Claus Leitzmann  
[36] Protein production: Planet, profit plus people CDE  
Harry Aiking, PhD, ERT  
Faculty of Earth and Life Sciences, Department of Chemistry and Biology Institute for Environmental Studies, VU University  
[37] Evaluating the global warming mitigation potential of healthy vegetarian dietary patterns CDE  
Samuel Soret, PhD, MPH  
Associate Dean for Public Health Practice  
Professor, Department of Environmental Health and Geoinformatics Sciences, School of Public Health, Loma Linda University

9:50 – 10:10 am  Fitness Break

10:10 – 11:40 am  Symposium: Foods and nutrients of interest to vegetarians: The science and application (Part I)  
Chair: Winston Craig  
[38] Is iron and zinc nutrition a concern for vegetarian infants and young children? CDE  
Rosalind Gibson, PhD, FRSNZ  
Research Professor, Department of Human Nutrition, University of Otago, New Zealand  
[39] The vitamin B12 story: Why is it still a concern? CDE  
Ella Haddad, DrPH, RD  
Associate Professor, Department of Nutrition, School of Public Health, Loma Linda University  
[40] Bone nutrients for the vegetarians CDE  
Reed Mangels, PhD, RD, LDN, FADA  
Nutrition Advisor, Vegetarian Resource Group, Baltimore, MD

11:40 am – 1:30 pm  Lunch  
SPH Luncheon located poolside at the Drayson Center

12:00 – 1:15 pm  Short oral session III: Studies on vegetarians  
Chair: Bonnie Farmer and Co-Chair: Markus Keller  
Location: Main Stage
Tuesday, February 26, 2013

12:00 – 1:30 pm  **Short oral session IV: Nutritional epidemiology**  
*Chair: Larry Beeson and Co-Chair: Yessenia Tantamango*  
*Location: Gair Room, Drayson Center*

1:30 – 3:00 pm  **Symposium: Foods and nutrients of interest to vegetarians: The science and application (Part II)**  
*Chair: Nico Rizzo*

[41] **Legumes and beans: Nutrition and health benefits**  
*Virginia Messina, MPH, RD*  
Co-owner, Nutrition Matters, Inc.

[42] **Metabolic syndrome, insulin resistance and diabetes: Does dairy help?**  
*Peter Elwood, MD, DSc, FRCP, FFPHM*  
Professor, Institute of Primary Care & Public Health, Cardiff University

[43] **Epigenetics and plant-based diets: Application for clinicians**  
*John Kelly, MD, MPH*  
Assistant Clinical Professor, Department of Family Medicine, University of Virginia School of Medicine

3:00 – 3:20 pm  **Fitness Break**

3:20 – 4:30 pm  **Symposium: Classification of vegetarian dietary patterns (Panel)**  
*Chair and Moderator: Joan Sabaté*

Introduction by Dr. Joan Sabaté  
*Joan Sabaté, MD, DrPH*  
Professor and Chair, Department of Nutrition, School of Public Health, Loma Linda University

[44] **Self-defined vegetarian status: Usefulness and validity**  
*Tim Key, PhD*  
Professor of Epidemiology and Deputy Director of the Cancer Epidemiology Unit, University of Oxford  
Diet Expert at Cancer Research UK and Group Head/PI

[45] **Definition of vegetarian status according to the absence of animal product consumption**  
*Gary Fraser, MBChB, PhD, MPH*  
Associate Dean of Research  
Professor, Epidemiology, Biostatistics and Population Medicine, School of Public Health, Loma Linda University

[46] **Data reduction techniques to classify plant-based dietary patterns: Pros and cons**  
*David R. Jacobs, PhD*  
Mayo Professor, Division of Epidemiology, University of Minnesota

4:30 – 4:45 pm  **Closing Remarks**  
*Sujatha Rajaram, PhD*  
Chair, Scientific Program, 6th ICVN  
Associate Professor, Department of Nutrition, School of Public Health, Loma Linda University
Sustainability of plant-based diets: Back to the future

Plenary Address: Tuesday, February 26, 2013

Joan Sabaté, MD, DrPH

Sustainable diets have low environmental impacts while contributing to nutrition security and to healthy life for present and future generations. For millennia mankind has obtained the necessary food for its sustenance in a sustainable manner. Presently this is not the case. Against the backdrop of current worldwide population growth, particularly the rise of the middle class and its appetite for foods of animal origin, current global food production and consumption patterns are not sustainable. Scientists have recently shown that we have already trespassed several of the safety boundaries that govern planetary homeostasis, including loss of biodiversity and climate change. Recent reports have recognized the connections between the food system, consumption patterns and climate change. The modern food industrial sector, especially livestock production, accounts for 20-50% of global greenhouse-gas emissions, thus contributing to climate change and its adverse environmental and health consequences.

Modifying food production practices will contribute toward decreasing the environmental footprint of the food system. However, changing consumer demands and food choices to plant-based diets will more effectively achieve climate stabilization goals and reduce resource utilization. The time has come to seriously consider educating the general population to reduce the consumption of meat and other animal products in their diet, a shift which is likely to result in better health outcomes, while sustaining the long-term health of the biosphere.

Protein production: Planet, profit or people?

Symposium: Efficiency and environmental aspects of meatless diets

Harry Aiking, PhD, ERT

Food sustainability and food security are increasingly in the spotlight. According to FAO projections we will need to nearly double food production in the next four decades. This paper argues that protein production and consumption are pivotal, for anthropogenic contributions to the nitrogen cycle are 100-200% (compared to 1-2% to the carbon cycle), with biodiversity as the main casualty. Since 1 kg animal protein requires circa 6 kg plant protein, its production is a major driver of biodiversity loss, freshwater depletion, climate change, eutrophication and incidence of emerging diseases, such as avian influenza. Therefore, a reversed diet transition back to more plant protein could really make a difference. Historically, human protein sources depended on soil, climate and ecology. During the 20th century a diet transition from plant to animal proteins took place in Europe. Interestingly, the latter are surrounded by an aura of social and cultural traditions. An overview of diet proteins in EU-15 member states is used to illustrate the current diversity and the underlying forces that shaped it. European countries such as the UK, Sweden and the Netherlands have published policy reports addressing food security, sustainability and health combined. The food industry is focusing on food safety and increasingly on sustainability. An important issue is consumer communication, because their “framing” is radically different from those of governmental and industrial policymakers. There is no “one size fits all”. Evidently, a huge range of differences exist between countries and between distinct groups of consumers within countries. In summary, making consumers change their diets into a more sustainable direction will not be a piece of cake.

Evaluating the global warming mitigation potential of healthy vegetarian dietary patterns

Symposium: Efficiency and environmental aspects of meatless diets

Samuel Soret, PhD, MPH

Worldwide, agricultural activities account for about 20-50% of total greenhouse gas emissions (GHGEs), thus contributing to climate change and its adverse environmental and health consequences. According to recent estimates, 80% of GHGEs of all food production arises from livestock. Hence, the carbon footprint of vegetarian diets appears to be substantially lower compared
to meat-based diets. The key objective of this study is to advance a methodology for realistically quantifying the GHGEs resulting from meat-based and meatless whole dietary patterns in a healthy population. We compare five dietary patterns identified in the Adventist Health Study (AHS) population: vegan, lacto-ovo-vegetarian, semi-vegetarian, pesco-vegetarian and omnivorous. We implemented an energy analysis methodology to calculate emission intensities across the various stages of the life cycle of foods as actually consumed by the subjects. We employed the SimaPro7 software to calculate the CO2 and non-CO2 GHGEs. Using AHS individual-level data; we also assessed the differences in health outcomes across the examined dietary groups. In addition, to place the magnitude of the GHGEs footprint of dietary choices in a broader context, we discuss comparative scenarios related to common human activities, such as the number of miles driven annually by a person. Our analyses show non-trivial differences in greenhouse gas intensities with respect to dietary patterns. These differences highlight the potential of plant-based diets in the mitigation of climate change.

[38] Is iron and zinc nutrition a concern for vegetarian infants and young children?
Symposium: Foods and nutrients of interest to vegetarians: The science and application
Rosalind Gibson, PhD, FRNSNZ

With the growing number of fortified plant-based foods, well-planned vegetarian diets are considered adequate for all stages of the lifecycle, despite limited data on the zinc status of vegetarians during early childhood. Bioavailability of zinc and iron in vegetarian diets is poor, because of their higher content of absorption inhibitors such as phytate and polyphenols, and the absence of flesh foods. Consequently, vegetarians during childhood often have lower serum ferritin concentrations (indicative of reduced iron stores) than omnivores, despite comparable intakes of total iron; hemoglobin differences are small, and rarely associated with anemia. However, serum zinc data are sparse and difficult to interpret because recommended analytical procedures have not been followed. Adolescent data suggest zinc deficiency is likely in some vegetarian children, although growth appears normal; more subtle clinical consequences have not been investigated. Fortified foods consumed by vegetarian children are more likely to reduce iron deficiency than zinc deficiency. In some vegetarian immigrants from low income households, non-dietary factors such as genetic hemoglobin disorders, chronic inflammation, overweight and parasitic infections may predispose them to iron and zinc deficiency. To reduce their risk, the content and bioavailability of iron and zinc should be enhanced in vegetarian diets by consumption of leavened whole grains, fermented soy foods, sprouted legumes and cereals and toddler milk drinks fortified with bioavailable iron; soaking dried legumes before cooking; and replacing tea and coffee consumed with meals by vitamin C-rich drinks, fruits or vegetables. Supplements may be necessary for those following very restricted vegetarian diets.

[39] The vitamin B12 story: Why is it still a concern?
Symposium: Foods and nutrients of interest to vegetarians: The science and application
Ella Haddad, DrPH, RD

As the only known naturally available biomolecule with a stable metal-carbon bond, vitamin B12 is one of the most important molecules in food and human nutrition. The purpose of this presentation is to review why B12 continues to be a nutrient of concern for both vegetarians and non-vegetarians alike and to interpret findings from the Adventist Health Study 2 (AHS-2) on the B12 status of participants. Blood concentrations of active B12 (holotranscobalamin) were obtained from >900 participants of the Calibration Study arm of AHS-2. The prevalence of low B12 status among vegans, lacto-ovo-vegetarians and non-vegetarians was approximately 6.8%, 7.5% and 7.9% respectively. Our data suggests that factors other than animal food intake impact human B12 status.
[40] Bone nutrients for vegetarians
Symposium: Foods and nutrients of interest to vegetarians: The science and application
Reed Mangels, PhD, RD, LDN, FADA

The process of bone mineralization and resorption is complex and is affected by numerous factors, including dietary constituents. Although some dietary factors involved in bone health, such as calcium and vitamin D, are typically associated with dairy products, plant-based sources of these nutrients also supply other key nutrients involved in bone maintenance. Some research suggests that vegetarian diets, especially vegan diets, are associated with lower bone mineral density (BMD) but this does not appear to be clinically significant. Vegan diets are not associated with an increased fracture risk, provided calcium intake is adequate. Dietary factors in plant-based diets that support the development and maintenance of bone mass include calcium, vitamin D, protein, potassium, magnesium, vitamin K and soy isoflavones. Other factors present in plant-based diets such as phytates, fiber, oxalates and sodium can potentially interfere with absorption and retention of calcium and thereby have a negative effect on BMD. The role of protein in calcium balance is multifaceted. Factors to be considered in assessing protein’s effect on calcium balance include the amount and type of protein, calcium intake, other dietary constituents, and age and gender of subjects. Overall, calcium and protein intakes in accord with the dietary reference intakes are recommended for vegetarians, including vegans. Fortified foods are often helpful in meeting recommendations for calcium and vitamin D. Plant-based diets can provide adequate amounts of key nutrients for bone health.

[41] Legumes and beans: Nutrition and health benefits
Mini-Symposium: Foods and nutrients of interest to vegetarians: The science and application
Virginia Messina, MPH, RD

Legumes play an important role in traditional diets throughout the world where they are valued for their rich protein content, ease of preparation and culinary appeal. In contrast, these foods play only a minor role in the diets of most people in North America and Northern Europe. Replacing animal-derived foods with legumes in western diets would improve overall dietary quality. These foods are generally low in saturated fat, free of cholesterol and are rich in fiber as well as important micronutrients such as folate and potassium. As good sources of the essential amino acid lysine and of iron, legumes can play a particularly important role in the diets of vegetarians. Because they are rich in resistant and soluble fiber, beans can be an important component of diets aimed at reducing serum cholesterol levels and protecting against heart disease. These foods also have a low glycemic index, making them useful in diets for control of diabetes. Finally, legumes contain several biologically active non-nutritive components, such as phenolic antioxidants, which may exert beneficial effects on health. While these foods also contain anti-nutrients such as protease inhibitors, levels in properly cooked legumes are almost certainly too low to exert any adverse effects. In conclusion, their rich content of protein, fiber, micronutrients and phytochemicals and low content of saturated fat make legumes an important component of vegetarian diets and a valuable addition to all diets aimed at reducing chronic disease.

Mini-Symposium: Foods and nutrients of interest to vegetarians: The science and application
Peter Elwood, MD, DSc, FRCP, FFPHM

The metabolic syndrome has been termed “the deadly quartet” and has been said to be the fastest growing “disease entity” in the world. On the other hand, it is probably not a true syndrome but simply an elaborate risk formula. Nevertheless, a number of reports have shown negative relationships between the “syndrome” and the consumption of milk or dairy products. Beliefs about dairy foods are all too often based upon associations in short term studies between the consumption of a food,
such as milk, and a biochemical factor, such as cholesterol, or insulin resistance. This approach can be highly misleading, because most foods, and dairy in particular, are a complex mixture of nutrients, and these have effects on many biological mechanisms. Thus, a focus upon one biochemical factor, such as cholesterol, ignores changes in other factors, such as blood pressure. Dependable judgments about diet and health can only come from large, long-term “cohort”, or “prospective” studies, in which large samples of subjects, for whom dietary intake and other life-style factors are recorded, are then followed forwards in time so that new disease events and deaths can be identified and related to base-line milk or dairy consumption.

The very best evidence therefore come from an “overview” or “meta-analysis” of all the relevant cohort study. A search of the published literature identified 34 large, prospective studies on the consumption of dairy foods and associations with disease or death, seven of which gave data on the incidence of diabetes. Overviews of all these cohort studies will be presented.

[43] Epigenetics and plant-based diets: Application for clinicians
Mini-Symposium: Foods and nutrients of interest to vegetarians: The science and application
John Kelly, MD, MPH

The epigenome is more important than the genome in the clinical application of beneficial effects from plant-based nutrition in the treatment of chronic disease. Non-coding DNA and chaperone molecules, far from being “inert filler,” play an essential role in modulating gene expression. Plant-based diets have been shown to exert powerful, long-lasting effects on gene expression via the epigenome. Helping patients and caregivers understand the power of plant nutrition to modulate gene expression in beneficial ways can have profound impact on patient health and longevity. Simple tools can have large effects in a short period of time. The practical science of applied epigenetics is revealing exciting treatment options and methods.

[44] Self-defined vegetarian status: Usefulness and validity
Symposium: Classification of vegetarian dietary patterns (Panel)
Tim Key, PhD

For large epidemiological studies, vegetarian status is generally defined using a small number of questions on usual diet. For example, in the EPIC-Oxford prospective study participants are asked four questions about whether they eat any: meat (including bacon, ham, poultry, game, meat pies and sausages); fish; dairy products (including milk, cheese, butter, yogurt); and eggs (including eggs in cakes and other baked foods). These four questions are then used to classify participants into four diet groups: meat-eaters, who eat meat, irrespective of whether they eat fish, dairy products or eggs; fish eaters, who do not eat meat but do eat fish; vegetarians, who do not eat meat or fish; and vegans, who do not eat meat, fish, dairy products or eggs. The characteristics of these four diet groups will be described, with reference to food and nutrient intakes and some plasma nutrient concentrations, together with analyses of the stability of these diet groups at approximately 5, 10 and 15 years since recruitment into EPIC-Oxford. Finally the pros and cons of this classification and possible modifications for future research will be discussed.

[45] Definition of vegetarian status according to the absence of animal product consumption
Symposium: Classification of vegetarian dietary patterns (Panel)
Gary Fraser, MBChB, PhD, MPH

It is somewhat of a paradox that a diet pattern with the name “vegetarian” (emphasizing vegetables) should generally be thought of instead in terms of the few foods excluded (i.e. the absence of meats). Yet, despite this I believe that we should continue to embrace this label, as it has name recognition for nearly all in western societies, and perhaps beyond. Vegetarian options in eating establishments and in cookbooks are common, well-recognized and often sought after.
How often do you see Mediterranean diet options in restaurants, and how does the “man in the street” interpret this diet? The simplicity of the label and its interpretation enables all to easily understand a basic concept — the absence of meats. But this is also an “Achilles heel”. The absence of one food group cannot adequately define a dietary pattern. This leads to difficulties in comparing vegetarian research results among different societies and cultures. Secondly, it makes it difficult for authoritative groups to provide guidelines for a vegetarian diet, as the definitions are so vague, beyond the absence of meat. One initial solution would be to define and publish a recommended U.S. vegetarian diet, which could most easily be patterned after the typical lacto-ovo Adventist vegetarian diet, as a starting point. This would make sense as it is the diet that at present has by far the most published evidence of broad health benefits. In the future this could quite quickly progress to a recommended European vegetarian diet, recommended Indian vegetarian diet, recommended U.S. vegan diet, recommended African-American vegetarian diet, etc. In different communities and settings, different vegetarian foods will be available at reasonable price, there will be different cultural preferences and different proprietary products available.

[46] Data reduction techniques to classify plant-based dietary patterns: Pros and cons

Symposium: Classification of vegetarian dietary patterns (Panel)

David R. Jacobs, PhD

In statistical theory, data reduction is a method for reducing dimensionality of a multivariable problem to isolate one or a few dimensions that capture the essence of the full, multivariable data. This reduction in dimensionality enables the analyst to make simple, yet still comprehensive statements. In the field of dietary patterns, researchers initially took this perspective to reduce the complex nutritional problem encompassing many foods and nutrients consumed to a single score. They employed factor/principal components analysis. To the surprise of some, the resulting diet patterns predicted chronic disease. Recently we showed that diet patterns are stable over many years in free-living people, thereby constituting a nutritional characteristic with stability similar to that of measured characteristics such as serum cholesterol. Yet apart from broad strokes such as “I like meat” or “I am vegetarian”, diet pattern does not seem to be something that people think about. They think about food in meals over a few days, but most people do not obviously have a plan to eat in a certain pattern. Rather, diet pattern that persists over years may be an epidemiologic discovery. Issues in forming diet patterns include what foods or nutrients to include as elements of the pattern, whether to combine them into groups based on gram weight, energy content, servings/day, or something else, how to combine across groups and whether the rules that connect all these elements should be data-driven or a priori. Classification of plant-based diets into patterns may be able to capture nuances that are not accessible when plant food consumption is low. Several similar diet patterns all predict chronic disease. Methods are needed to compare and contrast these patterns in order to form an enhanced, even better, pattern.
Short Oral Presentations
## Short Oral Presentations

### February 24, Session I: Nutrition Education/policy/ ecology
**Location:** Gair Room, Drayson Center

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<td>S101</td>
<td>2010 environmental impact of USDA dietary guidelines for eating</td>
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<td>Lanou et al.</td>
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<td>Five years later in the food fight to move vegetarian diets to the center of MyPlate</td>
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<td>Hawkins et al.</td>
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<td>Registered dietitians’ concern and actions regarding climate change vary according to vegetarian preference</td>
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<td>Hodgkin et al.</td>
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### February 25, Session II: Plant-based diets and health outcomes
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<td>S201</td>
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<td>Elwood et al.</td>
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<td>Natural salicylates from plant foods and health effects</td>
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<td>Craig W.</td>
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<td>Sutliffe et al.</td>
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<td>Does a plant-based lifestyle modification program adversely affect HDL?</td>
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<td>Melina</td>
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### February 26, Session III: Studies on vegetarians
**Location: Main Stage**

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<td>Nutrient adequacy of adopting a whole food, plant-based diet pattern</td>
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<td>Effect of cyanocobalamine fortified tooth paste on vitamin B12 status of vegetarians</td>
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### February 26, Session IV: Nutritional epidemiology
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<td>Serum uric acid concentrations in meat eaters, fish eaters and vegetarians: EPIC</td>
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<td>Orlich et al.</td>
<td>S406</td>
<td>Differences in food consumption between vegetarians in AHS-2</td>
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[S101] Environmental impact of USDA dietary guidelines for healthy eating

Luciana Baroni¹, Marina Berati², Maurizio Candilera³, Massimo Tettamanti²

¹Primary Care Unit, District no. 4, U.L.S.S. No. 9, TREVIso, Italy, ²NEIC, Nutrition Ecology International Center, Torino, Italy, ³Department of Mathematics, University of Padua, Italy

Background: Based on a review of the most recent available scientific evidence, the new Dietary Guidelines for Americans provide information and advice for choosing a healthy diet. The aim of the present study is to further explore this topic and to compare the environmental impacts of, respectively, omnivorous, lacto-ovo-vegetarian and vegan dietary patterns as suggested in the Dietary Guidelines. Method: LCA (Life Cycle Assessment) represents an objective procedure for the evaluation of the energy and environmental impacts of a process or activity. It is carried out through the identification of i) the energy and raw material consumption and ii) the release of waste into the environment. The assessment includes the whole life cycle of the process or activity, from the extraction and processing of raw materials to the production, transportation, distribution, use, reuse, recycling and final disposal. Results: The largest impact always stems from land and water use. The second largest impact comes from energy use. The third cause of impact is the emission of toxic inorganic compounds into the atmosphere. Impacts on climate change and on acidification/eutrophication are statistically significant. The best diet choice from an environmental point of view is demonstrated to be 100% plant-based (vegan); while this is the best choice for the environment, every step towards this end is useful in order to decrease the individual environmental impact. Conclusion: The consequences of a radical shift towards a plant-based diet would be many, all of them positive: a potential reversal of climate change, a profitable decrease in energy use and water waste, a lessening of the impact of deforestation, a much more rational use of soil (also leading to a dramatic decrease of chemical use in agriculture). We are indebted to the owner of Simapro, Società Scientifica di Nutrizione Vegetaria, Italy, who supplied the software.

[S102] Five years later in the food fight to move vegetarian diets to the center of MyPlate

Amy Joy Lanou¹

¹Department of Health and Wellness, University of North Carolina Asheville

Background: In 1977, the U.S. Senate released Dietary Goals that included a recommendation to “decrease the consumption of meat.” This statement was strongly opposed by food producers, manufacturers and industry associations. The language was revised to read “choose meats, poultry and fish which will reduce saturated fat intake” and the report was re-released. Shortly thereafter, the 1980 Dietary Guidelines for Americans were formulated, taking great care to offer the public advice that would not create a political backlash. As we head into the 2015 revisions of the Dietary Guidelines for Americans, researchers, educators and other stakeholders will need to learn from efforts over the last few decades and work collaboratively to get vegetarian diets featured in the guidelines. Methods: Various opportunities have been utilized to urge Dietary Guidelines Advisory Committees (DGAC), the Department of Health and Human Services and the United States Department of Agriculture to issue evidence-based dietary guidance that focuses on foods and dietary patterns (rather than nutrients) and that puts vegetarian diets at the center of the plate. Key strategies have included trying to place a researcher knowledgeable about vegetarian diets on the DGAC, engaging the general public in the effort by improving nutritional literacy, and building coalitions between individuals and organizations to counter the powerful food industry pressures to muddy nutritional advice. Results: To date, the most successful tactic was to mobilize individuals and groups to request that the DGAC ask key questions about vegetarian diets as part of their evidence-based review. Next steps and other lessons learned for making additional progress in 2015 will be addressed. Conclusion: Concerted efforts in the last five years have resulted in federal dietary guidance that is more inclusive of vegetarian eating styles, but falls short of acknowledging the importance and viability of vegetarian diets for promoting optimal health of Americans.
[S103] Is a vegetarian diet adequate? Concepts and controversies in plant-based nutrition

Angela Vince Saunders 1, Kate A Marsh 2, Carol L. Zeuschner 2, Michelle A. Reid 1
1Sanitarium Health & Wellbeing, NSW, Australia, 2Sydney Adventist Hospital, NSW, Australia, 3Northside Nutrition and Dietetics, Sydney, NSW, Australia

Objective: To publish a series of peer-reviewed papers on the nutrient adequacy of a vegetarian diet that would enable health practitioners to feel more confident in recommending plant-based diets to their clients/patients. Methods: A team of dietitians, clinicians and university academics reviewed the latest research regarding adequacy of vegetarian diets, particularly protein, iron, zinc, omega-3 and vitamin B12. The team also reviewed the Australian NRVs (nutrition reference values) to determine if they could be met on a vegetarian diet, particularly iron (180%) and zinc (150%) — 13 one-day vegetarian meal plans were developed for various life stages to comply with the NRVs. The final paper was designed as a practical resource with tips on how to prepare delicious vegetarian meals. An editorial, six clinical focused articles and one educational resource article were written to cover the above topics. Challenges: Health practitioners continue to question whether vegetarian diets are nutritionally adequate. Clever media campaigns suggest meat and fish are the best and only sources of protein, iron, zinc, omega-3, vitamin B12. Our challenge was to reach the medical community with evidence-based research regarding alternative sources of these nutrients. The Medical Journal of Australia was recommended as the most credible way to reach health practitioners. Our challenge was to convince MJA that the information would be of significant benefit to health practitioners and their patients. Outcomes: The 40-page MJA supplement (8 articles) entitled “Is a Vegetarian Diet Adequate?—Concepts and Controversies in Plant-based Nutrition” was published in June 2012 and distributed to 27,000 doctors/specialists and 4,500 dietitians. Unprecedented media interest included 20 radio and five TV interviews, as well as 100+ online, newspaper and magazine articles. News coverage went global, with articles appearing as far away as New Zealand, U.S. and China. Reference to the publication continues in the media, and excellent feedback is being received from health practitioners. Funding for this project came from: Sanitarium Health and Wellbeing, Nuts for Life, Grains & Legumes Nutrition Council, Lifestyle Medicine Institute (CHIP), Adventist Health (South Pacific) and also Adventist Health (General Conference). MJA OPEN (free access articles) can be found at: www.mja.com.au/open/2012/1/2

[S104] The Oldways Vegetarian Network: Connecting science with good food and health for life

Sara Baer-Sinnott 1, Sharon Palmer, RD 2
1President, Oldways, Boston, MA, 2Author, The Plant Powered Diet

The Oldways Vegetarian Diet Pyramid was developed and introduced in 1997 at an international conference. This Pyramid was fourth in a series of traditional diet pyramids developed and promoted by Oldways, a nonprofit food and nutrition organization with a mission to guide people to good health through heritage. Oldways has collaborated with hundreds of international experts including scientists, health care professionals, chefs, historians, food producers and food writers to create “mini-movements” that have inspired millions of people to change the way they eat. The Vegetarian Diet Pyramid will be reviewed and updated by a scientific committee including Dr. Joan Sabaté of Loma Linda, and Drs. Walter Willett and Frank Sacks of the Harvard School of Public Health, Registered Dietitian Sharon Palmer and others. To extend and expand the reach of the updated Pyramid, and with an overall goal of increasing consumption of plant foods, the Oldways Vegetarian Network will reach consumers, media, health professionals and others with program activities (4-week meal plan, recipe collection, the “Vege Pledge,” restaurant connections, toolkits and website resources). The objectives of the Oldways Vegetarian Network include a) to be a primary resource for reliable information on vegetarian diets/plant-based eating; b) to develop an array of science-based materials on the website/make it nutritious; c) to dispel myths/knock down barriers to people eating more plant foods: make it nutritious/delicious; d) to recognize/honor/bring more awareness about cultural traditions or heritage of vegetarian eating; e) to partner with

ICVN
6th International Congress on Vegetarian Nutrition
the food industry to help support plant-based nutrition choices; f) to bring together experts in the field of vegetarian nutrition, cooking, culture (this is the Committee — science, food, cultural); g) to raise awareness/bring attention to the concept of vegetarian/vegan diets.

[S105] Registered dietitians’ concern and actions regarding climate change vary according to personal vegetarian behaviors

Irana Hawkins 1, Alan Balsam 2, Robert Goldman 3

1Health Professions Education, Simmons College, Boston, MA, 2Brookline Health Department, Brookline, MA, 3Dept. of Math & Biostatistics, Simmons College, Boston, MA

Background: Climate change and environmental degradation are associated with food and beverage choices. Although Registered Dietitians (R.D.’s) are on the front lines of food and nutrition recommendations, it is unclear how many R.D.’s in the United States (U.S.) are concerned with climate change. Our objective was to explore beliefs and concerns about climate change amongst U.S. R.D.’s and identify factors that may influence related practice-based behaviors. Methods: An exploratory, cross-sectional survey was utilized to acquire primary data. The survey was sent to a random sample of all U.S. R.D.’s. Results: Of the 570 survey responses, 75% strongly agreed or agreed that climate change is an important issue, while 50% were unsure that R.D.’s should play a major role in climate change mitigation strategies. Thirty-eight percent of survey respondents were engaged in activities that promoted diet as a climate change mitigation strategy. Vegetarian and vegan dietitians were significantly more likely than non-vegetarian and non-vegan dietitians to believe that R.D.’s should play a major role in climate change mitigation strategies. Vegetarian and vegan dietitians were also significantly more likely to engage in activities that promoted diet as a climate change mitigation strategy. Additionally, those possessing comfort in promoting plant-based diets and those who believed animal products are not essential for a healthy diet were significantly more likely to engage in diet-related climate change mitigation strategies. Overall, concern for climate change among R.D.’s varied significantly by the level of awareness that animal products are implicated in climate change, and by region of the country in which the R.D. resided. Conclusion: U.S. R.D.’s are concerned with climate change. However, there is a discrepancy between concern and actions. Animal products appear to be an important factor affecting practice based-recommendations, as is comfort in promoting plant-based diets. Research Support from the Academy of Nutrition and Dietetics who graciously provided the names constituting the random sample of R.D.’s free of charge.

[S106] A vegetarian food plate for adequate intakes

Georgia Hodgkin 1, Fred Hardinge 2

1Department of Nutrition and Dietetics, School of Allied Health Professions, Loma Linda University, Loma Linda, California, 2General Conference of Seventh-day Adventists, Silver Spring, Maryland

The introduction by the USDA of MyPlate in 2010 was a giant leap from the more complex pyramid to a simple plate for illustrating adequate dietary intake to the general population. MyPlate made it much easier for nutrition professionals to visually describe an adequate diet. In quick succession, Harvard University School of Public Health released their own take on the plate. The General Conference of Seventh-day Adventists Nutrition Council (GCNC) has for a number of years published a vegetarian version of the Food Pyramid, adapting it as it was revised over its lifespan. The GCNC recognized the need for vegetarians to have a plate of their own, and consequently is pleased to introduce to the ICVN “My Vegetarian Plate.” Nutrition professionals from dietetics, education, medicine and public health adopted the proportions of the food groups, added stylized foods to their backgrounds, and kept all food groups the same as the USDA MyPlate, with the exceptions of the protein and dairy groups. The proteins eliminate meat, fish and poultry. The dairy group allows for dairy equivalents. This plate is designed specifically to provide a useful guide to those who choose to follow a vegetarian meal pattern. The number of servings of each food group
Greenhouse emissions from tofu production

Mejia A. 1, Sranacharoepong K. 1, Jaceldo K. 1, Sabaté J. 1, Soret S. 2

1Department of Nutrition, School of Public Health, Loma Linda University 2Department of Environmental Health and Geoinformatics Sciences, School of Public Health, Loma Linda University, Loma Linda, California.

Background: There is an increased consumption of tofu in the United States by people who strive for healthy foods rich in protein. While there is some literature documenting the health benefits of tofu, and other soy foods, little is known on the carbon footprint generated by tofu. Objectives: The purpose of this study was to evaluate the emissions of greenhouse gases (GHG) generated by the production of tofu. Methods: We performed a life cycle assessment (LCA) using SimaPro 7. We gathered original data from a tofu manufacturer and soybean production data from the software database to calculate the GHG emissions with global warming potential (CO2and N2O). Results are reported in carbon dioxide equivalents (CO2eq) following the Traci 2 life cycle impact assessment methodology with 100 years horizon. Main processes include: soaking of soybeans, soymilk production and coagulation, tofu cutting, packaging, pasteurization, cooling and storage. Our LCA calculations include materials and energy inputs required to produce tofu: whole soybeans, water, electricity, natural gas, transportation and packaging materials. The functional unit is one kilogram of tofu and the boundary limits are from cradle to factory gate. Results: The total GHG emissions per one kilogram of tofu produced are 893 g of CO2eq. Those emissions come from whole soybeans (50%), natural gas (27%), packaging (13%), transportation (6%) and electricity (4%). Conclusion: Tofu, a protein rich food, generates relatively low GHG emissions when compared to protein-rich animal foods – about 20 times less GHG than beef products. Thus, tofu is a suitable food to consume by people who intend to reduce their carbon footprint by dietary choices.

Osteoporosis and osteopenia in vegetarians and omnivores in Taiwan

Ming-Nan Lin 1, Tina H. T. Chiu 2, Hui-Ya Huang 1, Wen-Ling Liao 3, Chin-Lon Lin 2

1Department of Family Medicine, Buddhist Tzu Chi General Hospital, Chia-yi, Taiwan, 2Medical Mission, Tzu Chi Foundation, Hualien, Taiwan, 3Personalized Medicine Center, China Medical University, Taichung, Taiwan

Background: Previous studies have yielded inconsistent results on bone mineral density of vegetarians. We evaluated the prevalence of osteoporosis and osteopenia in the Tzu Chi Health Study in Taiwan. Methods: Bone mineral densities were determined using dual-energy X-ray absorptiometry, at femoral neck for 2402 men and at lumbar spine for 2181 post-menopausal women. Osteoporosis was determined based on T-score < -2.5, while osteopenia represents T-score between -1.0 to -2.5. All participants were interviewed to obtain information about diet, lifestyle and medical history. The food frequency questionnaire assessment for calcium intake had a validity and reliability of $r=0.40$ and $r=0.50$, respectively. Polytomous logistic regression was used to analyze the relationship between vegetarian diet and osteoporosis/osteopenia, adjusting for age, BMI, height and exercise for all participants. We additionally adjusted for years of lifespan with menstrual cycle and duration of hormone replacement therapy for female participants. Results: Among men, vegetarian diet was not associated with osteoporosis (OR: 1.11, $p=0.20$) or osteopenia (OR: 1.17, $p=0.59$). Among post-menopausal women, vegetarians with calcium intake < 600mg (reference) had higher prevalence of bone abnormality than vegetarians with calcium intake >= 600mg (osteoporosis OR: 0.55, $p=0.004$; osteopenia OR: 0.74, $p=0.061$); omnivores with calcium >= 600mg (osteoporosis OR: 0.54, $p=0.002$; osteopenia OR: 0.62, $p=0.001$); and omnivores with calcium < 600mg (osteoporosis OR: 0.48, $p<0.001$; osteopenia OR: 0.75, $p=0.047$). Calcium intake did not appear to contribute to bone mineral density in men (at femoral neck) or omnivorous women (at lumbar spine). Conclusion: Adequate calcium intake may protect bone health in female vegetarians in Taiwan.
[S202] Natural salicylates from plant foods and health effects
Elwood, Peter¹, Micaela Gal¹
¹Cardiff University, United Kingdom

The story of natural salicylates goes back to recommendations in Egyptian Eberus papyri in 1,500 BC that myrtle be taken to ease back pain; then to Hippocrates who in 300 BC recommended a brew of willow leaves for the relief of pain in childbirth and then to the Rev. Edward Stone who, in 1963, gave increasing doses of powdered willow bark to relieve “various agues” in his parishioners. The salicylate story was however taken over by aspirin in 1897 when acetic acid, added to an extract of meadowsweet, produced a white powder. Salicylates are involved in plant growth and development, in photosynthesis, in transpiration, in ion uptake and in transport in plants. They induce changes in leaf anatomy, and are responsible for the falling (apoptosis) of leaves in the fall. They have a role in resistance to pathogens, inducing the production of defensive proteins, and are responsible for resistance in which a pathogenic attack on one part of a plant induces resistance in other parts. These actions led a botanist to comment that medicinal effects of salicylates in humans may simply be a logical prediction of their roles in plants. Interest in salicylates has increased enormously following the demonstration of a substantial reduction in cancer by acetyl salicylic acid (aspirin) in recent long-term follow-up and ad hoc randomized trials. More direct, but as yet only suggestive evidence focuses on the spice curcumin, which has a high content of salicylate, and is being tested as an adjunct treatment of cancer. Salicylates however are a response to stress in plants, and current agricultural practices which aim to limit stress from heat, cold and pest infestation, produce plants with low salicylate levels. On the other hand, organically grown vegetables have a considerably higher salicylate content compared to those grown conventionally.

[S203] New dietary factors that impact risk of diabetes
Winston Craig¹, Tatiana Kim¹
¹Department of Nutrition and Wellness, Andrews University, Berrien Springs, Michigan

Background: Type 2 diabetes is a very common metabolic disorder, affecting about 300 million persons worldwide. Overall, vegetarian diets tend to reduce the risk of diabetes while red meat consumption increases the risk. The typical American diet rich in saturated and trans fat, red meat, high glycemic index refined foods and low in fruits and vegetables, especially green leafy vegetables, coupled with the prevalence of a hormone-altering sleep deficiency and a lack of regular exercise, together aggravates the risk factors for diabetes. Although obesity is the most important risk factor for type 2 diabetes, evidence is emerging that certain plant foods contain dietary factors that may be useful in reducing the risk of diabetes. Results: A number of herbal products have shown some value as adjuncts in improving glycemic control and ameliorating other symptoms of diabetes. New research has now shown that certain vegetables and spices contain phytochemicals and other components that improve glycemic control or are associated with a lowered risk of type 2 diabetes. The use of antioxidant compounds is a novel approach for the improvement of insulin resistance and its complications in type 2 diabetes. Conclusion: The increased use of vegetables and certain herbs and spices has a potential role in diabetes management and human health.

[S204] Expeditious CRP reduction through a comprehensive nutrition and lifestyle program
Jay Sutliffe¹,², Hendrik de Heer¹, Ray Foster²
¹Northern Arizona University. Flagstaff, Arizona, ²Black Hills Health & Education Center. Hermosa, South Dakota

Background: Cardiovascular disease (CVD) continues to account for the highest incidence of morbidity and mortality worldwide. Inflammatory measures, including elevated C-reactive protein (hs-CRP) levels, have been associated with increased risk of CVD and events bestowing its impact in a graded fashion without known threshold peaks. Methods: A total of 614 participants took part in this comprehensive residential wellness program over a 6-year period (2006 – 2011)
with a mean duration of 18.5 days (SD=6.4). This structured program included a plant-based diet, supervised physical activity, stress management sessions and practical lifestyle education. Pre and post measures were assessed at baseline and at the end of each guest’s stay. Descriptive measures of clinical indicators were used to analyze significance of change. **Results:** The mean age of participants was 57.1 years (SD=15.8), 68% were female, 81.6% Caucasian, 11.2% Black, (other ethnicities all <3%), and the mean BMI was 29.81 (SD=8.41). At baseline, the mean value for hs-CRP was 4.61mg/dl (SD=9.02), 29.6% of participants were at low risk, 34.2% at average risk and 36.3% (n=223) of participants at high risk for adverse health consequences (greater than 3 mg/dl). Following the program, mean hs-CRP values dropped to 3.33 (SD=8.31), a significant improvement (t(613)=5.680, p<.001). Of the high risk participants, 40.4% reduced their risk at the end of the program (30.5% to average risk and 9.9% to low risk). Among participants at average risk, 47.8% reduced their risk to low risk, whereas 7.7% increased their risk to high-risk. **Conclusion:** A comprehensive residential wellness program utilizing a plant-based diet and lifestyle modification can be effective at achieving improved hs-CRP levels in an expeditious manner while reducing dependency on pharmacologic agents. A corresponding reduction in CVD and events could be realized. Long term adherence and personal application support efforts need to be investigated further.

**[S205] Does a plant-based lifestyle modification program adversely affect high-density lipoprotein levels?**

**Lillian Kent¹, Darren Morton ¹, Paul Rankin ¹**  
¹Lifestyle Education Research Group, Avondale College of Higher Education, NSW, Australia

**Background:** Low high-density lipoprotein (HDL) levels are associated with cardiovascular disease, and HDL is also one of a suite of risk factors that characterizes metabolic syndrome. Lifestyle modification involving low-fat, plant-based diets have been demonstrated to effectively reduce the risk factors for cardiovascular disease, but also appear to adversely affect HDL levels. Our objective was to examine the effect of the Complete Health Improvement Program (CHIP), a 30-day lifestyle modification program that advocates a low-fat, plant-based diet, on HDL and other biometric indices related to cardiovascular disease. **Methods:** Changes in body weight, blood pressure, blood lipid profile and fasting plasma glucose were assessed in 5,046 participants (age=57.3±12.9 yrs, 33.5% male/66.5% female) from CHIP programs conducted in the United States between 2006 and 2009. **Results:** Significant reductions (p<0.001) were recorded for HDL (9%), LDL (13%), total cholesterol (11%), triglycerides (8%), fasting plasma glucose (6%), systolic blood pressure (5%), diastolic blood pressure (5%), body mass index (3%) and the total cholesterol/HDL ratio (3%). In 16% of participants, HDL decreased from normal to low levels. Furthermore, 6% of participants were newly characterized with metabolic syndrome following the 30-day program, with almost half of these obtaining the classification because of decreases in HDL. **Conclusion:** HDL levels following the 30-day CHIP program were reduced. While reductions in HDL at a population level are not desirable as high levels of HDL are cardio-protective, the CHIP lifestyle intervention appeared to effectively reduce all other risk factors. It is postulated that low-fat diet-induced reductions in HDL do not carry the same risk as low HDL at a population level. The importance of measuring HDL at an individual level following lifestyle modification may need to be re-evaluated.

**[S206] Raw vegan diets: Nutrition update for health professionals**

**Vesanto Melina¹,², Brenda Davis¹**  
¹Author, ²Consultant to the Government of British Columbia

Update yourself with the latest research and practical information regarding raw vegan diets. Topics include protein, omega-3 fatty acids, iron, zinc and non-dairy sources of calcium; suitability (or lack of suitability) at various stages of the life cycle; challenges that may arise, along with solutions; nutritionally adequate raw vegan diets; current research regarding plant-based diets in relation to weight management, certain cancers, rheumatoid arthritis, fibromyalgia. Vesanto Melina and
**Nutrient adequacy of adopting a whole food, plant-based dietary pattern**

*Sarah Tindall, Wendy Moore, Keith Ray, Amy Joy Lanou*

1Department of Health and Wellness, University of North Carolina Asheville

**Background:** Vegetarian and vegan diets are criticized for concerns about nutrient adequacy. The aim of this study was to determine whether shifting to a whole food, low-fat, plant-based (WFLFPB) diet would result in a healthy nutrient intake. **Methods:** A 6-week randomized controlled trial tested two levels of support for adopting a WFLFPB diet and the nutrient adequacy of the resultant dietary patterns. Twenty-six healthy adults were randomly assigned into two intervention groups (SUPP; n=13 and INFO; n=13) and compared to a convenience control (CON; n=11) group asked not to change their dietary pattern. Target macronutrient intake for the WFLFPB was 10:15:75 percent of calories from fat, protein and carbohydrate, respectively. SUPP was given weekly group coaching sessions, nutrition information, email/phone support and two cooking classes. INFO was given the same nutrition information and email/phone support only. SUPP and INFO did daily compliance surveys. All participants were asked to complete 2-day food records at baseline and 6-weeks. **Results:** Macronutrient pattern improved for SUPP group with significant increases in percent of calories from carbohydrate, and fiber (g) and with decreases in percent of calories from fat and protein, total fat (g) and protein (g) (p<0.05). Similarly, INFO group had significant increases in percent of calories from carbohydrate and significant decreases in percent calories from fat, total calories, total fat (g) and saturated fat (g) (p<0.05). SUPP micronutrient increase occurred in magnesium (p=0.00), while decreases were observed in choline, calcium and cholesterol (p<0.05). Likewise, INFO micronutrients showed decreases in sodium and cholesterol (p=0.00). Calorie intake decreased from baseline in both groups (SUPP 542±50.12; INFO 431.95±238.9 kcal; p<0.03). **Conclusions:** Shifting to a WFLFPB diet resulted in a healthier macronutrient nutrition profile as compared to baseline, even as total calorie intake decreased. Further analysis will illuminate micronutrient changes. Funded by the North Carolina Center for Health and Wellness

**Food intake of vegetarian adolescents attending Adventist schools**

*Gina S. Siapco, Joan Sabaté*

1Department of Nutrition, School of Public Health, Loma Linda University, Loma Linda CA 92350

**Background:** Vegetarianism (absence of meat in the diet) has become a popular trend among adolescents. However, little is known of the foods they consume or how they differ from their non-vegetarian counterparts. **Objective:** To compare the food intake of vegetarian and non-vegetarian adolescents attending Adventist schools. **Methods:** Adolescents (n=307, 163 females and 144 males) from four Adventist schools near Loma Linda University participated in an on-going cross-sectional study. Dietary intake was determined with a web-based food frequency questionnaire. “Vegetarian” was defined a priori as someone with a combined intake of less than one serving per week of meat, poultry and fish. ANCOVA was done to compare the food intake of vegetarians and non-vegetarians while controlling for age, gender and ethnicity. **Results:** Seventy-six (25%) participants were vegetarians, 55% of which were females. Total dairy intake of vegetarians was one serving less per day compared to non-vegetarians (2.3 vs. 3.4 svg/d, p =.001). Vegetarians ate less than half the milk intake (0.4 vs. 0.9 svg/d, p=.002) and half a serving less the cheese intake (1.9 vs. 2.5 svg/d, p=.032) of their non-vegetarian counterparts. Vegetarians ate one serving more of soy foods per day (2.6 vs. 1.4 svg/d, p<.001) but most of this came from meat analogs (1.5 vs. 0.7 svg/d, p<.001). The two groups did not differ in intake of starches, vegetables, fruits, legumes, tofu, soymilk and snack foods (chips and sweets); however, vegetarians significantly drank less soda/sweetened beverages (0.5 vs. 0.9 svg/d, p=.004) and tea/coffee (0.1 vs. 0.3 svg/d, p=.028) compared to non-vegetarians. **Conclusion:** Results confirm previous findings that among Adventist adolescent
vegetarians, abstinence from meats is not compensated by eggs and dairy but by meat analogs. Vegetarian adolescents also consume less soda and practically no caffeine-containing beverages.

**[S304] Effect of cyanocobalamin-fortified toothpaste on vitamin B12 status of vegetarians and vegans**

*Markus Keller1, Beatrice Redemann1, Ursula Chavez-Zander1, Claus Leitzmann1*

1Institute of Alternative and Sustainable Nutrition, Giessen, Germany

**Background:** Due to inadequate dietary intake of vitamin B12, vegans and some vegetarians tend to show low vitamin B12 status or vitamin B12 deficiency. We investigated the effect of cyanocobalamin-fortified toothpaste on vitamin B12 status in vegans and vegetarians. **Methods:** In an intervention study, 71 vegans and 30 vegetarians were randomly assigned to use cyanocobalamin-fortified toothpaste for five weeks (verum group, n=63) or use placebo toothpaste, identical in appearance and taste (placebo group, n=38). The verum group included 21 subjects with baseline holotranscobalamin II levels below the reference value (<19.1 pmol/L, verum group A) and 42 subjects with normal baseline holotranscobalamin II levels (verum group B). All subjects were advised not to use fortified foods or vitamin B12, vitamin B6 or folate supplements during the study. Serum levels of total vitamin B12, holotranscobalamin II and total homocysteine were analyzed before and after the trial. **Results:** Cyanocobalamin-fortified toothpaste significantly increased holotranscobalamin levels (from 13 to 41 and from 32 to 53 pmol/L in verum groups A and B, respectively; p<0.001). In the placebo group, no change in holotranscobalamin levels was detected. Serum vitamin B12 increased significantly in verum group A (from 173 to 258 pg/mL, p<0.001) and showed a small, statistically non-significant increase in verum group B and a statistically significant decrease in the placebo group (from 265 to 206 pg/mL, p<0.001). Serum homocysteine levels decreased significantly in verum group A (from 9.9 to 8.5 µmol/L, p<0.05), remained unchanged in verum group B, and increased slightly but statistically non-significantly in the placebo group. **Conclusion:** Daily use of cyanocobalamin-fortified toothpaste for five weeks improved vitamin B12 status in vegans and vegetarians. Corresponding biochemical parameters were improved or normalized in subjects with vitamin B12 deficiency. The long-term effect of cyanocobalamin-fortified toothpaste on vitamin B12 status in vegans and vegetarians should be investigated in further studies. Funded by the German Vegetarian Union, Berlin, and LOGOCOS Naturkosmetik AG, Salzhemmendorf.

**[S305] Estrogen levels in serum and urine of vegetarian and omnivore premenopausal women**

*Gertraud Maskarinec1, Brook Hormon1, Yukiko Morimoto1, Frank Z. Stanczyk2, Adrian A. Franke1*

1University of Hawaii Cancer Center, Honolulu, HI, 2University of Southern California, Los Angeles, CA

**Background:** High-meat diets have been associated with elevated breast cancer risk and the effect may be mediated through hormonal pathways. This investigation compared estrogens measured in serum and urine of 278 premenopausal participants in two soy interventions (BEAN1 and BEAN2). **Methods:** BEAN1 participants completed seven unannounced 24-hour dietary recalls and donated five blood and urine samples over two years. BEAN2 women provided seven recalls and three samples over 13 months. Serum samples were analyzed for estrone (E1) and estradiol (E2) using highly sensitive radioimmunoassays. Nine estrogen metabolites were measured in urine by liquid chromatography mass spectrometry and adjusted for creatinine. Vegetarians were defined as women with a combined intake of <30 g/day of red meat, poultry and fish and pescatarians as those consuming <20 g/day of meat and poultry but >10 g/day of fish. We applied mixed models using log-transformed estrogen values and computed least-square means adjusted for age, body mass index, ethnicity, energy intake, parity, study, dietary assignment and menstrual cycle phase. **Results:** The mean age at study entry was 41.9±4.4 years and the ethnic distribution was 41% Caucasian, 36% Asian (primarily Japanese), and 23% Other. Serum E1 (86 versus 101 pg/mL, p=0.04) and E2 (140
versus 154 pg/mL, p=0.05) levels were significantly lower in the 37 vegetarians/pescatarians than in the 241 omnivores. However, the difference in urinary excretion of total estrogens (184 versus 201 pmol/mg creatinine, p=0.31) as well as E1 (40 versus 43 pmol/mg creatinine, p=0.55), E2 (14 versus 16 pmol/mg creatinine, p=0.19), and E3 (46 versus 51 pmol/mg creatinine, p=0.38) were not significant. The differences were greater when the models were restricted to the 974 samples collected during the luteal phase. **Conclusions:** Lower levels of circulating and urinary estrogens in vegetarians and pescatarians as compared to omnivores may lower the risk of hormone-related cancers and conditions.

[S306] Nutrient intake adequacy of vegans, lacto-ovo-vegetarians and non-vegetarians
Karen Jaceldo-Siegl 1, E. Teo 1, Joan Sabaté 1, Gary Fraser 2, Ella Haddad 1
1Department of Nutrition, School of Public Health, Loma Linda University 2Department of Epidemiology and Biostatistics, School of Public Health, Loma Linda University, Loma Linda, California

Published studies have found vegetarian diets to have inadequate intake of several nutrients, particularly vitamins and minerals. Nutritional studies of vegetarians, unfortunately, have been hampered with small samples and few days of dietary recalls. We assessed prevalence of nutrient intake inadequacy in vegans, lacto-ovo-vegetarians and non-vegetarians using the Estimated Average Requirement (EAR) cut point method where applicable. Nutrient intake from foods was determined from multiple 24-hour dietary recall data provided by 992 participants of the Adventist Health Study-2 Calibration Study. Dietary pattern was defined according to the frequency of consumption of red meat, poultry, fish, dairy and eggs. Sixty six were vegans, 331 lacto-ovo-vegetarians and 595 were non-vegetarians. The prevalence of inadequacy was different among vegans, lacto-ovo-vegetarians and non-vegetarians for vitamin C (8%, 10%, 26%, respectively), magnesium (15%, 23%, 49%, respectively) and vitamin B12 (48%, 23%, 16%, respectively). In both men and women, the prevalence of inadequacy among vegans and lacto-ovo-vegetarians when compared to non-vegetarians was lower for vitamin C, vitamin E, vitamin B6, riboflavin, folate, copper, magnesium and phosphorus, but higher for vitamin B12 and niacin. We conclude that vegans and lacto-ovo-vegetarians had a lower prevalence of inadequacy for most nutrients compared to non-vegetarians.

[S401] Validation of self-defined vegetarian status, dietary and lifestyle characteristics in a large cohort
Anne M. J. Gilsing 1, Matty P. Weijenberg 1, R. Alexandra Goldbohm 2, Pieter C. Dagnelie 3, Piet A. van den Brandt 1, Leo J. Schouten 1
1Dept of Epidemiology, GROW-School for Oncology and Developmental Biology, Maastricht University, NL, 2TNO, Leiden, NL, 3. Dept of Epidemiology, CAPHRI School of Public Health and Primary Care, Maastricht University, NL

**Background:** Vegetarian diets have been associated with lower risk of chronic disease, but little is known about the validity of self-defined vegetarian status and health effects of low meat diets. We therefore aimed to establish an analytical cohort oversampled with vegetarians, pescetarians and 1-day/week meat consumers, to validate the concept of self-defined vegetarianism using an extensive food frequency questionnaire (FFQ), and to describe their lifestyle and dietary characteristics. **Methods:** Embedded within the ongoing Netherlands Cohort Study, the NLCS-Meat Investigation Cohort (NLCS-MIC) (n=120852; including 1150 self-defined vegetarians) was established by combining all validated vegetarians (n=702), pescetarians (n=394) and 1-day/week meat consumers (n= 1396) from the total cohort with a random sample of 2-5 days/week and 6-7 days/week meat consumers (n=2965 and 5648, respectively). **Results:** Although 50% of self-defined vegetarians reported to consume meat or fish on the FFQ, our findings suggest that the level of misclassification that occurs when merely relying on self-defined vegetarian status may not be as large as expected beforehand. The overall group of self-defined vegetarians did not differ considerably from the validated vegetarians in terms of diet and lifestyle. Validated vegetarians,
pescetarians and 1-day/week meat consumers had more favorable dietary intakes (e.g. higher fiber and vegetables) and lifestyle characteristics (e.g. lower smoking rates) compared to regular meat consumers in both sexes. Vegetarians adhered to their diet longer than pescetarians and 1-day/week meat consumers. **Conclusion:** The misclassification occurring when classifying vegetarians on self-reports was small. We established an analytical cohort with a wide range of dietary intake by enriching our population with persons at lower end of the meat consumption spectrum. This should facilitate future identification of associations with major cancers and causes of death. The study has been funded by the World Cancer Research Fund (WCRF NL).

**[S402] Dietary pattern analysis: A comparison between matched vegetarians and omnivorous subjects**

*Peter Clarys\(^1\,2\), Peter Deriemaeker\(^1\,2\), Inge Huybrechts\(^3\), Tom Deliens\(^1\), Marcel Hebbelinck\(^1\), Patrick Mullie\(^1\,2\)*

\(^1\)Department of Human Biometrics and Biomechanics, Vrije Universiteit Brussel, Brussels, Belgium, \(^2\)Erasmus University College, Brussels, Belgium, \(^3\)Department of Public Health, Ghent University, Ghent, Belgium

**Background:** Dietary pattern analysis, based on the concept that foods eaten together are as important as a reductive methodology characterized by a single food or nutrient analysis, has emerged as an alternative approach to study the relation between nutrition and disease. The aim of the present study was to compare the results of dietary pattern analysis in properly matched vegetarian and omnivorous subjects. **Methods:** Vegetarians (n=69) were recruited via purposeful sampling and matched non-vegetarians (n=69) with same age, gender, health and lifestyle characteristics were searched for via convenience sampling. Two dietary pattern analysis methods, the Healthy Eating Index (HEI) and the Mediterranean Diet Score (MDS) were calculated and compared between vegetarians and omnivorous subjects. **Results:** Mean total energy intake was comparable between vegetarians and omnivorous subjects (p > 0.05). Macronutrient analysis revealed significant differences between the mean values for vegetarians and omnivorous subjects (absolute and relative protein and total fat intake were significantly lower in vegetarians, while carbohydrate and fiber intakes were significantly higher in vegetarians than in omnivorous subjects). The HEI and MDS were significantly higher for the vegetarians (HEI= 72.1 ± 9.7; MDS= 4.3 ± 1.3) compared to the omnivorous subjects (HEI= 65.6 ± 14.0; MDS= 3.8 ± 1.4). **Conclusion:** Our results indicate a more nutrient dense pattern, closer to the current dietary recommendations for the vegetarians compared to the omnivorous subjects. Both indexing systems, with some components not or incompletely applicable for vegetarian diets, result in higher scores for vegetarians compared to the omnivorous subjects.

**[S403] Serum uric acid concentrations in meat eaters, fish eaters, vegetarians and vegans in EPIC-Oxford**

*Julie A. Schmidt\(^1\), Francesca L. Crowe\(^1\), Paul N. Appleby\(^1\), Tim Key\(^1\), Ruth C. Travis\(^1\)*

\(^1\)Cancer Epidemiology Unit, Nuffield Department of Medicine, University of Oxford, UK

**Background:** Circulating concentrations of uric acid may be affected by dietary components such as meat, fish and dairy products, but only a few studies have compared uric acid concentrations among individuals who exclude some or all of these foods from their diet. The aim of this study was to investigate differences in serum uric acid concentrations between meat eaters, fish eaters, vegetarians and vegans. **Methods:** A sample of 670 men and 1,023 women (424 meat eaters, 425 fish eaters, 422 vegetarians and 422 vegans, matched on age and sex) from the European Prospective Investigation into Cancer and Nutrition Oxford cohort were included in this cross-sectional analysis. Diet was assessed using a semi-quantitative food frequency questionnaire and serum concentrations of uric acid were measured. Mean concentrations of uric acid by diet group were calculated after adjusting for age, body mass index, calcium and alcohol intake. **Results:** In both men and women, serum uric acid concentrations differed significantly by diet group (p < 0.0001 and p = 0.01, respectively).
differences between diet groups were most pronounced in men; vegans had the highest concentration (340, 95% confidence interval 329 – 351 μmol/l), followed by meat eaters (315, 306 – 324 μmol/l), fish eaters (309, 300 – 318 μmol/l) and vegetarians (303, 294 – 312 μmol/l). In women, serum uric acid concentrations were slightly higher in vegans (241, 234 – 247 μmol/l) than in meat eaters (237, 231 – 242 μmol/l) and lower in vegetarians (230, 224 – 236 μmol/l) and fish eaters (227, 221 – 233 μmol/l). Conclusion: Individuals consuming a vegan diet had the highest serum concentrations of uric acid compared to meat eaters, fish eaters and vegetarians, especially in men. Vegetarians and individuals who eat fish but not meat had the lowest concentrations of serum uric acid. Funded by Cancer Research UK.

[S404] Dietary patterns and their association with the metabolic syndrome and its component risk factors

Nico Samuel Rizzo 1, Joan Sabaté 1
1Department of Nutrition, School of Public Health, Loma Linda University

Background: In the U.S. 27% of the population have the Metabolic Syndrome (MetS). The identification of amendable dietary factors that may help in the prevention of the MetS thus becomes an important goal. Objective: The purpose of the study was to investigate associations between dietary patterns specified by degree of meat and dairy intake with the MetS and its component factors. Methods: Cross-sectional analysis of 1,278 subjects (mean age 63 years) with a complete set of clinical and dietary data from the Adventist Health Study-2. Subjects were classified as non-vegetarian, semi vegetarian, pesco vegetarian, lacto-ovo-vegetarian and strict vegetarian. ANCOVA was used to determine associations between dietary pattern and metabolic risk factors while controlling for possible confounding factors such as sex, age, ethnicity, physical activity and other relevant factors. Odds ratios for being over the risk threshold as defined by the Adult Treatment Panel III for each metabolic risk factor and the MetS were calculated with non-vegetarians being set as the group of reference. Results: After multiple adjustments the odds ratio of having a waist circumference that was over the risk threshold was halved for pesco vegetarians (OR=0.49, CI=0.32-0.73) and semi vegetarians (OR=0.49, CI=0.36-0.67) and reduced by two thirds for strict vegetarians (OR=0.32, CI=0.19-0.55). The OR for high blood pressure was reduced by half for lacto-ovo-vegetarians (OR=0.53, CI=0.39-0.72) and the OR of high glucose levels was significantly reduced in lacto-ovo-vegetarians (OR=0.64, CI=0.45-0.92) and strict vegetarians (OR=0.42, CI=0.22-0.78). Strict vegetarian had the lowest risk for MetS (OR=0.33, CI=0.17-0.61) followed by lacto-ovo-vegetarians (adjusted OR=0.65, CI=0.47-0.90). Conclusions: Dietary patterns characterized by lower intakes of animal products are associated with a lower metabolic risk profile and may thus contribute in the prevention of metabolic disease.

[S405] Serum cholesterol concentrations in meat-eaters, fish-eaters, vegetarians and vegans in EPIC-Oxford

Kathryn E. Bradbury 1, Francesca L. Crowe 1, Paul N. Appleby 1, Julie A. Schmidt 1, Ruth C. Travis 1, Tim Key 1
1Cancer Epidemiology Unit, University of Oxford, Oxford, UK

Background: Compared to non-vegetarians, studies have shown that vegetarians and vegans have lower serum total and LDL cholesterol concentrations. Differences between diet groups in serum concentrations of the apolipoproteins A-I and B are not well characterized. Methods: This cross-sectional analysis was conducted on a sub-sample of 424 meat-eaters, 425 fish-eaters, 423 vegetarians and 422 vegans from the European Prospective Investigation into Cancer and Nutrition (EPIC)-Oxford cohort. Serum concentrations of total and HDL cholesterol, and apolipoproteins A-I and B were measured in blood samples collected at recruitment. Results: Vegans had the lowest body mass index, the highest intakes of polyunsaturated fat and fiber and the lowest intakes of saturated fat and alcohol. The mean (SD) serum total cholesterol concentration was highest in meat-eaters [5.13 (1.02) mmol/L], followed by fish-eaters [4.96 (1.00) mmol/L], vegetarians [4.81 (0.90) mmol/L], and vegans [4.42 (0.86) mmol/L] (p < 0.001 for difference between groups). Similarly, the mean
(SD) serum apolipoprotein B concentration was highest in meat-eaters [92 (23) mg/dl], followed by fish-eaters [87 (23) mg/dl], vegetarians [84 (20) mg/dl] and vegans [78 (21) mg/dl] (p < 0.001). The mean (SD) serum apolipoprotein A-I concentration was similar in meat-eaters [157 (24) mg/dl], fish-eaters [159 (25) mg/dl] and vegetarians [158 (27) mg/dl], but lower in vegans [153 (24)] (p = 0.006). The mean (SD) HDL cholesterol concentration was 1.36 (0.34) mmol/L in meat-eaters, 1.38 (0.33) mmol/L in fish-eaters, 1.32 (0.33) mmol/L in vegetarians, and 1.28 (0.30) mmol/L in vegans (p < 0.001). **Conclusion:** In this study, which included a large number of vegans, serum total cholesterol and apolipoprotein B concentrations were highest in meat-eaters and lowest in vegans. Serum HDL cholesterol and apolipoprotein A-I concentrations were lowest in vegans. Funded by Cancer Research UK.

**[S406] Differences in food consumption between vegetarian-spectrum dietary patterns in Adventist Health Study-2**

*Michael Orlich¹, Joan Sabaté¹, Karen Jaceldo-Siegl¹, Jing Fan¹, Pramil. Singh¹, Gary Fraser¹*

¹Loma Linda University, Loma Linda, California

**Background:** Vegetarian diet patterns have been defined by an absence of certain animal foods, but the consumption of other foods may also differ in important ways. We sought to identify how the consumption of various food groups differed among vegetarian-spectrum dietary patterns in Adventist Health Study-2 (AHS-2). **Methods:** AHS-2 is a cohort of 96,469 Seventh-day Adventists recruited between 2002-2007. Diet was assessed by a quantitative food frequency questionnaire. Diets were classified into five patterns: vegan, lacto-ovo vegetarian, pesco vegetarian, semi vegetarian and non-vegetarian. Individual foods were classified into 43 minor, non-overlapping food groups, which were further clustered into 16 major food groups. Mean values, adjusted for age, sex and race by direct standardization and standardized to 2000 kcal/day by simple division, were compared for the vegetarian diet patterns compared to the non-vegetarian diet. **Results:** Vegetarians consumed less meats, dairy products and eggs than did non vegetarians, by definition. Additionally, vegetarians consumed substantially less caloric beverages, sweets and added fats than did non-vegetarians; they consumed notably greater amounts of nuts and seeds, soy foods and meat analogues, legumes, grains, potatoes, avocados, vegetables and fruits. **Conclusion:** The food consumption patterns of vegetarians differ markedly from those of non-vegetarians, beyond their reduced consumption of animal foods, in ways which might have health effects.
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Suruchi Mishra 1, Neal D Barnard 1,2, Jia Xu 1, Ulka Agarwal 1, Joseph Gonzales 1, Susan Levin 1

1 Physicians Committee for Responsible Medicine, 5100 Wisconsin Avenue, Washington, DC 20016, 2 George Washington University School of Medicine and Health Sciences, Washington, D.C.

Background: To determine the effects of a low-fat plant-based diet program on anthropometric and biochemical measures in a multicenter corporate setting. Methods: Employees from 10 sites of a major United States company with BMI ≥25 kg/m2 and/or previous diagnosis of type 2 diabetes were asked to either follow a low-fat vegan diet, with weekly group support and work cafeteria options available, or make no diet changes for 18 weeks. Dietary intake, body weight, plasma lipid concentrations, blood pressure and glycated hemoglobin (HbA1C) were determined at baseline and 18-weeks. Results: Mean body weight fell 2.9 kg and 0.06 kg in the intervention and control groups, respectively (P<0.001). Total and LDL cholesterol fell 8.0 mg/dl and 8.1 mg/dl in the intervention group and 0.01 mg/dl and 0.9 mg/dl in the control group (P<0.01). HbA1C fell 0.6 and 0.08 percentage point in the intervention and control group, respectively (P<0.01). Among study completers, mean changes in body weight were -4.3 kg and -0.1 kg in the intervention and control groups, respectively (P<0.001). Total and LDL cholesterol fell 13.7 mg/dl and 13.0 mg/dl in the intervention group and 1.3 mg/dl and 1.7 mg/dl in the control group (P<0.001). HbA1C levels decreased 0.7 and 0.1 percentage point in the intervention and control group, respectively (P<0.01). Conclusion: An 18-week dietary intervention using a low-fat plant-based diet in a corporate setting improves body weight, plasma lipids and, in individuals with diabetes, glycemic control.

[P502] Adoption of plant-based diet improves lipid profile in all participants

Francisco E. Ramirez 1, Alfred O. Irizarry 1, Snorri Olafsson 2, Neil Nedley 1

1 Research, Nedley Clinic, Ardmore, OK, USA 2 Assistant Professor, Loma Linda University, Loma Linda, USA

Background: It is known that plant-based diets have a positive effect on blood lipids. This study investigated whether a change from the Standard American Diet to a plant-based diet in an area with a very poor selection of fruits and vegetables can be effective in lowering the lipid profile. The study was conducted in San Felipe, Mexico, a desert location with no fruit/vegetable production of its own. Often what is imported is of poor quality and selection, especially as compared to the average American market. Methods: A total of 37 Caucasian seniors wintering in Mexico participated in a two-week plant-based intervention. The educational component of this investigation included twice a week classes that included diet and lifestyle instruction, plant-based cooking classes, menu planning and recipe book distribution. Dietary evaluation was conducted via food frequency questionnaires. Fasting serum lipids were measured at the start of the program and again at commencement. Results: 26 of the 37 (13 males and 24 females) participants completed the two-week plant-based diet. All participants decreased their total cholesterol. The average cholesterol and LDL cholesterol decreased 21%, triglycerides 11%. HDL cholesterol decreased by 12%. Conclusion: A plant-based diet, even in areas where there is a poor quality and selection of produce, can have an excellent lipid lowering effect during a very short treatment intervention.

[P503] Protein assessment of vegetarian adolescents in Brazil

Carolina Veira de Mello Barros Pimentel 1,2, Sonia Tucunduva Philippi 1, Gabriela da Silva Macedo 2, Conceição Maria Costa Sena 2, Ana Carolina Barco Leme 1

1 Department of Nutrition, School of Public Health, University of São Paulo, São Paulo, Brazil, 2 Paulist University, São Paulo, Brazil

Background: The prevalence of vegetarianism in Brazil is not available for any stage of life. Vegetarian diet is an eating pattern that doesn’t include meat and/or products containing these foods. Various
sub categories of vegetarian diets could or not include eggs, milk and dairy products. In this sense, all of these foods are proteins sources. Furthermore, vegetarians tend to have a lower body mass index and most of the time the vegetarian diet is nutritionally adequate. The main concern about vegetarian diet is protein adequacy. The aim of this study is to evaluate the adolescents’ nutritional status and protein consumption. **Methods:** This was a cross-sectional study with 15 vegetarian adolescents aged 12 to 19 years enrolled in the city of São Paulo. Protein intake was assessed through a 24-hour recall and the nutritional status through height and weight measurements. **Results:** 60% (n=9) of the adolescents have normal weight, 33% (n=5) have risk of overweight and obesity. The average of protein consumed by the population studied was 53.35g (SD=30.63) and 44g (SD = 5.57) are the recommendation for this population. **Conclusion:** Although protein intake was below the recommendation in almost half of the adolescents’ sample, most of them were normal weight. These results suggest the importance of supporters to seek care in a vegetarian diet for nutritional assessment and dietary adequacy.

**[P601] Is infant feeding type associated with food consumption pattern during adolescence?**
**Edward Bitok**, **Ahmed Al Abdralnabi**, **Gina Siapco**

1Department of Nutrition, School of Public Health, Loma Linda University, Loma Linda, California

**Background:** It is largely hypothesized that infant feeding type determines food eating patterns both in childhood and adulthood. **Objective:** The purpose of this investigation was to explore whether there are any discernible food consumption patterns for adolescents who were exclusively breastfed or fed with either soy- or dairy-based formula as infants. **Methods:** In a cross-sectional study, participants ages 12-18 years old (n=305, 144 males and 161 females) recruited from four Seventh-day Adventist academies in Southern California filled out a web-based food frequency questionnaire where they were asked to report intake during the past month. Participants also self-reported whether they were breastfed, or fed with dairy-based or soy-based formula during infancy. Data were analyzed using frequency distributions, goodness of fit tests, and ANOVA. **Results:** Out of 305 participants, 172 (56%) reported to have been exclusively breastfed, 86 (28%) were fed dairy-based formula, and 47 (16%) were fed soy-based formula. These groups have similar proportions of males and females. Adolescents exposed to soy-based formula did not significantly eat more soy/soy-containing food/beverages. Dairy intake levels were similar among the groups. Although 60% of the dairy-based formula fed adolescents were either medium or high consumers of meat, the groups did not differ significantly in meat intake. The groups also had similar intake levels of fruits, vegetables, starches and other foods/food groups. **Conclusion:** In this population, exposure to exclusive breastfeeding, soy or dairy based formula during infancy is not associated with choice of food during adolescence.

**[P602] Meeting the Nutrient Reference Values on a vegetarian diet**
**Michelle Reid**, **Kate Marsh**, **Carol Zeuschner**, **Angela Vince Saunders**, **Surinder Baines**

1Sanitarium Health & Wellbeing, NSW, Australia, 2Sydney Adventist Hospital, NSW, Australia, 3Northside Nutrition and Dietetics, Sydney, NSW, Australia, 4University of Newcastle, NSW, Australia

Surveys over the past 10 years have shown that Australians are increasingly consuming more plant-based vegetarian meals. Many studies demonstrate the health benefits of vegetarian diets. As with any type of eating plan, vegetarian diets must be well planned to ensure nutritional needs are being met. This clinical focus project shows how well planned vegetarian diets can meet almost all the nutritional needs of children and adults of all ages. Sample single-day lacto-ovo-vegetarian meal plans were developed to meet the Nutrient Reference Values (NRVs), including the increased requirements for iron and zinc at 180% RDI and 150% RDI respectively for vegetarians across all NRV age and gender groups. With the exception of vitamin D, long chain omega-3s and extended
iron requirements in pregnancy, the single-day lacto-ovo-vegetarian meal plans met key requirements including energy, protein, carbohydrate, total fat; saturated, poly- and monounsaturated fats, ALA, fibre, iron, zinc, calcium, folate, vitamins A, C, E and B12.

[P701] Nutrient intakes of Taiwanese vegetarians
Tina H. T. Chiu 1, Jason P. C. Chiu 2, Ming-Nan Lin 3, Chin-Lon Lin 1
1Medical Mission, Tzu Chi Foundation, Hualien, Taiwan, 2Department of Computer Science, University of British Columbia, Vancouver, Canada, 3Department of Family Medicine, Buddhist Dalin Tzu Chi Hospital, Chiayi, Taiwan

Background: Although a well-planned vegetarian diet could be healthy, vegetarians could potentially have insufficient intake of several essential nutrients, particularly in countries with little fortified food sources. We analyzed nutrient intake from three days of dietary records in 78 participants of the validation sub-study of the Tzu Chi Health Study, and compared nutrient intake to Taiwan's Dietary Reference Intakes (DRI). Methods: All participants were instructed by a trained research dietitian to complete at least three days of dietary records within two weeks of the period. All dietary records were coded by the same dietitian. Nutrient intakes were analyzed in a computer program based on Taiwan's Food Composition Database, and additional data on folate and vitamin D compiled by experts in Taiwan. Participants who did not record any intake of meat, poultry and fish were classified as vegetarians. Results: Vegetarians had significantly lower intake of cholesterol, saturated fat, EPA, DHA and vitamin B12. There is no significant difference for other nutrients. Vegetarians had a median intake of 0.89g of protein/kg body weight, while non-vegetarians consumed 1.02g protein/kg body weight. Intakes of several nutrients were low in both vegetarians and non-vegetarians (proportion of participants getting 80% of DRI in parenthesis): calcium – vegetarians (11%), non-vegetarians (10%); vitamin D – vegetarians (23%), non-vegetarians (24%); zinc – vegetarians (16%), non-vegetarians (29%). Conclusion: Vegetarians had low intake of vitamin B12, EPA and DHA. Both vegetarians and non-vegetarians should be advised to ensure adequate vitamin D and calcium. More efforts should be devoted to providing plant sources of these nutrients and to educating vegetarians on planning a nutritionally adequate diet.

[P702] Iron and vegetarian diets
Angela Saunders 1, Winston J Craig 2, Surinder Baines 2, Jennifer S Posen 3
1Sanitarium Health & Wellbeing, 2Andrews University, 3Sydney Adventist Hospital

Vegetarians who eat a varied and well balanced diet are not at any greater risk of iron deficiency anemia than non-vegetarians. A diet rich in whole grains, legumes, nuts, seeds, dried fruits, iron fortified breakfast cereals and green leafy vegetables provides an adequate iron intake. Vitamin C and other organic acids enhance non-heme iron absorption, a process that is carefully regulated by the gut. People with low iron stores or higher physiological need for iron will tend to absorb more iron. Research to date on iron absorption has not been designed to accurately measure absorption rates in typical Western vegetarians with low ferritin levels.

[P703] Association between genetic polymorphisms of fatty acid desaturases and blood lipid profiles among Japanese vegetarians
Chiharu Nishijima 1, Keiko Nakamoto 2, Kazuhiro Nakayama 3, Sadahiko Iwamoto 4, Terue Kawabata 1, Yasuo Kagawa 1
1Kagawa Nutrition University, 2San-iku Food Company, 3Jichi Medical University, Japan

Background: Recent reports have suggested that dietary long-chain polyunsaturated fatty acids (LCPUFAs) interact with genetic factors to modify the lipid profiles. Meanwhile, vegetarians consume little or no animal derived LCPUFAs, and therefore maintain blood levels of LCPUFAs mainly depending on endogenous biosynthesis. In order to confirm the interaction between polymorphisms and dietary patterns as well as internal lipid status, we investigated the PUFA
concentrations and lipoprotein levels of Japanese vegetarians. **Methods:** Subjects were 75 Japanese vegetarians of both genders. Dietary FA intake was calculated from a digital-photograph assisted 3-day dietary record. Participants were divided into three groups according to dietary patterns: no animal products but dairy (“V” n=43), fish eaters (“F” n=22), no fish but meat and egg eaters (“M” n=10). Three single nucleotide polymorphisms (SNPs) reported to be associated with lipid profiles were determined by using TaqMan Genotyping Assay Systems. Erythrocyte PUFA status was analyzed by gas-chromatography. For 55 of participants, serum lipoprotein fractions were analyzed by anion-exchange chromatography. **Results:** Comparing the PUFA status with dietary patterns, “V” had higher concentrations of linoleic acid (LA) (p=0.012) and alpha-linolenic acid (ALA) (p=0.003) and lower n-3 LCPUFAs (p<.0001) than other two. According to genotypes, minor allele of rs2397142 in “F” was associated with higher arachidonic acid (p=0.046) and lower eicosapentaenoic acid (p=0.045), and lower LDL cholesterol (p=0.005). In all dietary patterns, the minor allele carriers of rs174547 tended to have higher precursors and lower LCPUFAs. Among them, “V” had lower HDL cholesterol (p=0.036) and Lp(a) cholesterol (p=0.012), and “M” had lower LDL cholesterol (p=0.045). The correlation between lipoproteins and LA/ALA intake was observed in rs174547 minor allele. **Conclusion:** The effects of polymorphisms on blood lipid profiles appear to be emphasized or diminished along with dietary PUFA composition, especially with the intake level of LCPUFAs and the ratio of LA/ALA.

**[P801] The CARVOS Study: Lower prevalence of chronic disease risk factors in vegetarian and semi-vegetarian Brazilians**


1Heart Institute (InCor) University of São Paulo Medical School São Paulo, Brazil, 2University of São Paulo Public Health School, Brazil, 3Mario Margarido Health Basic Unit of Ferraz de Vasconcelos, Brazil

**Background:** Meat consumption and other factors like excess body weight and smoking have been associated with an increased risk of chronic diseases. Our objective was to investigate the association of meat consumption with reported chronic diseases, according to demographic, social and anthropometric variables. **Methods:** 549 adults (≥ 18 years) of both sexes, who answered a questionnaire to select people for The CARVOS Study (Carotid Atherosclerosis, Aortic Stiffness and Risk Factors in Vegetarians and Omnivorous Subjects) were studied. The variables analyzed were: age, gender, education level, meat consumption, reported chronic diseases, smoking and body mass index (BMI) (kg/m2). Study subjects were classified as omnivorous (OM=consumption of meat four or more times/week) (n=228, 41.53 %), semi-vegetarians (SV=consumption of meat 1-3 times/week) (n=97, 17.67%) and vegetarians (V=no consumption of meat or fish) (n=224, 40.8%). The differences between mean values was calculated by T-test. To test the association between the variables, chi-square test and univariate logistic regression were used (p <0.05, CI = 95%). **Results:** There was a greater prevalence of smokers among OM than SV and V respectively 56.5%, 14% and 29.4 %, p=0.009. The same was observed regarding BMI 24.8, 23.4 and 23.3 kg/m2, respectively for OM, SV and V p<0.01. There was a higher prevalence of overweight (41.7%) in OM in comparison with SV (29.2%) and V (29.0%), p=0.008. In an exploratory analysis excluding SV subjects, OM (considering the people who eat meat at least one time per week) reported more hypertension prevalence than V (71.4% vs. 57.8%; p=0.049). Comparing the three categories, dyslipidemias were most frequently referred by OM in comparison with V and SV (54.6% vs. 28.9 % and 16.5%; p=0.011). Being OM significantly increased the risk of referring dyslipidemia (OR 2.12, CI 1.28-3.50). **Conclusion:** Meat consumption was associated with a greater prevalence of risk factors for chronic disease.
[P802] Intake of dairy products, calcium and prostate cancer risk: a systematic review and meta-analysis of cohort studies
D. Aune 1, 2, D. S. M. Chan 2, A. R. Vieira 2, D. A. Navarro Rosenblatt 2, R. Vieira 2, D.C. Greenwood 3, P. Romundstad 1, L. J. Vatten 1, T. Norat 2

1Department of Public Health and General Practice, Faculty of Medicine, Norwegian University of Science and Technology; 2Department of Epidemiology and Public Health, Imperial College, London, United Kingdom; 3Biostatistics Unit, Centre for Epidemiology and Biostatistics, University of Leeds, Leeds, United Kingdom

**Background:** Epidemiological studies of dairy product and calcium intake in relation to prostate cancer risk have indicated an increased risk, but it is unknown whether calcium from supplements or non-dairy sources is associated with risk. **Methods:** To further explore these associations we conducted a systematic review and meta-analysis of published prospective studies. Summary relative risks were estimated using a random effects model. **Results:** Twenty-nine prospective studies could be included in the analyses. Intake of total dairy products, summary RR=1.06 (95% CI: 1.02-1.10, I2=36%) per 400 g/d, total milk, summary RR=1.03 (95% CI: 1.00-1.07, I2=14%) per 200 g/d and cheese, summary RR=1.09 (95% CI: 1.01-1.18, I2=0%) per 50 g/d, was associated with increased prostate cancer risk. Total calcium, summary RR=1.02 (95% CI: 1.01-1.04, I2=2%) per 400 mg/d, dietary calcium, summary RR=1.03 (95% CI: 1.01-1.05, I2=33%) per 400 mg/d and dairy calcium, summary RR=1.06 (95% CI: 1.02-1.09, I2=33%) per 400 mg/d, but not nondairy calcium, summary RR=0.97 (95% CI: 0.90-1.04, I2=0%) per 400 mg/d or supplemental calcium intakes, summary RR=0.99 (95% CI: 0.96-1.02, I2=0%) per 400 mg/d, were significantly associated with prostate cancer risk in linear dose-response analyses. Nonlinear associations were observed for milk, total calcium and dietary calcium, reaching a plateau when increasing milk intake from low intakes to 100 g/d, while the positive associations with total and dietary calcium were most apparent at the higher levels of intake. **Conclusion:** Our results support that high intake of dairy products, milk, low fat milk, cheese, dietary calcium and dairy calcium intake may increase prostate cancer risk, whereas no association was observed for supplemental calcium and nondairy calcium. The diverging results for types of calcium might suggest that other components of dairy than calcium may contribute to prostate cancer risk.

[P803] Whole grain and refined grain consumption and the risk of type 2 diabetes: A systematic review and dose-response meta-analysis of cohort studies

Aune D. 1, 2, Norat T. 2, Romundstad P. 1, Vatten L. J. 1

1Department of Public Health and General Practice, Faculty of Medicine, Norwegian University of Science and Technology; 2Department of Biostatistics, School of Public Health, Imperial College, London, United Kingdom

**Background:** Several studies have suggested a protective effect of intake of whole grains, but not refined grains on type 2 diabetes risk, but the dose-response relationship between different types of grains and type 2 diabetes has not been established. We conducted a systematic review and meta-analysis of prospective studies of grain intake and type 2 diabetes. **Methods:** We searched the PubMed database for studies of grain intake and risk of type 2 diabetes, up to November 7, 2012. Summary relative risks were calculated using a random effects model. **Results:** Thirteen cohort studies were included in the analyses. The summary relative risk per three servings per day was 0.83 (95% CI: 0.75-0.91, I2=36%, n=4) for total grains, 0.67 (95% CI: 0.55-0.81, I2=85%, n=8) for whole grains and 0.98 (95% CI: 0.90-1.08, I2=35%, n=5) for refined grains. Nonlinear associations were observed for total grains, p-nonlinearity=0.001, and whole grains, p-nonlinearity<0.0001, but not for refined grains. Inverse associations were observed for subtypes of whole grains, while white rice was associated with increased risk, but the results for subtypes of whole grains were based on few studies. **Conclusions:** Our results support the hypothesis that a high intake of total grains and whole grains, but not refined grains, reduces the risk of type 2 diabetes, while white rice is associated with increased risk. Any further studies should assess different subtypes of grains in relation to risk of type 2 diabetes.
**[P804] A dietitian-led wellness program for cancer survivors and family in Taiwan**

*Tina H.T. Chiu¹, Chia-Hou Lin², You-Kang Chang³*

¹Medical Mission, Tzu Chi Foundation, Hualien, Taiwan, ²Taiwan Vegetarian Nutrition Society, Taiwan, ³Department of Radiation Oncology, Buddhist Tzu Chi General Hospital, Taipei, Taiwan

**Background:** Lifestyle; including diet, physical activity and spiritual wellness, may affect survival and quality of life for cancer patients. In Taiwan, cancer care focuses on conventional treatments such as chemo and radiation therapy. While nutrition counseling with dietitian is available during the course of treatment, such support ceases after patients finish treatments. We designed a 4-week program to assist lifestyle changes for patients and family members. **Methods:** The program included classes on planning and cooking healthy vegan meals, exercise (Tai Chi), coping with challenges in life, organic gardening and an experience sharing session with successful cancer survivors. In addition, participants joined an organic vegan buffet after every class to taste a healthy plant-based diet. Participants were instructed to make dietary and exercise records and dietitians analyzed these records to provide feedback. **Results:** Nineteen cancer survivors and eleven family members joined the program. The diagnosis of patients included breast cancer (35%), thyroid cancer (9%), lung cancer (6%) and other cancers (16%). Forty-one percent were already vegetarians but wanted to learn how to eat more healthfully. Nutrition analysis revealed that many cancer patients depended on fast food and were eating too much refined carbohydrates and not enough of the other food groups. Participants found the program to be very helpful in planning and preparing a healthy diet. Many non-vegetarian participants were motivated to adopt a plant-based diet as a result. **Conclusion:** From this pilot program, we found cancer patients are in need of nutrition assistance post treatment. A vegetarian diet may be attractive to patients who seek for mind-body healing. A holistic program incorporating diet, exercise, organic gardening, living in harmony with cancer and caring for our environment could be helpful for these patients.

**[P805] The essential role of plant-based diets on the acid-base balance**

*Peter Deriemaeker¹ ², Dirk Aerenhouts¹ ², Marcel Hebbelinck³, Peter Clarys¹ ²*

¹Department of Human Biometrics and Biomechanics, Vrije Universiteit Brussel, Brussels, Belgium, ²Erasmus University College, Brussels, Belgium

**Background:** There is a vast body of evidence that food intake affects acid-base balance in the human body. In general a high protein intake has an acidifying effect, while a high fruit and vegetable intake has a more alkaline effect and as such reduces the acid load. One of the most striking effects of a dietary acidic overload may result in demineralization of the bone. A first objective of the present study was to estimate the acid-base balance of the food intake in vegetarians and non-vegetarians. A second objective was to evaluate if additional input of specific food items on the existing potential renal acid load (PRAL) list was necessary for the comparison of the two dietary patterns. **Methods:** Thirty vegetarians between the age of 18 and 30 years were matched for sex, age and BMI with 30 non-vegetarians. Based on the 3-days food diaries the acid-base status of the food intake was estimated using the PRAL method. **Results:** Mean PRAL values as estimated with the standard table yielded an alkaline load of -5.4±14.4 mEq/d in the vegetarians compared to an acid load of 10.3±14.4 mEq/d in the non-vegetarians (p<0.001). Mean PRAL values as estimated with the extended table yielded an alkaline load of -10.9±19.7 mEq/d in the vegetarians compared to an acid load of 13.8±17.1 mEq/d for the non-vegetarians (p<0.001). **Conclusion:** The findings of this study indicate that vegetarian food intake produces more alkaline outcomes compared to non-vegetarian diets. The use of the standard PRAL table was sufficient for discrimination between the two diets.
[P806] The lifestyle and the prevalence of vegetarianism in Seventh-day Adventists Hispanics  
Maribel Hidalgo 1, Peter Pribis 1, Magaly Hernandez 1  
1School of Health Professions, Department of Nutrition & Wellness, Andrews University, Berrien Springs, MI

Background: Chronic diseases are the leading causes of death and disability in the United States and account for seven out of every ten deaths. While the etiology of chronic diseases is multifactorial, individual modifiable behaviors play an important role in both risk and prevention. Hispanics are disproportionately affected by chronic diseases and are a growing and significant population. There is minimal research regarding the lifestyle of the Seventh-day Adventists (SDA) among the Hispanic community. The purpose of this cross-sectional observational study was to ascertain the lifestyle, health status, eating and physical activity habits of the Hispanic SDAs from the Lake Union Conference. Methods: We used an anonymous survey distributed in person to a convenience sample of 120 participants 18 years or older in the Hispanic SDA churches of Berrien Springs, Grand Rapids and Indianapolis. The survey was divided into five sections: demographics, eating habits, physical activity habits, quality of life questions and a Food Frequency Questionnaire. Results: Most of the Hispanics came from Mexico, Dominican Republic and Puerto Rico, 52% of the participants were female and 48% males. Only 36% of participants carried health insurance. We identified 44% as non-vegetarian, 31% as lacto-ovo-vegetarian, 8% as pesco-vegetarian and 7% as vegan. The main reason given for adopting a vegetarian lifestyle was health concern; the average span following a vegetarian lifestyle was 23.4±16.9 years (range 1-57). Conclusion: Significant portion of Hispanic SDAs (56%) follow vegetarian diet, mostly for health concerns.

[P807] Withdrawn

[P808] Do men or women respond better to a 30-day plant-based lifestyle modification program?  
Lillian Kent 1, Paul Rankin 1, Darren Morton 1  
1Lifestyle Education Research Group, Avondale College of Higher Education, NSW, Australia

Background: The Complete Health Improvement Program (CHIP), a 30-day lifestyle modification program that emphasizes a plant-based eating pattern, has been shown to effectively reduce selected risk factors for chronic disease, but the role of gender has not been elucidated. Methods: Changes in body weight, blood pressure, blood lipid profile and fasting plasma glucose were assessed in 5,046 participants (33.5% male, age=57.9±13.0 yrs; 66.5% female, age=57.0±12.9 yrs) from CHIP programs conducted in the United States between 2006 and 2009. Results: Significant reductions (p<0.001) were found for both men and women for all biometrics, but reductions were significantly greater (p<0.001) among men for low-density lipoprotein (16% versus 12%), total cholesterol (13% versus 10%), triglycerides (11% versus 6%), fasting plasma glucose (8% versus 5%), body mass index (6% versus 5%) and diastolic blood pressure (3.5% versus 3%). There was no significant difference in the reduction in systolic blood pressure between men and women (6% versus 5%). The reduction in high-density lipoprotein was significantly greater (p<0.001) for women than for men (9% versus 8%), but the reduction in the total cholesterol/high-density lipoprotein ratio was significantly greater (p<0.001) for men than for women (6% versus 1%). For both genders, participants who entered the program with the highest classifications of total cholesterol, low-density lipoprotein, triglycerides and fasting plasma glucose tended to experience the greatest reductions in these measures in 30 days. Conclusion: The CHIP 30-day lifestyle program effectively reduced risk factors for cardiovascular disease among both genders, but particularly men, with the largest reductions occurring in individuals at greatest risk. Physiological or behavioral factors, which may explain the advantage enjoyed by men, are discussed.
[P809] Duration of vegetarian diet and prevalence of type 2 diabetes mellitus and impaired fasting glucose

Chin-Lon Lin¹, Ming-Nan Lin², Hui-Ya Huang², Yen-Feng Chiu³, Tina H. T. Chiu¹
¹Medical Mission, Tzu Chi Foundation, Hualien, Taiwan, ²Department of Family Medicine, Buddhist Tzu Chi General Hospital, Chiayi, Taiwan, ³Division of Biostatistics and Bioinformatics, National Health Research Institute, Zhunan, Taiwan

Background: A vegetarian diet improves glucose metabolism by reducing body weight in overweight Westerners but whether it benefits normal weight Asians, and whether the protective effect strengthens with increasing duration is unknown. We evaluated the prevalence of Type 2 diabetes (T2DM) and impaired fasting glucose (IFG) by durations of vegetarian diet and proportion of lifespan as vegetarian. Methods: All participants (2,419 men and 3,560 women) underwent a comprehensive health examination and a health interview to obtain data on demographic, medical history, diet and vegetarian diet practices. We identified cases of diabetes and IFG from medical history questionnaire and fasting plasma glucose, and confirmed T2DM diagnosis in either the medical records or in a telephone follow-up. Polytomous logistic regression was applied to examine the impact on T2DM and IFG by different durations of vegetarian diet and proportion of lifespan as vegetarian. Results: Non/short term vegetarians were more likely to have T2DM and IFG than medium-term vegetarians (T2DM: OR=0.69, p=0.045; IFG: OR=0.79, p=0.056) and long-term vegetarians (T2DM: OR=0.43, p<0.0001; IFG: OR=0.67, p=0.0013) after adjusting for age, gender, family history of diabetes, education, Tzu Chi commissioner status and BMI. Similarly, a clear dose-dependent protective effect of vegetarian diet is seen, when presented as proportion of lifespan. Conclusion: Both absolute and relative vegetarian duration showed significant dose-response protective associations with T2DM and IFG, independent of BMI.

[P810] The effect of the vitamin B12 supplement on the plasma homocysteine levels in vegetarians

Ming-Nan Lin¹, Hui-Ya Huang¹, Chin-Lon Lin², Tina H. T. Chiu²
¹Department of Family Medicine, Buddhist Tzu Chi General Hospital, Chia-yi, Taiwan, ²Medical Mission, Tzu Chi Foundation, Hualien, Taiwan

Background: Diet has been known to be one of the most important factors for health. Vegetarian diet has been proven to be good for health in Western society; however, the serum level of vitamin B12 tends to be lower in vegetarians and hence increases the serum level of homocysteine which is known to be a risk factor for coronary heart diseases. Objective: Supplementation of vitamin B12 will improve the serum blood level of vitamin B12 and reduce the serum homocysteine. There are few studies focusing on the effect of vitamin B12 supplementation on serum homocysteine and the duration of its effect, especially in the oriental vegetarian diet. Method: 65 vegetarians with Hcy more than 12 µmole/L were selected and informed consent was received prior to the trial. They were randomly assigned to the experimental (N=33) and control groups (N=32). 500 µg VitB12 for the experimental group and placebo for the control group were given with double blinding procedure for six months, then the supplementation was stopped. Serum vitamin B12 and homocysteine levels were checked before the trial, at 3, 6, and 12 months. Results: The mean vitamin B12 before the trail was 207.7 ± 68.4 pg/mL in the experimental group and 235.8 ± 102.9 pg/mL in the control group, which was statistically insignificant. Vitamin B12 level was statistical significantly higher in the experimental group at third month and sixth month but returned to statistically insignificant at the ninth and twelfth months. Homosysteine level became statistically lower in the experimental group at the third month and remained statistically lower throughout the year. Conclusion: Vitamin B12 supplementation can effectively reduce the Hcy level in vegetarians in three months. 500 µg VitB12 qd PO for six months can improve the Hcy level at least for 12 months in vegetarians with hyperhomocysteinemia.
**[P811] The influence of lacto-ovo-vegetarian diet on insulin resistance**  
*Szentagotai Lorant 1*  
1Thedora Elder House, Promedical Center, Cluj Napoca.

**Background:** Insulin resistance plays a central role in the pathogenesis of cardiovascular illnesses, diabetes, arterial hypertension and obesity. Diets rich in complex carbohydrates, vegetative fibres, proteins of vegetable origin low in SFA—which are all essential components of lacto-vegetarian diets— are associated with a low secretion of insulin and the maintaining of insulin sensitivity.  

**Methods:** We had 153 subjects (77 lacto-vegetarians + 76 non lacto-vegetarians), all SDA members, non-smokers, non-drinkers and in good apparent health. We followed the markers of insulin resistance (HOMA), the triglyceride / HDL ratio, and obesity (BMI, Waist) in the diet flow (from the perspective of their capacity to lessen insulin resistance) correlated to the values of the dietary index (calculated on the basis of the Elderly Dietary Index).  

**Results:** Both HOMA insulin resistance markers (Lov: 1.735, Non Lov 2.245) Tg/Hdl (Lov: 2056, Non-Lov: 2.520) and those of obesity, BMI (Lov: 22.397, Non Lov: 24.430) Waist (Lov: 84.92, Non Lov 91.59) were significantly more favorable.  

**Conclusion:** Globalization is associated with an increase in the frequency of chronic degenerative illness, largely due to insulin resistance. Our study demonstrated the beneficial effects of a lacto-vegetarian diet with regard to the prevention of these illnesses, as they are associated with the reduction of body weight, reduction of insulin resistance and the reduction of cardiovascular risk factors.

**[P812] Legumes and meat analogs intake are associated with hip fracture risk independently of meat intake**  
*Vichuda Matthews 1, 2, Synnove Knutsen 1, W. Lawrence Beeson 1, Donna Thorpe 1, Raymond Knutsen 1, Gary Fraser 1*  
1Department of Epidemiology, School of Public Health, Loma Linda University, 2Los Angeles County, Department of Health Services, California  

**Background:** Dietary protein plays an important role in the maintenance of bone health. In contrast to non-vegetarians, vegetarians consume more legumes and meat analogs as sources of protein to substitute for meat intake. To assess the association between foods with high protein content by dietary patterns (vegetarian or omnivore) on the occurrence of hip fracture.  

**Methods:** Enrollees (n=33,208) of the Adventist Health Study-2 (AHS-2) completed a comprehensive lifestyle and dietary questionnaire between 2002 and 2007. Every two years after enrollment, a short questionnaire on hospitalizations and selected disease outcomes including hip fractures were sent to these members. Associations between hip fracture incidence and high protein foods (legumes, meat, meat analogs) and selected lifestyle factors were assessed using Cox proportional hazard regression.  

**Results:** In a multivariable model, with all three protein foods in the model with attained age as the time variable and adjusting for body mass index (BMI), gender, caloric intake, physical activity, total calcium intake, self-reported health status and smoking, legumes intake once a day or more reduced the risk of hip fracture by 55% (HR=0.45, 95%CI: 0.27-0.75)(p=0.005) compared to those with legumes intake less than once per week. Similarly, meat intake of four or more times per week was associated with a reduced risk of hip fracture of 46% (HR=0.54, 95%CI: 0.37-0.78)(p=0.001) compared to those whose meat intake was less than once per week. Among vegetarians, meat analogs consumption once a day or more was associated with a reduced risk of hip fracture of 62% (HR=0.38, 95%CI: 0.15-0.94)(p=0.01) compared to an intake less than once per week.  

**Conclusions:** Hip fracture incidence is inversely associated with legumes intake to a similar degree as meat intake. Among vegetarians, a high intake of meat analogs was associated with a significantly reduced risk of hip fracture.
[P813] Regular soy intake supports normal growth of both male and female adolescents

Tricia Norkunas¹, Lynnley Huey¹, Gina Segovia-Siapco¹

¹Department of Nutrition, School of Public Health, Loma Linda University, Loma Linda, USA.

Background: There is an association between reduced chronic disease risk and soy intake. Lifelong health can be impacted by obesity and overweight during adolescence. However, research on the impact of soy intake in growth and development of teens is limited; moreover, little is known if effects differ between genders. Objective: Our aim is to determine if a relationship between soy consumption and growth, and risk of overweight/obesity differs among adolescent males and females. Method: We conducted a cross sectional study among 300 adolescents (158 females, 142 males) ages 12-18 years attending Seventh-day Adventist schools in Southern California. A web-based food frequency questionnaire was used to assess soy consumption. Weight and height were measured during school visits. Association between soy intake and gender- and age-specific height and BMI z-scores were estimated with linear regression and odds of overweight/obesity with logistic regression. Results: Soy intake was not significantly different between the genders. Soy intake was not significantly associated with height nor with risk for overweight/obesity. For females, Hispanics, Asians, other ethnicities and those whose parents are of different ethnicities are significantly shorter relative to Caucasians (p=>.001, p=>.001, p=.011 and p=.024, respectively). For males, only Hispanics and Asians are significantly shorter compared to Caucasians (p=.020 and p=.001, respectively). Soy intake was not related to BMI. For females, those of “other” ethnicities (including Pacific Islander, West Indians and others) have a significantly higher BMI relative to Caucasians (p=.031). For males, African Americans have a significantly higher BMI relative to Caucasians (p=.032). Conclusion: We conclude that in both the males and females of this adolescent population, soy intake has a neutral effect on growth and risk of overweight/obesity. Funded by WhiteWave Foods.

[P814] The effects of dried California mission figs on hyperlipidemic adults

Joycelyn Peterson¹, Susan Montgomery¹, Ella Haddad², Lauren Kearney¹, Serena Tonstad¹

¹Department of Health Promotion and Education, School of Public Health, Loma Linda University ²Department of Nutrition, School of Public Health, Loma Linda University

Background: Figs are a rich source of soluble fiber. We evaluated the effect of consuming dried California mission figs into the daily diet on elevated low-density lipoprotein (LDL) cholesterol. Methods: In a crossover trial men and women aged 30–75 years with elevated low-density lipoprotein cholesterol (100–189 mg/dl) were randomized to add dried California mission figs (120 g/day) to their usual diet for five weeks or eat their usual diet for five weeks, then crossed over to the other condition for another five weeks. Six 24-hour dietary recalls were obtained. Results: Low and high-density lipoprotein cholesterol and triglyceride concentrations did not differ between usual and figs-added diets (Bonferroni-corrected p = 0.017), while total cholesterol tended to increase with fig consumption (p = 0.02). Total cholesterol increased in participants (n = 41) randomized to usual, followed by figs-added diet (p = 0.01), but remained unchanged in subjects (n = 42) who started with figs-added followed by usual diet (p = 0.4). During the figs added diet, soluble fiber intake was 12.6 versus 8.2 g/day in the usual diet (p= 0.0001). Sugar intake increased from 23.4 grams to 32.2 grams of kcal in the figs-added diet (p = 0.0001). Body weight did not change (p = 0.08). Conclusions: Daily consumption of figs were not statistically significantly to reduce low-density lipoprotein cholesterol. Triglyceride concentrations were not significantly changed despite an increase in sugar intake. Funded by the California Fig Advisory Board.
[P815] Non-soy legume consumption may be protective against central adiposity and hypertriglyceridemia
Gina Segovia-Siapco 1, Keiji Oda 2, Karen Jaceldo-Siegl 1,3
1Department of Nutrition, School of Public Health, Loma Linda University, Loma Linda, USA
2Department of Biostatistics and Epidemiology, School of Public Health, Loma Linda University, Loma Linda, USA
3Adventist Health Study-2, Loma Linda University, Loma Linda, USA

Background: Legume intake is associated with favorable health parameters; however, this is often attributed to soy. Studies on effects of non-soy legume intake on metabolic factors are lacking.

Objective: To investigate the relationship between intake of non-soy legumes and the prevalence of metabolic syndrome (MetSyn) and its components in a biethnic population.

Methods: We performed a cross-sectional analysis of dietary, anthropometric and clinical data from the Adventist Health Study-2 Calibration sub-study (298 males and 596 females; 43.5% Blacks and 56.5% Whites). Non-soy legume intake was determined from a food frequency questionnaire which had been validated for legume intake. MetSyn was defined according to NCEP/ATP III diagnostic criteria. Data were analyzed using descriptive statistics, comparison tests and logistic regression.

Results: MetSyn was present in 27% (n=259) of the subjects, 57% of which were Whites. Non-soy legume intake is inversely associated with central adiposity (p-for-trend=.038). Moderate consumers have 44% higher risk of central adiposity compared to high consumers (OR=1.44, 95% CI: 1.01-2.07). Among Blacks, intake of non-soy legumes is inversely associated with hypertriglyceridemia (p-for-trend=.027); moderate consumers have 161% higher risk compared to high consumers (OR=2.61, 95% CI: 1.11, 6.13). Conclusion: In a population known to have a healthy lifestyle, non-soy legume intake may protect against central adiposity and, among Blacks, against hypertriglyceridemia. Data collection funded by National Cancer Institute.

[P816] Vegetarians have a lower risk of obesity than non-vegetarians in high and low obesity environments
Nico Samuel Rizzo 1, Samuel Soret 2
1Department of Nutrition, School of Public Health, Loma Linda University, 2Department of Environmental Health and Geoinformatics Sciences, School of Public Health, Loma Linda University

Background: Obesity has become an epidemic in the U.S. and other countries with detrimental effects to the quality of life and health perspectives. Lifestyle factors such as dietary patterns may contribute in the prevention of obesity.

Objective: The purpose of the study was to investigate associations between vegetarian diets and obesity in high and low obesity environments.

Methods: Cross-sectional study of 55,676 subjects (age range 30 to 110 years) from the Adventist Health Study-2 with a complete set of data. Subjects were classified as vegetarian and non-vegetarian. County-level estimates of obesity provided by the CDC were stratified in quintile levels and individual level BMI was used. Logistic regression was used to assess the association between vegetarian dietary pattern and obesity stratified by county-level obesity adjusting for race, sex, age, physical activity, caloric intake and sedentary behavior.

Results: After multiple adjustments the odds ratios of being obese were substantially lower for vegetarians than non-vegetarians in all quintiles of county level obesity with odds ratios (OR) between 0.460 and 0.522. The odds ratios were lowest in counties with the two highest obesity quintiles (4th quintile OR=0.460, CI=0.406-0.521 and fifth quintile OR=0.469, CI=0.400-0.549)

Conclusions: Vegetarians have a lower risk of being obese than non-vegetarians in high and low obesity environments.
[P901] The use of vitamin and herbal supplements by vegetarian university students

*Winston Craig*¹, *Tatiana Kim*¹, *Ruth Serveli*¹, *Kylee Gumm*¹, *Jimmy Kijai*²

¹Department of Nutrition and Wellness, Andrews University, Berrien Springs, Michigan; ²Department of Educational and Counseling Psychology, Andrews University, Berrien Springs, Michigan

**Background:** The practice of complementary medicine on college campuses is not insignificant. Up to 80% of students in one study had used at least one herbal substance in the past 12 months. Furthermore, there is an increasing trend toward self-medication among college students. No survey data for the use of dietary and herbal supplements has been reported to determine if usage is influenced by dietary preference or other lifestyle factors. There is no published data showing supplement usage on a SDA university campus. **Methods:** 78 university students completed a three-page questionnaire outlining their demographic information, sleep and exercise habits, dietary preference, and their use of vitamin, mineral and herbal supplements. The students were contacted in general education classes and some upper division classes as well as student lobbies on the campus of Andrews University. Data was analyzed by SPSS. **Results:** Most common vitamin and nutrient supplements consumed by the students were multivitamins, vitamin C, vitamin D, iron and omega-3 capsules. About 25% of the students surveyed reported taking amino acids, protein powders and other body building supplements. The students taking supplements typically do body building, stretching and aerobic exercises for about eight hours a week. The most common herbal supplements consumed were green tea, chamomile, Echinacea and garlic. Vegetarians sleep almost half an hour longer each night and do aerobic exercise 20 minutes longer than non-vegetarians. While 79% of non-vegetarians reported feeling sleep deficient only 49% of the vegetarians reported this. Only three of the 11 students who reported taking vitamin B12 said they did so because they were vegetarian. Non-vegetarians were more likely to take iron, vitamins C and D, while vegetarians were more likely to use herbal supplements. **Conclusion:** Being a vegetarian did not appear to be a major motivation for students to use vitamin/mineral supplements.

[P902] Effects of vegan dietary program to nutritional status

*Chirlynor Ebora-Calbayan*¹, *Miriam Razon-Estrada*², *Jonathan W. Calbayan*³

¹Adventist International Institute of Advanced Studies, Silang, Cavite, Philippines, ²Adventist University of the Philippines, Silang, Cavite, Philippines, ³Culion Foundation, Makati City, Philippines

**Background:** Diet has the greatest potential in the attainment of better nutritional status in terms of body mass index, waist circumference, blood lipids, blood sugar and blood pressure. Thus, an effective dietary program is needed. It is the purpose of this study to determine the effects of vegan dietary program to nutritional status. **Methods:** This study utilized the quasi-experimental research design, using a pre-test, post-test and a follow-up test. Forty at-risk adults participated in the vegan dietary program that consisted of vegan cooking classes, vegan meals and nutrition education for four weeks. Nutritional assessment using anthropometric, biochemical and clinical measurements were employed to determine the effects of the vegan dietary program. Post-test and follow-up test were conducted after four weeks and 17 weeks, respectively. **Results:** There was a significant difference in body mass index, waist circumference, body fat percentage, fasting blood sugar and diastolic blood pressure between the pre-test and post-test, and between the pre-test and follow-up test. A significant difference on systolic blood pressure was only noted between the pre-test and post-test. Also, significant differences in HDL level and diastolic blood pressure were observed between the post-test and follow-up test. **Conclusion:** The vegan dietary program was effective in improving nutritional status in terms of body mass index, waist circumference, body fat percentage, fasting blood sugar and diastolic blood pressure at the end of the study.
[P903] Comparison of health-impacting nutrients from dairy and alternative cheese products in Trinidad
Patricia Dyett1, Ayana Small1, George Legall2
1Department of Agricultural Economics & Extension, The University of the West Indies, Trinidad; 2Department of Para-Clinical Sciences, The University of the West Indies, Trinidad

Background: Dairy cheese is commonly used on the island of Trinidad. However, some food stores offer vegetarian cheeses for consumers who perceive them as “more healthful” options. Health conscious consumers need convincing evidence that alternative cheeses do contain more healthful nutrient content when compared to dairy cheeses. Method: Trinidad food stores with greater than two branch locations in heavily populated areas were surveyed to determine the brands, forms and flavors of regular and alternative cheeses that were most commonly purchased by consumers. Based on Nutrition Fact Label information, the nutrient content of the three most commonly purchased products for dairy and alternative cheeses were compared using means and one-way Analysis of Variance contrast tests. Results: As available, the nutrient content for sliced, block and shredded commercial forms of American, Cheddar and Swiss dairy cheeses were compared to soy and rice alternatives. Shredded forms demonstrated no significant nutrient differences among cheese types. But based on content per unit serving, mean calorie from fat, total fat, saturated fat and cholesterol, were all significantly higher in sliced Cheddar and Swiss dairy cheeses (p<0.01); and in block Cheddar cheese (p<0.05), than alternatives. Compared to other cheeses, sodium content was high in Cheddar soy and low in Swiss dairy, though not significant; but American dairy cheese sodium content was significantly higher than all types (p=0.039). Conclusion: Healthful cheese options depend on particular nutrient content levels; and the type, flavor and form of the cheese. For Trinidad consumers who are more conscious of calorie, fat and cholesterol intake; soy and rice alternatives may provide more healthful options, except shredded forms. For those seeking to reduce sodium intake, American dairy and Cheddar soy cheeses should be avoided. Block dairy Swiss cheese may offer a more healthful option. Study funded by the University of the West Indies, Trinidad.

[P904] Ferritin status in elderly vegetarians and non-vegetarians participants in the Adventist Health Study-2
Ella Haddad1, Natalie Kazzi1
1Department of Nutrition, Loma Linda University

Background: Low serum ferritin is a biomarker for reduced iron stores whereas elevated ferritin may signify high dietary intake, iron overload, infection or chronic inflammation. Elevated ferritin is associated with increased risk of oxidative stress and chronic disease. The objective of this study was to determine whether vegetarian dietary patterns influence ferritin status in an elderly population. Methods: Study participants were randomly selected from the AHS-2 cohort geographically spread throughout the U.S. and Canada by church, and then by subject-within church. Each participant provided blood samples and two sets of three weighted 24-hour dietary recalls. Serum ferritin was determined by ELISA and dietary patterns constructed as vegan (no dairy, eggs, meat or fish), lacto-ovo (dairy and eggs but no meat for fish), pesco (fish, dairy and eggs but no meat), semi (meat or fish 1-4 times per month) and non-vegetarian (meat and/or fish at least 1 time per week). Results: The prevalence of deficient ferritin ($\leq 12$ mg/L) among vegan, lacto-ovo, pesco, semi and non-vegetarians were 13.4%, 14.2%, 18.8%, 12.5% and 14.5% respectively; whereas, elevated levels ($\geq 100$ mg/L) were 2.4%, 4.9%, 10.9%, 12.5% and 18.3% respectively. One-way analysis of variance showed significant mean differences between dietary groups p<0.001. Conclusions: Vegetarian dietary patterns are associated with variations in serum ferritin concentrations.
[P905] Fiber as a nutritional characteristic in leaf protein extracted from potato leaves

Jyoti Shanker

1Division of Biochemistry, K.A. Postgraduate College, CSJM University, Allahabad 211001, India

Background: The widespread prevalence of diet-related health problems, particularly in industrialized nations suggests that many humans are not eating in a manner compatible with their biology. Analysis of vegetable leaves routinely consumed by wild primates shows that many of these foods are good sources of hexoses, cellulose, hemicelluloses, pectic substances, fiber, vitamin C, minerals, essential fatty acids and protein. Leaf proteins are a very recent novelty in human nutrition where the use of vegetable protein is very common. Wet fractionation of leaf protein constituent is used for two purposes, to obtain fiber and to obtain structural lipoproteins. Biochemical studies were made to determine nutritional characteristics, particularly the fiber in the leaf protein concentrate fractionated from potato (Solanum tuberosum L.) Leaves selected for the analysis. Fiber content was found to be maximum in the unfractionated fraction followed by fractionated cytoplasmic then fractionated chloroplastic fraction of the Leaf Protein Concentrate. The presence of higher fiber content is an indication of providing more skeletal strength and high degree of tensile strength to support the aerial part of the plant. It appears that due to low fiber content in LPC obtained from the fractionated fraction will have better digestibility and higher nutritive value. The quality of feeding stuff is adjudged by lower crude fiber content. Low crude fiber and high carbohydrate feeds are valued as supplements to hay and fodder components of the animal ration. It promotes a number of positive physiological effects, helping to prevent constipation, lower blood cholesterol levels and control glucose levels.

[P906] Carbohydrates intake and selection in relation with the time of vegetarianism

Daniela Vega1, Emilce Suschevich2, Yanina Leguizamon2

1Thesis Student of Nutrition, Health Science Faculty, River Plate Adventist University, Entre Rios, 2School of Nutrition Professors, Health Science Faculty, River Plate Adventist University, Entre Rios

Background: Vegetarian diets are recognized for the higher consumption of carbohydrates and whole foods rich in dietary fiber, whereas the Argentine diet is known to contain large amounts of meat and refined starches. These cultural preferences make it difficult for the Argentine vegetarian to obtain the desired quantity and quality of carbohydrates. Our objective was to determine if the quantity and quality of the carbohydrates consumed by the vegetarian students from River Plate Adventist University improved in relation to their duration of vegetarianism. Methods: We used a retrospective, transverse and observational design. A food frequency record was taken in 60 Argentine students self-identified as vegetarian, who were then divided into two groups: less than five years of vegetarianism (<5), and five years or more (>5). The quality of ingested carbohydrate was considered, classifying them as carbohydrate from refined food (RF), whole food (WF) and food with added fiber (FaF). Results: 73.3% of the students attained the RDI for carbohydrates. Group >5 ingested a greater percentage of carbohydrate (60.23%), a statistically significant difference (t58=3.10; p=0.003). 71.7% attained the RDI for fiber. 78.3% consumed more added sugars than that recommended by the pyramids, with the <5 students consuming the most sugar; this difference was also statistically significant (t58=2.884; p=0.006). Group <5 consumed higher percentages of RF carbohydrates (55.54%), but lower WF (32.25%) and FaF carbohydrates (12.15%). A statistically significant trend in the consumption of RF carbohydrates (t58=1.841; p=0.071) and WF carbohydrates (t58=1.729; p=0.089) was found in relation with the duration of vegetarianism. Conclusion: Most of the students attained the RDI for carbohydrate. The quality was less than expected, due to the higher RF carbohydrate intake and the lower WF and FaF carbohydrate intake. However, the >5 students as a group consumed a higher quality of carbohydrate, with less intake of added sugar and more fiber in their diets.
[P907] Vegetarian and non-vegetarian dietary patterns and their nutrient profiles
Nico Samuel Rizzo¹, Karen Jaceldo-Siegl¹, Gary Fraser²
¹Department of Nutrition, School of Public Health, Loma Linda University, ²Department of Epidemiology, School of Public Health, Loma Linda University

Background: Dietary patterns are of great interest as they reflect choices of food combinations. A description of major nutrient intakes by dietary pattern can help elucidate their possible contributions to the prevention of disease. Objectives: To describe the associations between dietary patterns and nutrient intakes stratified by sex and race. Design: A cross-sectional study of 71,751 subjects (mean age 59 years, 65% women, 76% white) from the Adventist Health Study-2 with data collected between 2002 and 2007. Participants completed a 204-item validated semi-quantitative food frequency questionnaire. Five dietary patterns were established: non-vegetarian, semi-vegetarians, pesco vegetarians, lacto-ovo-vegetarians and strict vegetarians. ANCOVA analysis was used to determine differences in nutrient intakes by dietary patterns. Differences in non-dietary variables, such as age, BMI, smoking and physical activity are also reported. Results: Mean nutrient intakes varied markedly between dietary patterns. Nutrient intakes were more similar for men and women than for blacks and whites. Supplement intakes were often markedly higher in women than in men and higher in whites than in blacks. Blacks had lower values of nutrients often associated with dairy intake and higher values of soy protein and marine fatty acids. Conclusions: Nutrient intakes vary markedly between dietary patterns, more so than between the sexes or between blacks and whites. These differences may have health implications.

[P1001] Qualitative analysis of a statewide restaurant healthy eating and menu labeling initiative
Eric Aakko¹, ²
¹Weld County Department of Public Health and Environment, ²Past, Colorado Department of Public Health and Environment sporadic

Background: The state of Colorado implemented a restaurant menu labeling initiative to increase healthier eating options, and in particular, to increase the consumption of fruits and vegetables. Over the past two years, a targeted campaign was used to increase the marketing and evaluation of the healthy eating initiative. The campaign included paid radio and social media, and a specific “campaign food truck” that provided healthy meal samples at various public events. Over 200 restaurant locations participated, including an additional 110 restaurant locations from a global fast food corporation. Methods: A qualitative convenience field intercept survey interviewed 150 restaurant participants about their awareness, perceptions and knowledge about the healthy eating campaign. Results: The field intercept survey found 52% of respondents eat out four or more times per week; the majority of consumers interviewed go out to eat during their lunch hour. Thirty-one percent of respondents noticed the healthy eating campaign options on the menu; most consumers did not notice it unless there was signage on the menu board, even in restaurants that had prominent signage in other areas. Additionally, 55% of respondents who were not aware of the campaign stated that they would be more interested in returning to the restaurant now that they know healthy options are offered. Conclusion: Our project evaluation found there is strong demand for healthy meal options, including vegetarian entrees and dishes that include more fruits and vegetables. A majority of patrons will seek restaurants that have healthy options. There is also a greater opportunity to promote a healthy eating campaign with family owned and independent or small chain casual dining restaurants. Other lessons learned and emerging opportunities from implementing a population-based nutrition education campaign will be discussed.
**[P1002] Evolution in scientific production in the area of vegetarian nutrition, 1907-2012**

Julio Acosta-Navarro\(^1\)\(^2\), Adriana Oki\(^2\)\(^3\), Luiza Gouveia\(^2\)\(^3\), Valeria Hong\(^1\), Maria Bonfim\(^1\), Raul Santos\(^1\)

\(^1\)Heart Institute (InCor) University of São Paulo Medical School Hospital São Paulo – Brazil, \(^2\)Federal University of São Paulo Nutrition School, Brazil, \(^3\)Mario Margarido Health Basic Unit of Ferraz de Vasconcelos, Brazil

**Background:** Studies about vegetarian nutrition have been published in various sites of medical articles. The present study is aimed at evaluating the scientific evolution of articles of vegetarian nutrition. **Methods:** We analyzed the publication of articles of vegetarian nutrition, using the key term vegetarian in the National Institutes of Health Medline bibliographic database between 1907 and 2012. We quantified the number of articles in vegetarian nutrition by five-year time periods, and we classified the publication (nutrition journals and non-nutrition journals). Other characteristics were also analyzed: The affiliation of the first author, the origin of the study population and the type of articles. **Results:** The total number of articles was found 3,111. The publication rate of vegetarian articles increased steadily, except in periods of 2006-2010 and 2011-2012. Non-nutrition journals have published more articles on vegetarian nutrition for all periods. In relation to the total number of articles indexed by Medline annually, it is observed that after 1960 the articles on vegetarian nutrition are proportionately greater than the total published, except in the years 2007, 2008, 2011 and 2012 that the opposite occurs, but this probably can be explained by delay in the inclusion in the Medline. Regarding the variables, the majority of authors were located in Europe (41.60%), followed by North America (26.58%), Asia (15.11%) and Latin America (1.32%). The origin of the study population presented a similar trend being highest in Europe and lowest in Latin America. Original research and review articles represent 50.89% and 20.37% of all publications respectively. Clinical cases and letters in general decreased in the period studied. **Conclusion:** We noticed a marked increase in the publication of articles of vegetarian nutrition over the years in absolute and relative terms meaning a growing interest by publication type (nutrition and non-nutrition journals).

**[P1003] Female vegetarian students at Loma Linda University not at higher risk for eating disorders**

Ella Haddad\(^1\), Michaela Ballman\(^1\)

\(^1\)Department of Nutrition, Loma Linda University

**Background:** Poor eating attitudes and behaviors are widespread among female university students and may be linked to religious beliefs and vegetarianism. The purpose of this study was to assess the beliefs and attitudes of female university students in relation to food, eating behaviors and religious affiliation. **Methods:** Female participants (n=135) ages 19 to 30 years were recruited from among students at Loma Linda University (LLU). A two part questionnaire devised by combining the Eating Disorder Inventory-3 (EDI-3) (PAR, Lutz, FL) plus questions on dietary practices, weight history, ethnicity and religious affiliation was administered using SurveyMonkey (Palo Alto, CA). Data was compiled and analyzed using nonparametric Wilcoxon rank sum and Kruscal-Wallis tests for variables with a skewed distribution. Spearman correlations were calculated comparing the EDI-3 scores, BMI and a variable computed as the difference between the subjects’ desired weight and actual weight (Desired Weight). The study was approved by LLU’s Institutional Review Board. **Results:** Among the respondents 25.9% were vegetarian, 56% Caucasian, 42% Seventh-day Adventist and 59% reported a history of weight fluctuation. No correlations were observed between vegetarian status or religious affiliation and any EDI-3 score. Relationships were noted between desired weight and EDI-3 scores for drive for thinness, bulimia, body dissatisfaction and asceticism. Both desired weight and weight fluctuation were related to the Eating Disorder Risk Composite Score. In addition, ethnicity was related to the ineffectiveness, affective problems and general psychological maladjustment scores. **Conclusions:** Contrary to what is assumed, this group of young adult female university students did not show a link between vegetarianism or religious affiliation and eating disorder scores. The correlates of poor eating behaviors and attitudes
are complex and may be linked to a history of weight fluctuations, the drive for thinness and ethnicity. Further research is needed.

[P1004] Impact of adopting a partial vegetarian diet on plasma lipids in University students
Terri Holloway¹, Andrew Salter¹, Fiona McCullough¹
¹University of Nottingham, UK

Background: A recent UK report suggests that, “a reduction in the amount of meat consumed would have multiple benefits: a reduced demand for grain, leading to lower greenhouse gas emissions, and a positive effect on health”. This study hypothesised that with support, subjects can reduce meat intake by 50% which will positively impact on plasma lipid risk factors for cardiovascular disease. Methods: Twenty-five healthy subjects were recruited from a student population. At baseline, subjects undertook a 7-day diet diary and questionnaire, anthropometric measurements including BMI and total body fat and determination of plasma lipids. The 4-week intervention included two information-based motivational events. Based on current reported meat intakes, subjects were provided with alternatives to replace approximately 50% of the energy previously obtained from meat. The vegetarian alternatives included a range of commercially available products. Data collection was repeated post-intervention. Results: The average age of subjects (10 male/ 15 female) was 21.2 years (SD 3.3). There was no significant effect of reducing meat intake on BMI or % Body Fat. Data for both sexes was combined since there was no significant interaction between these factors for any of the variables. Total plasma and LDL cholesterol were significantly reduced by 10% and triacylglycerol by approximately 23% approximately. No significant effect of intervention was seen on HDL cholesterol. Conclusion: In a group of healthy individuals, reducing meat intake by 50% significantly reduced a range of plasma lipid risk factors for cardiovascular disease without impacting body weight or composition. Partly funded by a grant from the University of Nottingham.

[P1005] Vegetarian health nuggets, are they only foods for thought?
Loica Marc¹, Marta Sovyanhadi¹
¹Oakwood University, Family & Consumer Sciences Department, Huntsville, Alabama

Background: Research has shown that the more nutrition knowledge individuals possess the more likely they are to select healthier foods. The objective of this research was to determine whether the health benefits of a food were the primary factor in college student food choices. Methods: The data was collected through non-probability convenience sampling which took place at one of the SDA University libraries in the south. The university IRB approved the questionnaires and informed consents were signed. Statistical Package for the Social Sciences (SPSS) was the main data analysis tool used. From it, frequency tables, graphs and data cross-tabs were created to analyze relationships within the data. Results: A total of 30 questionnaires were collected; 60% were males and 40% were females across the educational levels. Of the participants, 10% were freshmen, 20% sophomores, 43% juniors and 27% seniors. The results reveal that 30% chose appearance of a food as the primary factor for food selection, 30% identified cost, 13% preferred a combination of factors, 6% familiarity, 3% due to mood. In addition, 43.3% described their eating habits as non-vegetarians, 20% as occasional lacto-ovo, 26.7% as lacto-ovo, 3.3% pescatarian, 3.3% vegan, 3.3% raw-foodist. The data also measured that 40% were slightly willing to try new foods, 36.7% were very willing, 16.7% were neutral, 3.3% were slightly willing and 3.3% were very unwilling. Conclusion: The health benefits of a food was not the primary factor of food choice but cost and appearance. Therefore, Adventist universities whose goals are not only for students to gain a Christian education but also to adopt a healthy vegetarian lifestyle should prioritize a vegetarian education course as a requirement to reach that goal. This class should provide knowledge in healthy meal planning with emphasis on budgeting and aesthetics. Funded by Oakwood University, Family and Consumer Sciences Department, Huntsville, Alabama.
[P1006] Lifestyle change initiative 2012: Support needed to shift to a whole food, plant-based diet
Wendy Moore 1, Sarah Tinsdall 1, Keith Ray 1, Amy Joy Lanou 1
1Department of Health and Wellness, University of NC Asheville

Background: Whole food, low-fat, plant-based diets (WFLFPB) promote weight loss, reverse type 2 diabetes and heart disease and prevent other chronic diseases. Health promoters are unclear about the type of guidance needed to support individuals in a transition to this dietary pattern. Methods: A 6-week randomized controlled trial with a 3-month follow-up tested the effectiveness of two levels of support for adopting a WFLFPB diet. Twenty-six healthy adults were randomly assigned into two intervention groups (SUPP; n=13 and INFO; n=13) and compared to a convenience control (CON; n =11) group asked not to change their dietary pattern. SUPP was given weekly group coaching sessions, nutrition information, email/phone support and two cooking classes. INFO was given the same nutrition information and email/phone support only. SUPP and INFO data included daily compliance surveys, and weekly blood pressure, weight and percent body fat measures. CONS had blood pressure, weight and percent body fat measures at the same three time periods. Results: Participants in SUPP (n= 11) complied with the dietary parameters WFLFPB on 81.4% of the days recorded whereas INFO (n =11) group complied 74.9% of the days. Target macronutrient intake for the WFLFPB was 10:15:75 % of calories from fat, protein and carbohydrate, respectively. 60% of SUPP participants were within 10% of these ratios, 50% of INFO participants met these criteria while none of the CON's did. Weight loss was 4.18±3.66lbs for SUPP, 1.93 ± 2.21 for INFO and -0.18±2.19 for CON (n =11). Weight loss was significantly greater for both SUPP (p = 0.00) and INFO (p = 0.04) than CON but was not significantly different between the two treatments. Changes in percent body fat and blood pressure were not significant across the intervention period. Conclusion: Both groups were successful, but weekly support meetings improved compliance and weight loss. Funded by the North Carolina Center for Health and Wellness.

[P1007] Soy-based recipes: Preparation and acceptability test
Juliana Santos Bahia do Vale 1, Rute de Oliveira 1, Glaucia Barrizzelli Murino 1, Odete Santelle 1
1Adventist University Center of Sao Paulo, Brazil

Background: Soy's nutritional aspects make this legume a highly healthy food, and educational strategies to encourage its consumption are welcome. The sensorial evaluation allows us to identify the product's acceptability or rejection. The aim of this study was to elaborate soy-based recipes, as well as their different presentations, and to test their acceptability. Methods: The study took place at the Dietetics' Techniques and Sensory Evaluation Laboratory, which belongs to the Adventist University Center of Sao Paulo (UNASP)'s nutrition course. The participants were 32 adults from both genders, including college students and teachers, and they attended six meetings between April and May 2012. Three soymilk-based recipes were selected (soy frappe with coconut, soybean cake with coconut, banana caramel cake); two soybean-based recipes (bread, meatball); two soy cheese based recipes (tofu with olive pate, corn grits salad); and three textured soy protein based recipes (rice, lasagna, soy kebab). For the sensory test, it was used the FACT Attitude Scale technique. The test consists of a nine-point scale that measures the acceptability and rejection rates. A recipe’s result equal or superior to 70% is considered acceptable. The recipes’ nutritional values were calculated with the Software Avanutri®. Results: the majority of the dishes prepared (8 out of 10) had a good acceptability. As for the acceptability rate, we highlight those with at least 80% of positive feedback: soy kebab, soy bread, lasagna with textured soy protein, soybean cake with coconut and banana cake. Conclusion: The acceptability test proved to be an easily utilized evaluation tool. The soy-based food workshop sparked the participants' interest for the use and integration of this kind of food in their personal menus. Funded by the College of Nutrition, Adventist University Center of Sao Paulo, Brazil.
[P1008] The importance of SDA Universities to emphasize the need of nutrition education and a vegetarian diet
Marta Sovyanhadi¹, Avenelle Thomas¹, Eva Starner²
¹Oakwood University, Family & Consumer Sciences Department, ²Oakwood University, Psychology Department, Huntsville, Alabama

Background: As a Seventh-day Adventist (SDA) institution, well-balanced vegetarian lifestyles should be emphasized. The General Conference of SDA's has promoted a healthy vegetarian diet because of their “belief in the holistic nature of humankind.” The authors of this study verified the hypothesis that among one of the southern USA Adventist Universities, a large percentage of male and female students, across educational levels, chose a diet that contained animal flesh. It is our objective to determine whether regular vegetarian educational seminars and vegetarian classes should be enforced in the general educational requirements. Methods: Data was obtained from three general education courses through questionnaires approved by the university IRB. Collected data was representative of all majors and educational levels. Subjects were either 18 years or older. Subjects were informed about the purpose of the study both verbally and in writing by informed consent. Results: A total of 88 surveys were collected from 27 male and 43 female respondents. Descriptive analysis, cross tabulations and correlations including mean, frequencies, and percentages were calculated by using the SPSS version 21.0. The analysis revealed that 27 out of 34 (79%) males ate meat and 44 out of 54 (81%) females ate meat. When the level of education and dietary habits were examined, the results indicated that 6 out of 11 (56%) freshmen ate meat, 36 out of 42 (86%) sophomores, 20 out of 23 (87%) juniors, and 9 out of 12 (75%) seniors ate meat. Conclusion: The prevalence of college students who ate meat did not drastically differ between males and females among various educational levels. These findings suggest to Adventist Universities the need to prioritize their emphasis on formal vegetarian nutrition classes in their general education curriculum. Thus, informal vegetarian educational seminars should be implemented to promote lifelong behavioral change. Sponsored by the Family and Consumer Sciences Department, Oakwood University, Huntsville, Alabama.

[P1009] What will vegetarians eat? Acceptability of foods and food production methods to vegans, vegetarians and those eating at least one vegetarian meal weekly
Charles Stahler¹, Reed Mangels¹
¹The Vegetarian Resource Group, Baltimore, Maryland

Background: Standard definitions of “vegetarian” and “vegan” become challenging when food production factors are considered. For example, should vegetarian items cooked on surfaces where meat has been cooked be considered “vegetarian”? Our objective was to determine attitudes of vegans, vegetarians and those eating at least one vegetarian meal weekly towards some foods and food production methods. Methods: Harris Interactive conducted a telephone survey within the U.S. in March 2012, among a cross-section of 2,030 adults. 936 respondents who ate one or more vegetarian meals per week were categorized as vegetarian, vegan or eater of some vegetarian meals. Respondents were asked about foods they would purchase if they wanted a vegetarian product. Choices included veggie burgers cooked on a grill where meat is cooked, veggie sandwiches from a non-vegetarian restaurant, desserts containing sugar potentially produced using bone char and meat alternatives produced using animal DNA obtained long ago. Results: Approximately half of respondents would purchase veggie sandwiches from a non-vegetarian restaurant (54% of all vegetarians including vegans; 47% of those eating some vegetarian meals). Vegans were less likely to purchase a product containing sugar produced using bone char than were other vegetarians (3% vs. 26%). Few respondents would purchase a meat alternative produced using animal DNA (11% overall). Many respondents would purchase a vegetarian dish containing leafy green vegetables (74%) or whole foods such as lentils or rice (67%). Conclusion: Attitudes of vegans, vegetarians and individuals who eat some vegetarian meals affect food choices and can lead to avoidance of some seemingly “vegetarian” foods and the addition of other foods. This information should be taken into
consideration for product development, labeling purposes, working with individual clients and for establishing food-service and food production procedures. A related survey, focusing on product labeling, is being conducted and will provide additional information.

[P1010] Diabetes and the Navajo Nation: Translating diet research into community education

**Caroline Trapp**, **Betti A. Delrow**
1Physicians Committee for Responsible Medicine, 2Navajo Nation Special Diabetes Project

**Background:** Native Americans have a very high rate of type 2 diabetes. A growing body of research has shown that a low-fat, plant-based diet is effective at preventing and halting the progression of type 2 diabetes. The intervention diet has similarities to the diet of the ancestors of many Native Americans, among whom diabetes was rare. Among the Navajo People, forced relocation, historical trauma and provision of commodity foods have contributed to dramatic changes in diet and lifestyle, with diabetes and its complications now a significant public health problem. It was not known if a plant-based diet would be acceptable and accessible to the people living on the Navajo Reservation. **Methods:** The Navajo Nation Special Diabetes Project (NNSDP) partnered with the Physicians Committee for Responsible Medicine (PCRM) to implement a plant-based nutrition and cooking education program. The program was approved and supervised by the Navajo Nation Human Research Review Board, who requested that the program expand from a pilot for people with diabetes to a train-the-trainer model. More than thirty NNSDP staff members, including eight nutritionists who serve the eight service areas of the Navajo Reservation participated. Upon completion of a multi-week training program, materials were revised and disseminated, and ongoing support provided. **Results:** Some Navajo Nation Special Diabetes Project staff members have implemented all or parts of a plant-based diabetes nutrition curriculum as an alternative to a conventional diabetes nutrition curriculum. Anecdotal cases have reported significant improvements in diabetes control, weight and/or other benefits. **Conclusion:** A plant-based diet, as taught by trained community members, is acceptable and accessible within the Navajo Nation, and offers a hopeful way to address the diabetes epidemic. Funded by the Physicians Committee for Responsible Medicine and the Navajo Nation Special Diabetes Project.

[P1011] Outcomes of a school gardening program for First Nations children in Canada

**Lucila Triador**, **Anna Farmer**, **Katerina Maximova**, **Noreen D. Willows**, Alexander First Nation,
1Department of Agricultural, Food and Nutritional Science, University of Alberta, Edmonton, Alberta, 2Centre for Health Promotion Studies, University of Alberta, Edmonton, Alberta, 3Department of Public Health Sciences, University of Alberta, Edmonton, Alberta

**Background:** Many Native American children are overweight. Adequate vegetable and fruit consumption may prevent excessive weight in children. Earthbox Kids was an intervention in Canada designed to promote First Nations schoolchildren’s intake of vegetables and fruit through exposure to classroom container gardening for seven months and a weekly snack program offering vegetables and fruit for four months. One goal of the study was to evaluate changes in schoolchildren’s attitudes towards vegetables and fruit and their home consumption from pre- to post-intervention. **Methods:** Children in grades 1-6 at Alexander First Nation School were asked at baseline and 7-months follow-up to (1) taste and rate seventeen foods using a 6-point Likert-type scale with 6 = ‘I really like it’ to 1 = ‘I will never eat it again’ and (2) indicate if they ate each food at home. Measured BMI was used to classify children as normal and overweight/obese based on the WHO Child Growth Standards. **Results:** 76 of 116 children (65.5%) completed the survey at baseline and follow-up. Of the 60 children who had BMI data, 40% were normal weight. There was a significant increase in the overall vegetable and fruit attitude score (79.6 ± 11.3 vs. 82.6 ± 11.8, p <0.01) and six vegetable scores between baseline and follow-up. Both normal weight and overweight/obese
children had similar attitude scores pre- and post-intervention. There was no change in home food consumption of any vegetable or fruit. The vegetables and fruits children liked the most were the same ones consumed at home. **Conclusion:** Earthbox Kids appeared to improve children's attitudes towards vegetables and fruit, but not their home food environment. School interventions to improve children's diets should include family participation to promote healthy eating at home. Funded by the Canadian Institutes of Health Research and a contribution agreement from Health Canada.

**[P1101] Evaluation of the environmental impact of food consumption in the U.S. from 1961 to the present**

*Maurizio Candilera, Luciana Baroni, Marina Berati, Massimo Tettamanti*

1Department of Mathematics, University of Padua, Italy, 2Primary Care Unit, District no. 4, U.L.S.S. No. 9, TREVISO, Italy, 3NEIC, Nutrition Ecology International Center, Torino, Italy

**Background:** From 1961, the population of the U.S. has been increasing steadily. The daily caloric intake has also been increasing until 2003, and has been stable since. The combination of these two factors causes a significant increase in the environmental impact of food consumption. This paper analyzes that impact. **Methods:** LCA (Life Cycle Assessment) represents an objective procedure for the evaluation of the energy and environmental impacts of a process or activity. It is carried out through the identification of i) the energy and raw material consumption and ii) the release of waste into the environment. The assessment includes the whole life cycle of the process or activity, from the extraction and processing of raw materials to the production, transportation, distribution, use, reuse, recycling and final disposal. **Results:** The results, obtained from the analysis of resources consumption, of the contributions to global warming, to acidification/eutrophication, to the different kinds of eco-toxicity and of toxicity to humans, show that the increase in consumption of plant-based foods has led to an extremely small increase in environmental impact because of the intrinsically very small impact of that food category. On the other hand, the environmental impact of a real present-day diet, with its unhealthy rate of animal products (whose consumption was already excessive in the 1960s), is 400% higher than that of a healthy diet as recommended by the Dietary Guidelines for Americans, 2010. **Conclusion:** The consumption of plant-based food, which had been insufficient in the past, has now increased; however, an immediate decrease in the consumption of animal food is necessary; the cultural habit of making them a staple of nutrition has a strong negative impact not only on human health but also on the environment. We are indebted to the owner of Simaprox, Società Scientifica di Nutrizione Vegetariana, Italy, who supplied the software.

**[P1102] Evaluation of the environmental impact of food consumption by continent**

*Massimo Tettamanti, Luciana Baroni, Maurizio Candilera, Marina Berati*

1NEIC, Nutrition Ecology International Center, Torino, Italy, 2Primary Care Unit, District no. 4, U.L.S.S. No. 9, TREVISO, Italy, 3Department of Mathematics, University of Padua, Italy

**Background:** Differences in food consumption among various parts of the world are well known; data is systematically collected by the Food and Agriculture Organization of the United Nations (Food Consumption Database). The trend towards an increase in the consumption of animal products in developing countries is just as well known. The purpose of this paper is to examine the environmental impact of food consumption on each continent. **Methods:** LCA (Life Cycle Assessment) represents an objective procedure for the evaluation of the energy and environmental impacts of a process or activity. It is carried out through the identification of i) the energy and raw material consumption and ii) the release of waste into the environment. The assessment includes the whole life cycle of the process or activity, from the extraction and processing of raw materials to the production, transportation, distribution, use, reuse, recycling and final disposal. **Results:** If the value of the environmental impact of a well-balanced omnivorous diet, as defined by the Dietary Guidelines for Americans 2010, is defined as one, the highest environmental impact is...
shown to be that of the North American diet (4.07), followed by the European diet (3.35), Oceania (3.10) and South America (2.27). The environmental impact of Africa, because of the prevalence of malnutrition, is significantly lower than one (0.76). Of particular interest is the average Asian diet, which was still impacted by malnutrition in the 1960s, but is now the one which achieves the best balance between optimal human health and low environmental impact (1.15) because of its high content of plant-based food. Unfortunately, present trends show that the Asian diet will become more and more similar to the developed world’s diet. Conclusion: A global shift towards a plant-based diet provides the only sustainable choice to feed a growing world population. Government policies in developed countries should implement interventions aimed to increase the consumption of plant food and strongly decrease the consumption of animal food. We are indebted to the owner of Simapro, Società Scientifica di Nutrizione Vegetariana, Italy, who supplied the software.

[P1201] Weight gain over 14 years in meat-eaters, fish-eaters, vegetarians and vegans in EPIC-Oxford
Kathryn E. Bradbury 1, Paul N. Appleby 1, Julie A. Schmidt 1, Ruth C. Travis 1, Tim Key 1
1Cancer Epidemiology Unit, University of Oxford, Oxford, UK

Background: Cross-sectional analyses have shown vegetarians and vegans are leaner than meat-eaters; however, there is limited longitudinal data on weight gain in different diet groups. We have previously reported the annual mean weight gain over five years amongst meat-eaters, fish-eaters, vegetarians and vegans participating in the European Prospective Investigation into Cancer and Nutrition (EPIC)-Oxford cohort. We now extend this report to include 14 years of follow-up.

Methods: This longitudinal study includes 19,768 adults (4,081 men, 15,687 women) from the EPIC-Oxford cohort, aged 20 to 54 years at recruitment. Self-reported anthropometric, dietary and lifestyle data were collected at baseline in 1994-1999 and at follow-up in 2010; the mean duration of follow-up was 14.3 years. Results: The mean (SD) annual weight gain was 276 g (423 g) in men and 266 g (419 g) in women. After adjustment for age, cigarette smoking, height and weight at baseline, in men there were no statistically significant differences in mean annual weight gain between meat-eaters, fish-eaters, vegetarians and vegans. In women, the mean annual weight gain was smaller for vegans (174 g), fish-eaters (209 g), and vegetarians (255 g) compared with meat-eaters (291 g, p < 0.001, for all). At follow-up, age-adjusted mean body mass index (BMI, kg/m2) was highest in meat-eaters (men: 25.7; women: 25.0), followed by vegetarians (men: 24.6; women: 24.1), fish-eaters (men: 24.4; women 23.5), and vegans (men: 24.0; women: 23.3). Conclusion: During 14 years of follow-up, the mean annual weight gain in a health-conscious cohort in the UK was approximately 270 g. No significant difference in weight gain was observed between the diet groups in men, whereas small differences in weight gain were observed between the diet groups in women. At follow-up, vegans had the lowest BMI. Funded by Cancer Research UK.

[P1202] Opinions and beliefs concerning vegetarianism amongst Belgian vegetarians and omnivores
Peter Clarys 1, Inge Huybrechts 2, Barbara Vanaelst 2, Tobias Leenaert 3, Peter Deriemaeker 1, Patrick Mullie 1
1Department of Human Biometrics and Biomechanics, Vrije Universiteit Brussel, Brussels, Belgium, 2Department of Public Health, Ghent University, Ghent, Belgium, 3Ethisch Vegetarisch Alternatief, Ghent, Belgium

Background: Knowledge concerning the opinions and beliefs towards vegetarian nutrition in the general population is scant. The aim of the present study was to investigate the opinions and beliefs concerning different theorems related to vegetarianism and meat consumption. Methods: In March 2011, a large scale online survey was conducted by a professional Market Research Agency (iVOX) having access to 111,000 volunteers at service for research assignments. The questionnaire probed towards eating habits and towards attitudes and beliefs concerning meat and vegetarian product consumption. Results: Based on demographic data and the eating habits, the subjects were allocated to one of the following categories: female (n=26) and male vegetarians (n=12); female
Reasons to opt for a vegetarian meal were compared between semi-vegetarians and omnivores. Health was indicated as an important reason for 69% of the semi-vegetarians, this was only 46% in the omnivorous subjects. Taste was an important reason to eat vegetarian in 56% of the semi-vegetarians whilst this was only 18% amongst the omnivorous subjects. Climate and animal welfare were important reasons for the semi-vegetarians (respectively 50 and 45%) versus only 24 and 20% for the omnivorous subjects. More men than women indicated to eat meat for health reasons and for taste. Familiarity (“I was raised like that”) was a stronger reason for meat consumption in men compared to women. Appreciation of the health aspects related with milk and fish consumption was significantly lower for vegetarians compared to the semi-vegetarians and the omnivores.

Conclusion: Significant differences in the opinions and beliefs towards the use of vegetarian or animal products were detected between vegetarians, semi-vegetarians and omnivores as well as between men and women.

**[P1203] Vegetarianism: Motivations and practices**

*Anastácia de Souza Costa 1, Cristiane de Oliveira Novaes 1*

1Universidade Federal do Estado do Rio de Janeiro - UNIRIO, Brazil

**Background:** In Brazil, 15.2 million people call themselves vegetarians. Still, there are limitations and lack of national studies that characterize their profile, needs and need for intervention by health professionals. This study aimed to describe characteristics profile, practices and motivations to vegetarianism. **Methods:** This cross sectional study was approved by Research Ethics Committee of the Universidade Federal do Estado do Rio de Janeiro, with self-identified vegetarians who agreed to participate voluntarily signing the consent form. Participants were recruited by convenience sampling, underwent a semi-structured about their knowledge, attitudes and practices with items about eating habits, motivation and health. **Results:** Most interviewees had 30 years or more, half adopted the diet for more than 60 months and females were predominant. Most called themselves semi-vegetarians, followed by lacto-ovo-vegetarians and vegans, and most were satisfied with their current habits. Most were adequate weight and no one was in the underweight group. Most said to have become vegetarian abruptly, just 10.5% said they had consulted a nutritionist and 33.3% of those who use dietetic supplement does without prescription from professional. Socially, 68.5% said they had experienced difficulties to adhere/maintain vegetarianism and some said they perceive resistance from health professionals regarding this theme. The main benefits cited were associated with improvement in digestion/intestinal transit, greater variety of foods and nutrients and improves serum cholesterol, and major harm cited were reduction/deficiency of vitamin B12, iron and calcium, and deficiency of animal protein. The changes observed after feeding transition were weight change and improving health. Ethics and animal rights were unanimous motivations, followed by health and environment. **Conclusion:** It was similar to the profile of populations evaluated by other studies. Future studies should explore better the relationship between individual and health professional as well as the beliefs and practices of professionals about vegetarianism.

**[P1204] Motives and attitudes towards vegetarian diets and vegetarian meals in university students**

*Tom Deliens 1, Peter Clarys 1, 2, Sofie Laporte 1, Marcel Hebbelinck 1, Peter Deriemaeker 1, 2, Benedicte Deforche 1*

1Department of Human Biometrics and Biomechanics, Vrije Universiteit Brussel, Brussels, Belgium, 2Erasmus University College, Brussels, Belgium

**Background:** Knowledge of the determinants in the decision to opt for a vegetarian diet or vegetarian meals is required if one likes to promote the replacement of meat by vegetable proteins. The aim of the present study was to evaluate students’ attitude towards vegetarian diets and vegetarian meals as a function of their present eating pattern. **Methods:** Data were collected by means of a questionnaire distributed in the university restaurant (n=200 students; age 18-25 years). In order to obtain sufficient contrast purposeful sampling was carried out at the different counters (vegetarian,
non-vegetarian). The questionnaire probed towards the students’ current eating pattern (vegetarian; occasionally vegetarian and omnivorous) and their attitude towards vegetarian meals and diets. Statements were scored on a one to five Likert scale (ranging from totally disagree to totally agree). ANOVA with post hoc analysis was performed to compare the different eating patterns. **Results:** Based on the current eating pattern we found the majority of the students to be omnivorous (n=96) whilst 74 students used occasionally vegetarian meals and 29 were vegetarian. Although all groups indicated health aspects as an important reason to opt for vegetarian meals the score for the health aspect was significantly lower for the omnivorous students compared to the occasionally vegetarian students only. Ethical aspects and concerns for animal welfare scored significantly higher for the vegetarian students compared to the two other groups. The influence of modeling (friends, important people) and the social environment towards vegetarian meals was comparable for the three groups. The taste of meat was an important determinant for the omnivorous and the occasionally vegetarians. Taste appreciation of vegetarian meals was significantly lower for omnivorous students compared to the two other groups. **Conclusion:** Tailored interventions for the promotion vegetable proteins in place of meat need to focus on taste appreciation of vegetarian meals.

**[P1205] Nutritional status of Belgian vegetarians and non-vegetarians**  
*Peter Deriemaeker¹, Patrick Mullie¹, Inge Huybrechts², Tom Deliens¹, Tobias Leenaert³, Peter Clarys¹*

¹Department of Human Biometrics and Biomechanics, Vrije Universiteit Brussel, Brussels, Belgium; ²Department of Public Health, Ghent University, Ghent, Belgium; ³Ethisch Vegetarisch Alternatief, Ghent, Belgium

**Background:** Epidemiological studies on vegetarians show that appropriately planned vegetarian diets are healthy and nutritionally adequate. Compared to omnivorous diets, vegetarian diets can provide several health benefits. The aim of the present study was to compare the nutritional status between subjects with different dietary habits. **Methods:** The 1,632 subjects were recruited via purposeful sampling and divided in five different diet categories: vegans (n=115), lacto-ovo-vegetarians (n=624), pesco-vegetarians (n=163), semi-vegetarians (n=533) and non-vegetarians (n=197). The nutritional status was calculated using an online food frequency questionnaire. **Results:** Mean total energy intake was significantly lower for the vegans (2453±839 kcal) compared to the lacto-ovo-vegetarians (2712±867 kcal), pesco-vegetarians (2745±796 kcal), semi-vegetarians (2840±846 kcal) and non-vegetarians (3003±1050 kcal). Mean total energy intake was significantly higher for the non-vegetarians compared to the vegans, lacto-ovo-vegetarians, pesco-vegetarians and the semi-vegetarians. Mean total energy intake for the lacto-ovo-vegetarians, pesco-vegetarians and the semi-vegetarians was comparable. Macronutrient analysis revealed the highest mean values for the non-vegetarian subjects concerning absolute and relative protein, total fat, saturated fat and alcohol intake, while carbohydrate intake was significantly lower. Mean BMI was significantly lower for the vegans (21.7±2.8 kg/m²) compared to the lacto-ovo-vegetarians (22.2±3.5 kg/m²), pesco-vegetarians (22.2±3.4 kg/m²), semi-vegetarians (22.4±3.4 kg/m²) and non-vegetarians (23.7±4.0 kg/m²). Mean BMI was significantly higher for the non-vegetarians compared to the vegans, lacto-ovo-vegetarians, pesco-vegetarians and the semi-vegetarians. **Conclusion:** Our results indicate a nutritional status closer to the current dietary recommendations for the vegans, lacto-ovo-vegetarians, pesco-vegetarians and semi-vegetarians compared to the non-vegetarian subjects. This possibly explains the higher mean BMI value for the non-vegetarians compared to the vegans, lacto-ovo-vegetarians, pesco-vegetarians and semi-vegetarians.

**[P1206] Vitamin B12 status of German vegans and vegetarians**  
*Marcus Keller¹, Beatrice Redemann¹, Luise Schumann¹, Ursula Chávez Zander¹, Claus Leitzmann¹*

¹Institute of Alternative and Sustainable Nutrition, Giessen, Germany

**Background:** Vitamin B12 deficiency is very common among vegans and also some vegetarians. The main reason for this is that vitamin B12 is usually not found in plant foods and many vegans...
and vegetarians do not use cobalamin supplements on a regularly basis. The aim of this study was to investigate the prevalence of cobalamin deficiency in a group of German vegans and vegetarians.

**Methods:** The 127 apparently healthy vegans (n = 90) and lacto-ovo-vegetarians (n = 37), that were recruited for our vitamin B12 fortified toothpaste study, served as subjects in the present study. Blood samples were taken by the respective family physicians, sent to the central laboratory and analyzed for homocysteine (Hcy), serum vitamin B12 (VB12) and holo-transcobalamin II (holoTC).

**Results:** Only three subjects (8%) of the lacto-ovo-vegetarians, but 36 participants (41%) of the vegan group had holoTC levels < 19.1 pmol/L. The vegan group had significant lower holoTC levels than the vegetarian group (23.8 pmol/L vs. 30.5 pmol/L; p = 0.002). Thirty-six (40%) vegans and nine (24%) lacto-ovo-vegetarians showed VB12 levels below the normal range (200-950 pmol/mL). Only one vegetarian (3%), but ten (11%) vegans had elevated Hcy values (> 13 µmol/L). The differences in VB12 and Hcy levels between vegans and lacto-ovo-vegetarians were not significant.

**Conclusions:** Our study shows that vitamin B12 is a critical nutrient for vegans but also for some vegetarians since nearly half of the vegans, but less than 10% of the lacto-ovo-vegetarians were vitamin B12 deficient. Vegans and vegetarians should monitor their vitamin B12 status and should ensure an adequate intake of vitamin B12. This can be achieved with vitamin B12 enriched foods or supplements and since very recently also with fortified toothpaste.

**[P1207] Short- and long-term reliability of adult recall of vegetarian dietary patterns in the Adventist Health Study-2 (AHS-2)**

*Marcia Cristina Teixeira Martins*, *Karen Jaceldo-Siegl*, *Jing Fan*, *Gary Fraser*

1 Adventist University of Sao Paulo, Sao Paulo, SP, Brazil, 2 Department of Nutrition, School of Public Health, Loma Linda University, Loma Linda, USA, 3 Department of Epidemiology, School of Public Health, Loma Linda University, Loma Linda, USA

**Background:** Remote dietary patterns may be more important than recent dietary patterns in the etiology of chronic diseases because of the long latency in their development. **Methods:** We developed an instrument to recall vegetarian dietary patterns during the lifetime and examined its reliability of recall over 5.3 and 32.2 years on average. The short term/5 year recall ability study (5-RAS) was done using 24,690 participants from the cohort of the Adventist Health Study-2 (AHS-2). The long term/32 year recall ability study (32-RAS) included an overlap population of 1,721 individuals who joined the Adventist Health Study-1 (AHS-1) and AHS-2. **Results:** Spearman correlation coefficients were 0.78 and 0.72 for 5-RAS and 32-RAS, respectively, when compared to reference data. In both studies, sensitivity and positive predictive values (PPV) were highest for the lacto-ovo-vegetarian and non-vegetarian patterns. In the 5-RAS analyses, male, non-black, younger and more educated participants, lifetime Adventists and those with more stability of consumption of animal products showed higher recall ability. Somewhat similar tendencies were shown for the 32-RAS analyses. **Conclusion:** Our findings show that the instrument to recall vegetarian dietary patterns has good short and long term recall reliability for lacto-ovo-vegetarian and non-vegetarian patterns. Short term recall reliability was also good for the vegan pattern, while pesco-vegetarian and semi-vegetarian patterns had lower short and long term recall reliability.

**[P1208] Healthy Eating Index in Belgian vegetarians and non-vegetarians**

*Patrick Mullie*, *Peter Deriemaeker*, *Inge Huybrechts*, *Tom Deliens*, *Tobias Leenaert*, *Peter Clarys*

1 Department of Human Biometrics and Biomechanics, Vrije Universiteit Brussel, Brussels, Belgium, 2 Department of Public Health, Ghent University, Ghent, Belgium, 3 Ethisch Vegetarisch Alternatief, Ghent, Belgium

**Background:** Dietary pattern analysis, based on the concept that foods eaten together are as important as a reductive methodology characterized by a single food or nutrient analysis, has emerged as an alternative approach to study the relation between nutrition and disease. The aim of the present study was to compare the Healthy Eating Index (HEI) between subjects with different dietary habits. **Methods:** Subjects (n=1632) were recruited via purposeful sampling
using the website of a vegetarian organization. Subjects were allocated to one of the following diet categories: vegans (n=115) (total vegetarians) eat no red meat, fish, poultry, dairy and eggs; lacto-ovo-vegetarians (n=624) eat milk, eggs or both, but no red meat, fish or poultry; pesco-vegetarians (n=163) eat fish, milk and eggs, but no red meat and poultry; semi-vegetarians (n=533) eat red meat, poultry and fish less than once a week; and non-vegetarians (n=197) eat red meat, poultry, fish, milk and eggs more than once a week. The HEI was calculated and analyzed in function of the nutrient intake collected via an online food frequency questionnaire. Results: The HEI was significantly higher for the vegans (HEI= 57.6±6.2) compared to the lacto-ovo-vegetarians (HEI= 48.7±8.0), pesco-vegetarians (HEI= 47.8±7.1), semi-vegetarians (HEI= 48.7±7.1) and non-vegetarians (HEI= 44.9±8.0). The HEI was significantly lower for the non-vegetarians compared to the vegans, lacto-ovo-vegetarians, pesco-vegetarians and the semi-vegetarians. The HEI for the lacto-ovo-vegetarians, pesco-vegetarians and the semi-vegetarians was comparable. Conclusions: Our results indicate a dietary pattern closer to the current dietary recommendations for the vegans, lacto-ovo-vegetarians, pesco-vegetarians and the semi-vegetarians compared to the non-vegetarian subjects. The HEI, with some components not or incompletely applicable for vegetarian diets, results in the highest score for vegans and higher scores for the lacto-ovo-vegetarians, pesco-vegetarians and the semi-vegetarians compared to the non-vegetarian subjects.
Maps
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*Silk Unsweetened almondmilk 30 cal/veg; typical skim milk, 80 cal/veg. USDA National Nutrient Database for Standard Reference, Release 55. ©2012 WhiteWave
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* A one ounce serving of walnuts contains 18g of total fat - 2.5g of monounsaturated fat, 13g of polyunsaturated fat, including 2.5g of plant-based omega-3 ALA. It also provides 4g of protein, 2g of fiber, and 3.721 mmol antioxidants.

“Supportive but not conclusive research shows that eating 1.5 ounces of walnuts per day, as part of a low saturated fat and low cholesterol diet and not resulting in increased caloric intake, may reduce the risk of coronary heart disease.”