The premier scientific conference on the health effects of plant-based diets

the 5th
International Congress on Vegetarian Nutrition

Loma Linda University • March 4–6, 2008
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ICVN
5th International Congress on Vegetarian Nutrition
Message from the Congress Chair

Dear Colleagues,

On behalf of the International Advisory Board, the Local Organizing Committee and our host, Loma Linda University, it is my pleasure to welcome you to the 5th International Congress on Vegetarian Nutrition.

Over the next three days you will have the opportunity to share in cutting-edge research with those who are pioneering new paths of vegetarian knowledge and applications. From nutrigenomics to nuts, from global nutrition patterns to global warming, we trust this will be an engaging and informative experience. The balance between theory and practice should provide a stimulating event for each of you.

I am delighted that you are here to share this time with us. We have prepared a variety of social activities and events to make your stay enjoyable. Take a few minutes to look through the program and find those activities that most interest you.

I hope you will enjoy the professional fellowship and the scientific content of the Congress. 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 Chair
Chair, Department of Nutrition
Loma Linda University
Congress Organization

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  Gary Fraser, MB, ChB, Loma Linda University, California
  Marcel Hebbelinck, PhD, University of Brussels, Belgium
  Ingrid Hoffmann, PhD, University of Giessen, Germany
  David Jacobs, PhD, University of Minnesota, Minneapolis, Minnesota
  David Jenkins, MD, PhD, DSc, University of Toronto, Canada
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  Jim Joseph, PhD, Tufts University, Boston, Massachusetts
  Johanna Lampe, PhD, Fred Hutchinson Cancer Research Center, Seattle, Washington
  Claus Leitzmann, PhD, University of Giessen, Germany
  Mark Messina, PhD, Nutrition Consultant, Port Townsend, Washington
  Walter Willett, MD, DrPH, Harvard School of Public Health, Boston, Massachusetts

Congress Chair
  Joan Sabaté, MD, DrPH, Loma Linda University, California

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  Ella Haddad, DrPH
  Kathryn Knecht, PhD, LLU, School of Pharmacy
  Mark Messina, PhD, Nutrition Consultant, Port Townsend, Washington
  Hellen Ndiku
  Brenda Rea, DrPH
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Organizing Committee
(LLU School of Public Health and School of Allied Health Professions unless otherwise noted)
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  Martina Karunia, MS, MPH, RD, SAHP
  Louise Schneider, DrPH, RD, SAHP
  Randall Skoretz, DMin, SPH

ICVN
5th International Congress on Vegetarian Nutrition
Host and Congress Sponsors

Host
The Organizing Committee of the 5th International Congress on Vegetarian Congress on Vegetarian Nutrition wishes to recognize and express its thanks to Loma Linda University for providing the venue for this Congress and for their continuing support in hosting the Congress.

Major Sponsors
The Congress acknowledges the financial support of the following organizations.

Loma Linda University Medical Center
Loma Linda, California

California Walnut Commission
Folsom, California

Silk
White Wave Foods
Broomfield, Colorado
Additional Sponsors

International Tree Nut Council
Nutrition Research and Education Foundation
Davis, California

Wellsource®
THE WIN-WIN WELLNESS SOLUTION
Wellsource, Inc.
Clackamas, Oregon

Almond Board of California
Modesto, California

Harding Heritage Foundation
Worthington, Ohio

ICVN
5th International Congress on Vegetarian Nutrition
Background and Goals

Background
Over the past 20 years the International Congress on Vegetarian Nutrition has 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 and 2002 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 and now include overarching 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 session, workshops, poster presentations and social gatherings. It is our intent that the fifth edition of the congress follow the traditions established in the last four congresses and continues 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.

Goals
The goals of the 5th International Congress on Vegetarian Nutrition are:

1. To assess and summarize current research on plant based diets and vegetarian nutrition, in particular as it applies to disease prevention and health promotion. The current research will be evidence based.

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

3. To increase the awareness of the health implications of vegetarian dietary practices.

4. To survey the global repercussions of vegetarian food choices and practice.
General Information

Venue
The 5th International Congress on Vegetarian Nutrition is being held on the campus of Loma Linda University at the Drayson Center. 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 be transformed into a state-of-the-art conference center. All plenary sessions and symposia will be held in the gymnasium, while the Collins Room across from the gym houses the exhibits and the bookstore.

Tuesday night the poster session will be in the student lounge area of the Drayson Center, showing while the Congress reception is in progress in the Basaraba Gardens and around the Center pool.

Wednesday afternoon and Thursday morning the short oral presentations will be presented at the Randall’s Visitor Center on University Court near the Del Webb Library. And Wednesday night the Congress banquet will take place at the Wong Kerlee International Conference Center, inside the Coleman Pavilion. This is located between the Good Samaritan Sculpture and the Medical Center, adjacent to the University Church.

The mission of LLU Drayson Center is to provide opportunities for enhancement of 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 available to Congress attendees.

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.

Physical Exercise Opportunities
- While in attendance at the Vegetarian Congress the Drayson Center facilities are available, free of charge, to any fully paid attendee. Your congress name badge will gain you access to the resources described above.

- **Jog & Joke with the Chairs**—an opportunity to jog two miles or four miles with LLU faculty and leadership on Wednesday and Thursday morning from 6:00 to 6:45 a.m.; meet in the Hilton Hotel lobby at 5:50. (See Related Events, page 14)
Shuttle Transportation
Shuttle transportation will be provided each day between the Residence Inn Hotel, 1040 E. Harriman Place, the Hilton Hotel on Hospitality Lane, and the Fairfield Inn & Suites, 1041 E. Harriman Place in San Bernardino. Shuttles will make the rounds to these three hotels beginning at 7:00 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 ½ 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.

Taxi
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.

Certificate of Attendance
The certificate of attendance for pre-registered participants will be handed out at the registration table. Participants who register on-site are kindly asked to apply directly to the registration desk.

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.

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

Audio/Video Tapes
Audio video recordings of each session will be available for purchase. Visit the Congress Book Store for details. No audio or video taping will be allowed during the scientific sessions.

Book Store
The Book Store will be open from 8:00-8:30 a.m. each day of the Congress, during the morning and afternoon breaks and at lunch time. Educational materials and a variety of books are available for sale in the Congress bookstore located in the Collins Room, across from the gymnasium. Stop by and receive a complimentary copy of the proceedings from the 4th International Congress on Vegetarian Nutrition, while supplies last!

Exhibits
Exhibits will be open from 8:00-8:30 a.m. each day of the Congress, during the morning and afternoon breaks and at lunch time. Sponsored and paid exhibits are located in the Collins Room, across from the main auditorium. See a complete list of Congress exhibitors on page 13.
Community Table
A community table offering free materials is available. If you would like to place any material, please check with the Congress information booth. The education materials and exhibits are offered as a service to Congress attendees and do not imply endorsement of any material by the Congress organizers or by Loma Linda University.

Internet Service
Wireless internet access is available at the Drayson Center. A password will be issued to you upon request at the Congress information booth.

Messages, Meeting Point
All messages to participants will be displayed on the message board located the Congress information booth.

Parking
Free parking is available in the lot around the Drayson Center and in the parking lot between the Drayson Center and Printing Services. If additional parking is needed, parking lot “U” is the next most convenient lot (see the map at the back of this booklet). Shuttle service will be available from parking lot “U.” Extra parking will also be available at the gravel lot on Benson and Shepardon. Shuttle service will also be available from this lot. Parking attendants will be available to direct you to the best available lot.

Local Attractions
Within the immediate area of the University, the cities of Loma Linda, Redlands and Riverside provide an opportunity to experience some of old California as seen in the Victorian homes, orange groves, and towering palm trees. The surrounding mountains provide an opportunity for nature study and relaxation.

If you wish, you may visit some of the sites of Southern California. Palm Springs, the wild flowers and flowering cactus of Joshua Tree National Monument, and the aerial tramway to Mt. San Jacinto are 45-60 miles to the east. Disneyland and Disney’s California Adventure, Newport Beach, and Laguna Beach are 50-60 miles to the southwest. Los Angeles and Hollywood are 60 miles to the west, and San Diego, with its world famous zoological park is about 100 miles to the south.

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

Post Office & Bank
A United States Post Office branch and Bank of America branch office are both located in the heart of the LLU campus. See map for details. Automatic teller machines (ATM) can be found at the Bank of America, at the Loma Linda University Business Center, between La Loma Credit Union and Student Finance, as well as in the Medical Center lobby.
Food at the Congress

The opening night reception, snacks at break times, and the Congress banquet are included in the full registration fee. Breakfast and lunch are not included in the Congress registration.

Entrance to the Wednesday evening Congress banquet is by ticket only. All Congress participants interested in attending the banquet must obtain a ticket from the information booth by 5:00 p.m. on Tuesday afternoon. Additional banquet tickets for guests can be purchased until the end of the scientific program on Tuesday.

On Campus Eateries
We can recommend the following places to eat on campus. All offer exclusively meatless fare, with vegan and lacto-ovo vegetarian dishes.

**Campus Cafeteria**
Open Weekdays 11:15 am to 1:45 pm
Buffet-style service featuring vegetarian cuisine (recommended for lunch)

**Patio Pantry**
Open Weekdays 7:00 am to 3:00 pm
Vegetarian menu featuring a breakfast menu, fast food fare in a casual dining setting (recommended for breakfast)

**Loma Linda University Medical Center Cafeteria**
Open Weekdays 6:00 am to midnight
Full service cafeteria specializing in vegetarian cuisine from around the world

**Loma Linda University Children’s Hospital Cafeteria**
Open Weekdays 10:30 am – 3:00 pm
Full service cafeteria featuring vegetarian cuisine

**Faculty Lounge**
Open Weekdays from 11:30 am – 2:00 pm
Top floor of the Coleman Pavilion.
This is a full service restaurant with all-you-can-eat buffet option. For those who want a touch of elegance with linen tablecloths and napkins and friendly table service to meet your needs. Reservations are advisable.

See overleaf for a sampling of nearby dining facilities offering vegetarian fare.
Places to Dine in the Loma Linda Area
Many of the restaurants in the surrounding area offer vegetarian options.

A Dong
25685 Redlands Blvd. (Redlands & Mtn. View); (909) 796-8840
Vietnamese restaurant; cozy, moderately priced, full service restaurant.

Papaya Bay
1981 Diners Court (off Hospitality Lane); (909) 890-9997
623 Orange St., Redlands. (909) 793-0374
Exceptional Thai cuisine at either of their two locations.

El Torito
118 E. Hospitality Lane; (909) 381-2315
Delicious Mexican cuisine in a casual dining setting with a chance to hear live Mariachi bands.

Olive Garden
460 Hospitality Lane; (909) 381-2747
Italian fare at a reasonable price.

Kool Kactus Café
24957 Redlands Blvd ; (909) 796-1545
A contemporary and refreshing twist on Mexican cuisine.

Soup Plantation
228 Hospitality Ln; (909) 381-4772
With a wonderful selection of fresh produce, tasty soups and baked goods, Soup Plantation makes a great option for lunch and dinner.

Thai House
1824 Redlands Blvd. (909) 798-3143
Thai House offers delicious and exotic Asian cuisine.
Exhibitors

The following organizations are Congress exhibitors. Their exhibits are available in the Collins Room across from the main auditorium. Please take the time to visit them.

- American Dietetic Association Vegetarian Nutrition Dietetic Practice Group/
  Vegetarian Resource Group
- Bragg Live Products
- California Walnut Commission
- Freezees Nutcream
- Lifestyle Matters
- LLU School of Public Health, Department of Nutrition
- Loma Linda University Medical Center
- Loma Linda University School of Public Health
- Melissa’s Foods
- New Choices Institute of Integrated Health
- Physicians Committee for Responsible Medicine
- Seventh-day Adventist Dietetic Association Vegetarian Resource Group
- Vibrant Life
- Wellsouce
Congress Social Activities

Congress Reception
Tuesday, March 4, 6:30 p.m., Drayson Center
Tuesday evening there will be a reception for all attendees of the Congress. This will be held at the Drayson Center Student Lounge and out into the Basaraba Gardens and Pool Lawn (weather permitting). The festivities will include music by the Loma Linda Academy Jazz Band and appetizers with an international flavor that you won't want to miss. This will afford an excellent opportunity for reuniting with old friends and colleagues or getting to know those you have just met. Dress will be business casual.

Jog & Joke with the Chairs
Wednesday & Thursday 5:50 a.m., San Bernardino Hilton Hotel Lobby
Here's an opportunity to jog two miles or four miles with LLU faculty and leadership. Spend a fun morning working your muscles and networking with other professionals. The jog will be led by Wayne Dysinger, M.D., Chair of the Public Health and Preventive Medicine Department at the School of Medicine and Ron Mataya, M.D., Chair of the Global Health Department at the School of Public Health. One of them is a stellar runner, the other is not; so don't be afraid to join the group. On Wednesday and Thursday morning at 6:00 a.m.; meet in the Hilton Hotel lobby at 5:50 a.m.

Congress Banquet
Wednesday, March 5, 7:00 p.m., Wong Kerlee International Conference Center
As with the past Congresses, the Banquet on Wednesday will be a sumptuous feast for the eyes, the ears and the taste buds. On the program for the banquet this year will be the premiere of a 10 minute video marking 2008 as the 100th anniversary of nutrition education at Loma Linda University. Also, Per and Monica de Lange from Norway will provide a program of musical variety. Recognition will be awarded to two nutrition scientists working in the area of epidemiology. And, as always, the dinner menu, provided by the culinary artists at Loma Linda University will be a vegetarian delight. Dress will range from business to semi formal. Cost for the banquet is included in registration for the congress, but tickets are available for $50 for your guests who may not be registered. Entrance to the banquet is by ticket only. All Congress participants interested in attending the Congress banquet must obtain a ticket from the information booth by Tuesday afternoon.
Related Events

Pre-Congress
Alumni Postgraduate Convention (APC) Nutrition Symposium
Monday, March 3, 9:00 a.m. to 4:45 p.m.
Organized by the School of Medicine Alumni, this one-day conference is specifically geared to clinicians (physicians, dietitians, other clinical health professionals).
Location: Wong Kellee Conference Center

Post-Congress
Adventist Nutrition Conference
Thursday, March 6, 7:00 p.m. through Saturday, March 8, 5:30 p.m.
Organized by the Department of Health of the General Conference of the Adventist Church. Nutrition has been and is very special for Adventists. In fact we have made several important contributions to health and lifestyle. At this conference Dr. Hardinge will highlight many of these firsts. More than 20 speakers will address topics of special interest to Adventists. Current issues such as dairy and eggs, chocolate, coffee, the history of meat analogs and whole grains will be addressed, just to mention a few. The public is also invited.
Location: Loma Linda University Chapel

School of Public Health Alumni Breakfast
Wednesday, March 5, 7:00 - 8:00 a.m., Nichol Hall 1609
Shuttle service will be provided from the Drayson Center.

Preventive Care Alumni and Student Luncheon
Wednesday, March 5, 12:40-2:20 p.m., Nichol Hall 2019
Shuttle service will be provided from the Drayson Center.
Information for Speakers, Poster Presenters & Session Chairpersons

Chairpersons and Speakers
Session Chairperson and Speakers are kindly requested to be available in the Conference room – the Drayson Center gymnasium – at least 15 minutes before the beginning of their session to finalize any arrangements. 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 5 minute and a 1 minute warning. Scheduled time for oral presentations are as follows:

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<td>Plenary Speakers</td>
<td>35 – 40 minutes + 5 minutes Q&amp;A</td>
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<tr>
<td>Symposia Speakers</td>
<td>25 minutes + 5 minutes Q&amp;A</td>
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<tr>
<td>Short Oral Speakers</td>
<td>10 minutes + 3 minutes Q&amp;A</td>
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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 Fritz Room will be open from 7:30 a.m. to 4:30 p.m. each day. This room is for speakers to check their power point presentations. Computer equipment for this check will be provided by the Congress. This computer will have no internet access. For wireless internet access to your laptop, please obtain a password from the Congress Information booth. If you are scheduled to speak in the morning we ask you to check and deliver your electronic power point file to the media technician at the back of the gymnasium the afternoon before. For afternoon speakers please check and deliver your power point file at least two hours prior to the beginning of your session.

Please do not forget to collect your disk after the session at the Speaker Ready Room. Disks not collected by the end of the Congress will be disposed of.

Posters
Posters will be presented in the Student Lounge of the Drayson Center. Posters can be mounted from 8:00 a.m. to noon on Tuesday, March 4. All posters must be in place by noon. Please mount your poster on the board that corresponds to the number assigned to you. Presenters in Session 1 should be by their board from 6:30-7:15 p.m. and for Session 2 from 7:15 to 8:00 p.m.

All posters must be removed from the poster boards before noon on Wednesday, March 5 as the boards will be removed at noon. Any posters not removed will be destroyed.
Scientific Program

ICVN
5th International Congress on Vegetarian Nutrition
Tuesday, March 4, 2008—Morning

8:00-8:30 am Welcome Address
Joan Sabaté, David Dyjack

8:30-9:20 am Plenary Lecture
Chair: Joan Sabaté

[01] Diet, nutrients and cancer prevention: The nutrigenomics era
David Heber

9:20-9:40 am Break

9:40-11:10 am Symposia: Plant-based diets and cancer
Chair: Johanna Lampe
Co-Chair: John Morgan

A wide perspective on the impact of plant foods on cancer will be considered, including recent epidemiological findings, specific plant foods that prevent recurrence of breast cancer and examples of nutrient-gene interactions relevant to plant foods and risk of cancer.

[02] Diet patterns, plant foods and cancer risk: New epidemiological findings and strategies for future
Tim Key

[03] Reducing recurrence in breast cancer survivors with plant foods
John Pierce

[04] Inter individual differences in response to plant-based diets—implications for cancer risk
Johanna Lampe

11:20 am-12:20 pm Symposia: Plant versus marine n-3 polyunsaturated fat
Chair: David Jenkins

In an attempt to address the question whether the n-3 polyunsaturated fat, ALA and EPA/DHA are biologically equivalent or not, answers will be provided with respect to selected risk factors of cardiovascular disease and cancer, specifically prostate cancer.

[05] Walnuts versus fatty fish and cardiovascular risk factors
Sujatha Rajaram

[06] α-linolenic acid and prostate cancer
Joel Simon

12:20-2:00 pm Lunch

ICVN
5th International Congress on Vegetarian Nutrition
Tuesday, March 4, 2008—Afternoon

2:00-3:20 pm  Debate: Do vegetarians have to eat fish for optimal cardiovascular protection?
            Moderator: David Jenkins

            Debaters: [07] Alexander Leaf, [08] Iqwal Mangat

3:20-3:45 pm  Break

3:45-5:45 pm  Symposium: Current issues on soy
            Chair: Mark Messina
            Co-Chair: Karen Jaceldo-Siegel

            Given the importance of soy in vegetarian diets, some of the concerns and issues
            related to the use of soy and risk of disease or safety issues for specific life stages will
            be addressed. An understanding of isoflavone metabolism will provide the back-
            ground to discuss these concerns and issues.

            [09] Is isoflavone metabolism the key to the efficacy of soy foods?
                Johanna Lampe

            [10] Health implications of soy infant formula
                Thomas Badger

                Mark Messina

            [12] Soy ferritin: Implications for iron status of vegetarians
                Bo Lönnerdal

6:30-8:00 pm  Poster Session
            Posters will be on display in the Drayson Center student lounge

            6:30 – 7:15 p.m  Poster Category 1: Nutritional Epidemiology Authors present
                              Poster Category 2: Nutrition Education Authors present

            7:15 – 8:00 p.m. Poster Category 3: Clinical Nutrition Authors present
                                Poster Category 4: Nutrition & Chronic Disease Authors present
                                Poster Category 5: Nutritional Assessment Authors present
                                Poster Category 6: Nutrients/Phytochemicals Authors present
                                Poster Category 7: Others Authors present

6:30-8:00 pm  Reception
            The reception will be held by the Drayson Center pool, Basaraba Gardens & Student
            Lounge

ICVN
5th International Congress on Vegetarian Nutrition
Abstracts

[01] Diet, nutrients and cancer prevention: The nutrigenomic era
David Heber
While all humans are 99.9 percent genetically identical, there are genetic polymorphisms which affect how individuals metabolize nutrients that may affect their predisposition to developing common forms of cancer. These common polymorphisms such as the GSTM1 null mutation have been found to increase the risk of cancer slightly, but offer the opportunity to decrease cancer risk significantly when the foods—in this case cruciferous vegetables—metabolized by that enzyme are eaten frequently. Variations in cancer incidence among and within populations with similar dietary patterns suggest that an individual's response may be due to interaction of nutrients and lifestyle with genetic factors that modify gene expression of a gene and protein function. The field of nutrigenomics is in its infancy, but will have two major impacts on cancer prevention research. First, nutrigenomics will provide more understanding of responders and non-responders to certain dietary compounds. Second, it will provide an improved understanding of how genes respond to diet and how this can influence risk of disease especially as it relates to mechanisms such as oxidation, inflammation, and DNA repair involved in the process of carcinogenesis. Genome-wide scanning has yielded a few genes that increase cancer risk but multiple genes in combination are needed to impact the risk significantly. In the long term, it is hoped that nutrigenomics in combination with proteomics and metabolomics will lead to the development of new diagnostic tools and individualized intervention strategies for cancer prevention.

[02] Diet patterns, plant foods and cancer risk: New epidemiological findings
Tim Key
Dietary factors may affect the risk for several types of cancer, but despite much research during the last 30 years the only well established dietary risk factors are obesity and alcohol. Comparisons between countries show that diets comprised mainly of plant foods are associated with low incidence for certain cancers, especially cancers of the colorectum, breast and prostate, but these associations may be due to confounding by other dietary or non-dietary factors. Studies of diet and cancer risk in individuals have strongly suggested that high intakes of red and processed meat increase the risk for colorectal cancer. There is less convincing evidence that high intakes of fiber may reduce the risk for colorectal cancer, and that high intakes of fruit and vegetables may reduce the risk for several gastrointestinal cancers.
Vegetarian diets are usually relatively rich in fiber, fruit and vegetables, as well as being free from meat and fish; this diet pattern might be expected to reduce the risk for colorectal cancer. These topics will be discussed with reference to the recent WCRF report on food, nutrition and cancer, results from the EPIC study in Europe, and results on cancer in vegetarians in the EPIC-Oxford study in Britain.
[03] Reducing recurrence in breast cancer survivors with plant foods

John Pierce

The Women's Healthy Eating and Living (WHEL) study randomized 3,088 women with early stage breast cancer to an intensive plant-based dietary pattern (daily: 5 vegetable servings, 16 oz of vegetable juice, 3 fruit servings, 30 g fiber and 20% energy from fat). On average, women enrolled in the study already consumed 5-a-day dietary pattern. The study intervention (vs comparison group) achieved and maintained through 4 years the following between-group differences: a +65% vegetables, +25% fruit, +40% legumes, +30% fiber, +30% whole grains, -13% energy from fat. The change in dietary pattern included improvements in almost every hypothesized cancer prevention category of food. The study had follow-up data at an average of 7.3 years on 96% of enrollees. There was no difference between study groups in either additional breast cancer events or mortality. However, excluding premenopausal women, additional breast cancer events were associated with estradiol concentrations and women who did not report hot flashes at study entry (higher estrogen phenotype) had worse prognosis. The study dietary pattern appeared to reduce estrogen concentrations and to remove this additional risk.

[04] Inter individual differences in response to plant-based diets—Implications for cancer risk

Johanna Lampe

Genetic differences in taste preference, food tolerance, and phytochemical absorption and metabolism all potentially influence the effect of plant-based diets on cancer risk. Diet is a mixture of carcinogens, mutagens, and protective agents many of which are metabolized by biotransformation enzymes. Genetic polymorphisms that alter protein expression and/or enzyme function can modify risk. Genotypes associated with more favorable handling of carcinogens may be associated with less favorable handling of phytochemicals. For example, glutathione S-transferases (GST) detoxify polycyclic aromatic hydrocarbons, but also metabolize isothiocyanates, chemopreventive compounds in cruciferous vegetables. A polymorphism in the GSTM1 gene results in lack of GSTM1-1 protein. Pharmacokinetic studies suggest that lack of GSTM1 enzyme is associated with more rapid excretion of the isothiocyanate sulforaphane; therefore, individuals with this genetic variation may derive less benefit from consuming cruciferous vegetables. Flavonoids are conjugated with glucuronide, and sulfate and are excreted in urine and bile. Polymorphisms in UDP-glucuronosyltransferases (UGT), and sulfotransferases (SULT), may contribute to variability in phytochemical clearance and efficacy. Genetic polymorphisms in enzymes that metabolize phytochemicals may account in part for variation in disease risk but also have to be considered in the context of other aspects of human genetics, gut bacterial genetics, and environmental exposures.

ICVN

5th International Congress on Vegetarian Nutrition
[05] Walnuts versus fatty fish and CVD risk factors
Sujatha Rajaram
This study compared the effect of n-3 PUFA from two different food sources: walnut (ALA) and fatty fish (EPA + DHA) on plasma lipids in normal to moderately hyperlipidemic individuals. In a randomized crossover feeding trial, 25 normal to moderately hyperlipidemic adults consumed three isocaloric diets for four weeks each: control diet (no nuts or fish), walnut diet (42.5 g walnuts/2400 kcal, 6 d/wk) and fish diet (113 g salmon, 2 d/wk). Fasting blood samples were drawn at the end of each diet period on two alternate days and analyzed for plasma lipids. The walnut diet significantly reduced serum total and LDL cholesterol by 5.4% and 9.3% compared to the control diet, while the fish diet increased LDL cholesterol compared to the control diet. The fish diet also increased HDL cholesterol while decreasing triglyceride (11.4%) compared to the control diet. Both LDL: HDL and apo B: A-1 ratios were significantly lower after the walnut compared to the control and fish diets. N-3 PUFA derived from fatty fish and walnuts influence different blood lipid components and they both help in reducing the overall risk of CHD.

[06] α-linolenic acid and prostate cancer
Joel Simon
Prostate cancer is very common; approximately 16% of 40-year-old men will eventually be diagnosed with prostate cancer and between 3% to 4% will die from it. The incidence of prostate cancer in the US has increased with recent screening for early detection of prostate cancer, but mortality rates have remained largely unchanged. The dietary and demographic factors associated with the risk for prostate cancer will be reviewed. One dietary factor previously reported, albeit inconsistently, to be associated with an increased risk for prostate cancer is the consumption of α-linolenic acid (ALA), the parent and plant-based fatty acid of the omega-3 fatty acid group that includes the fish oil fatty acids, eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). ALA is the most commonly consumed omega-3 fatty acid among Americans. It is found in relatively high concentrations in flaxseed oil, soybean oil, rapeseed (Canola) oil, and walnuts. A recent meta-analysis linked higher dietary intakes or blood and tissue concentrations of ALA with an increased risk for prostate cancer. Since this meta-analysis, additional studies have been published. The presentation will present an up-dated review and meta-analysis, including by sub-group, will examine the published studies for the presence of heterogeneity, and discuss the likelihood of publication bias.

[07] In favor of eating fish for optimal cardiovascular protection
Alexander Leaf
Today there is available only one n-3 fatty acid from plants and that is the parent n-3 fatty acid named α-linoleic acid (C18:3n-3, ALA). In fish and other marine vertebrates ALA can be further elongated to provide two longer and more unsaturated n-3 fatty acids, but as noted these are not found in plants. In fish and other marine invertebrates the ALA is elongated to form EPA, eicosapentaenoic acid (C20:5n-3, EPA) and DHA, docosahexaenoic acid (C22:6n-3, DHA). DHA is the longest and most unsaturated of all the fatty acids normally encountered in the human diet. EPA and DHA are also the form of n-3 fatty acids stored in our bodies, especially in brain and heart with DHA as the most stored. But they are rapidly interconverted, so as need both are available for our bodies functions. EPA and DHA also have the distinction that they are stringily conserved from being metabolized simply for energy as is the case for most other fatty acids. Our bodies need EPA and DHA for other very important functions and other cheaper fatty acids can easily be burned to provide the energy needs of our bodies. This is the problem with ALA. Using isotopically labeled ALA it has been shown that over 90% is burned to provide energy and the 7% of so that escapes being burned is only slowly converted to EPA and DHA which are the physiologically essential n-3 fatty acids that we need for optimal health.
[08] Do vegetarians have to eat fish for optimal cardiovascular protection?
Iqwal Mangat
Abstract unavailable at press time

[09] Is isoflavone metabolism the key to the efficacy of soy foods?
Johanna Lampe
Gut bacterial modification of soy isoflavones produces metabolites that differ in biologic activity from the parent compounds. Hydrolysis of glycosides results in more active compounds. In contrast, further degradation and transformation of aglycones produce more or less active compounds, depending on the substrate metabolized and the product formed. Bacterial metabolism of soy isoflavones varies among individuals. The predominant daidzein metabolites produced by human intestinal bacteria are equol and O-desmethylangolensin (O-DMA). 30-50% of people have the bacteria capable of producing equol, whereas 80-90% have O-DMA-producing bacteria. Factors that influence the capacity to produce equol and O-DMA are not clearly established; however, gut physiology, host genetics, and diet contribute to interindividual differences in conversion of daidzein to equol. Effects of these phenotypes on human health are poorly characterized. Some studies in high-soy consuming populations have reported an inverse association between urinary and serum equol concentrations and breast and prostate cancer risk. Further, several studies of soy supplementation and bone density suggest that soy products may be more effective in maintaining bone density in equol-producing individuals. Factors that contribute to the phenotypes and the relationship of these specific phenotypes to human health need to be further characterized in order to guide intervention approaches.

[10] Health implications of soy infant formula
Thomas Badger
An estimated 24 million infants have been fed soy formula in the past 3 decades. Yet, very little information on the immediate, short-term and long-term health consequences has been reported. There is much speculation about beneficial and/or adverse effects, mainly based upon the high isoflavone exposure these infants have during the first year of life. The vast majority of published reports are based on in vitro or in vivo animal data, and the small numbers of clinical studies are mostly retrospective in nature. We are conducting a prospective, longitudinal study of infants fed breast milk or formula (milk-based and soy-based) from birth through puberty. Our oldest child is age 5 years. Preliminary data from approximately 100 infants/group through age one year suggest very clearly that children in all three diet groups grow and develop (physically and behaviorally) within standardized normal ranges, but there are significant (P<0.05) differences within this normal range. It is not yet known if these are transitory or permanent effects, and the biological significance of these small differences is yet to be determined. None of our data would suggest adverse health effects of soy formula. There are several areas, such as bone density, in which soy-fed infants have an apparent health advantage. Supported by USDA-ARS 6251-51000-005-02S.

Mark Messina

The relationship between soy food intake and breast cancer risk has been rigorously investigated for nearly 20 years. Much of this research has focused specifically on isoflavones, dihydrogen compounds essentially unique to soy foods that have estrogen-like properties. Despite the enormous amount of research conducted no clear consensus regarding the breast cancer-preventive properties of soy foods has emerged. Nevertheless, a recent meta-analysis of the Asian epidemiologic data found high soy intake was associated with a 29% reduction in risk. However, there is intriguing evidence suggesting for protection against breast cancer, exposure to soy/isoﬂavones must occur during childhood or adolescence. Conversely, the estrogen-like effects of isoﬂavones have raised concerns that soy foods are contraindicated for breast cancer patients and/or women at high risk of developing this disease. These concerns are based almost exclusively on in vitro and animal data. In contrast, clinical studies, including those in which breast tissue density has been measured and breast tissue biopsies taken before and after isoflavone exposure, show no estrogenic or stimulatory effects. These results contrast with those of combined hormone therapy. Given this evidence, and the relatively unimpressive evidence that estrogen therapy alone increases breast cancer risk, it seems very likely that soy foods can be safely consumed by all women.

[12] Soy ferritin: Implications for iron status of vegetarians

Bo Lünnerdal

Ferritin is present in several types of plants in low concentrations, but it is possible to enhance this content by plant-breeding, or by inserting the ferritin gene into staple foods. Since each ferritin molecule can bind thousands of iron atoms, this may be a sustainable means to increase the iron contents of plants. Before launching such efforts it is important to determine whether ferritin-bound iron is bioavailable. We assessed this in vitro using human intestinal cells and in vivo using radiolabeled ferritin and whole body counting in human subjects. In Caco-2 cells, we found that dietary factors affecting iron absorption, such as ascorbic acid, phytate, and calcium, had very limited effect on iron uptake from ferritin, suggesting that ferritin-bound iron is absorbed via a mechanism different from that of non-heme iron. Using in vitro digestion, we found that ferritin was relatively resistant against proteolytic enzymes. In human subjects, we found that iron absorption from animal ferritin was similar to that from ferrous sulfate, suggesting that iron is well absorbed from ferritin. We found no difference between iron absorption from ferritin reconstituted with high-phosphate (plant-type) and low-phosphate (animal-type) ferritin mineral, suggesting that plant ferritin-iron is bioavailable. A subsequent human study showed that iron from purified soybean ferritin given in a meal was as well absorbed as ferrous iron. In conclusion, iron is well absorbed from plant ferritin and may represent a means of biofortification of staple foods.
Wednesday, March 5, 2008—Morning

8:00-8:50 am  Plenary Lecture
Chair: Synnove Knutsen

[13] Vegetarian diets and health outcomes: What we know and where do we go from here?
Gary E. Fraser

8:50-11:10 am  Symposia: Nutritional and health status of vegetarians
Chair: Winston Craig
Co-Chair Susanne Montgomery

Recent epidemiological findings on health and nutritional outcomes of various vegetarian populations around the world will be discussed. Differences exist among these vegetarian cohorts, which provide challenges and opportunities in assessing health outcomes.

[14] The pros and cons of vegan diets
Winston Craig

Tim Key

9:50-10:10 am—Break

Nutritional status of different vegetarian populations: opportunities and challenges

11:10 am-12:40 pm  Symposia: Plant-based diets, obesity and diabetes
Chair: Sujatha Rajaram

The effectiveness of different types of vegetarian diets to induce weight loss and maintain glycemic control will be discussed. Also, given the increasing incidence of obesity among children, potential plant foods and diet patterns that may help reduce obesity among children will be presented.

[19] Effective vegetarian diets for weight loss and glycemic control: A high vegetable protein diet perspective
David Jenkins

Neal Barnard

[21] Plant foods and plant-based diets: Protective against obesity?
P.K. Newby

12:40-2:20 pm  Lunch
Wednesday, March 5, 2008—Afternoon

1:30-3:00 pm  Short Oral Presentations:

Session I—Nutritional Epidemiology
Chair: Bert Connell
Co-Chair: Larry Beeson

Randall Visitors Center

(Simultaneous Session)

[22] 1:30-1:40 p.m. The Association between childhood obesity and dietary intake
Vichuda Lousuebsakul

[23] 1:45-1:55 p.m. Height, weight and BMI among school-age children: soy consumers vs non consumers
Karen Jaceldo-Siegli

[24] 2:00-2:10 p.m. Soy intake is related to a lower body mass index in adult women
Gertraud Maskarinec

[25] 2:15-2:25 p.m. Meat and fish intake and coronary heart disease in the Nurses Health Study: Preliminary analyses
Adam Bernstein

[26] 2:30-2:40 p.m. The impact of a vegetable-rich diet on key markers of health in a cohort of Australian adolescents
Bevan Hokin

[27] 2:45-2:55 p.m. Quality of life in an aging population
Peter Pribis
Wednesday, March 5, 2008—Afternoon

2:20-4:20 pm  Symposia: Plant based diets—Nutritional perspective and non-nutritional perspectives
   Chair: Ella Haddad

   A global perspective on the adequacy of vegetarian diets with respect to specific nutrients will be discussed. Strategies for public health recommendations and for individual nutritional counseling on the importance of vegetarian diets will also be covered.

   [28] Predicting serum 25-hydroxyvitamin D levels
      Jacqueline Chan

   [29] Cultural aspects of vegetarian eating
      Susanne Montgomery

   [30] Vegetarian nutrition: Intended and actual effects
      Ingrid Hoffmann, Katharina Bernsmeier, Lena Wagner

   [31] Vitamin B12 and homocysteine status among vegetarians—A global perspective
      Ibrahim Elmadfa

4:20-4:40 pm  Break

4:40-5:50 pm  Debate: Dairy foods - Should they be part of a healthy vegetarian diet?
   Moderator: Joan Sabaté

   This debate will consider the benefits of using dairy as more than a calcium source and present the health concerns of including this food group. With the evidence for and against including this food group, vegetarians can make informed decisions as they make dietary choices.

   Debators: [32] Connie Weaver, [33] Walter Willett

7:00-9:30 pm  Congress Banquet
   The Congress Banquet will be held in the Wong Kerlee International Conference Center
Abstracts

[13] Vegetarian diets and health outcomes—what we know and where do we go from here?

Gary E. Fraser

Research to establish the health effects of vegetarian diet has taken a quantum leap as “new generation” studies are starting to report results. The definition of a “vegetarian” requires careful consideration, as this label includes many diverse diets with the focus in these definitions being only on meat. Persons with similar habits of meat consumption can differ greatly in the quality of the rest of their diets. It is likely that vegetarians in different parts of the world have very different diets, and will probably experience different health outcomes as a result. At present, apparently good studies do not always agree about the health experience of vegetarians. What does seem clear and consistent is that vegetarians are less likely to be overweight, have lower blood pressure and LDL cholesterol, and lower rates of diabetes mellitus. Whether vegetarians have lower rates of cancer is somewhat more controversial. California Adventists who are vegetarians have significantly lower risk of bladder, ovarian, and possibly prostate cancer, along with colon cancer. However, studies of British vegetarians do not clearly find such results. This may be due to differences in other parts of the diet and lifestyle of these two cohorts of vegetarians. Similarly, studies of California Adventists indicate that the absence of meat in the diet, regular nut consumption, and medium body weight—all characteristic of many vegetarians, adds about 6 years to life expectancy. “Health conscious” subjects in the U.K. experience major mortality advantages compared to others in U.K., yet vegetarians seem to gain little additional advantage beyond this. There are some indications that those who prefer a plant-based diet have more favorable values of inflammatory markers which may be of importance to many common disorders such as certain cancers, vascular disease, arthritis, and dementia. In addition to the current data on these health outcomes, future scope and directions will also be discussed.

[14] The pros and cons of vegan diets

Winston Craig

Mad cow disease, listeriosis, and E coli infections associated with animal foods, factory farming methods involved in the production of today’s meat products and eggs, and the overuse of antibiotics and growth hormones for cattle have encouraged an increasing number of people to become vegetarian or vegan. The health benefits and ready availability of soy have caused soy products to become popular. The term vegetarian is often used to describe a whole range of diets, practiced with varying degrees of restriction making it difficult to compare and contrast the health benefits of various vegetarian diets. A vegetarian diet is associated with many health benefits due to its higher content of potassium, fiber, folic acid, vitamins C and E, magnesium, a myriad of phytochemicals, and a healthier fat content. Compared to other vegetarian diets, vegan diets tend to contain less saturated fat and cholesterol, and more dietary fiber. Vegans tend to have lower serum cholesterol levels, and a reduced risk of heart disease, hypertension, some cancers, and obesity. However, eliminating food choices from the diet does increase the risk of nutritional deficiencies. Micronutrients of concern for the vegan include vitamins B12 and D, zinc, and calcium. An inadequate intake of ALA and DHA by vegans may compromise their health.
Tim Key
Vegetarian diets are usually rich in carbohydrates, n-6 fatty acids, fiber, carotenoids, folic acid, vitamin C, vitamin E and magnesium, and relatively low in protein, saturated fat, long-chain n-3 fatty acids, retinol, vitamin B12 and zinc; vegans may have low intakes of calcium. Cross-sectional studies of vegetarians and vegans have shown that, on average, they have a relatively low body mass index and plasma cholesterol concentration, but also relatively high plasma homocysteine. Cohort studies of vegetarians have shown a moderate reduction in mortality from ischaemic heart disease but little difference in other major causes of death or in all-cause mortality in comparison with health-conscious non-vegetarians from the same population. Studies of cancer have not shown clear differences in cancer rates between vegetarians and non-vegetarians. Recent data show similar fracture rates in vegetarians and meat eaters, but suggest an increased fracture rate among those vegans who do not eat sufficient calcium. More data are needed especially on the health of vegans and on the possible impacts on health of low intakes of long-chain n-3 fatty acids and vitamin B12. In general the health of vegetarians and vegans appears to be good and similar to that of comparable non-vegetarians.

[16] Nutritional status of Seventh-day Adventists
Pramil Singh
Measuring the health effects of increasing meat intake has huge relevance to emerging economies in China, India, and Latin America where newly affluent adults are eating more meat and, in some instances, abandoning traditional faith-based vegetarian practices in favor of a Western diet. For the past 50 years, The Adventist Mortality Study and Adventist Health Studies (I and II) at Loma Linda University have been conducting prospective studies to examine the relation between the vegetarian diet and chronic disease outcomes among US members of the Seventh-day Adventist church. Adventists share some similarities with populations in Asia and South Asia since a sizable proportion (about 1/3) follow, due to reasons of faith, a vegetarian diet pattern. We have previously reported that Adventist vegetarians who increased their meat intake during 1960 to 1976 experienced a 3.6 year decrease in life expectancy during the 12 years that followed. In this presentation we will examine how such an increase in meat intake among vegetarians impacts coronary heart disease, diabetes, and cancer. The implications of these findings for the chronic disease burden in emerging economies will be discussed.
[17] Nutritional status of Latin American vegetarians: opportunities and challenges in research
Julio Acosta-Navarro

Beans are legumes that are thought to have originated from southern Mexico and Central America over 7000 y ago; they still form an important part of the staple diet in those regions. In 1964 Pazzaneze examined clinically 53 Indian with a predominantly vegetarian diet and high level of physical activity, living in Brazil. 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 and Sao Paulo Study 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. In other study, Rodrigues found that the iron deficiency, evaluated by ferritin concentration, was present only in lacto-vegetarian and vegan and absent in omnivorous and ovo-lacto-vegetarians. The prevalence of zinc deficiency showed to be higher in lacto-vegetarian group when compared by the omnivorous. The perspectives of Latin America as a potential producer and consumer of functional foods will depend largely on the level of information and income of the population, credibility of the products, research investments and regulatory practices.

[18] Nutritional status of Flemish vegetarians: opportunities and challenges
Peter Clarys, Peter Deriemaeker, Katrien Alewaeters, Marcel Hebbelinck

Background: The most recent national nutritional survey (2004) reveals high meat consumption amongst Flemish inhabitants (152 g/day for men and 92 g/day for women) with a very small proportion of vegetarians (± 1% of the Flemish population). The effects of a vegetarian lifestyle in that specific region of Belgium are but poorly studied. The aim of the present study is to describe the nutritional intake, and other health- and lifestyle characteristics of different groups of Flemish vegetarians.

Materials and methods: Nutritional intake was assessed in different selected vegetarian populations: children, adolescents and young adults (2 to 32 years of age; n=108), adults (3 studies, respectively (1) 18 to 24 years of age, n= 24; (2) 14 to 71 years of age, n=39 and (3) 20 to 98 years of age, n= 375), and elderly (69 to 94 years of age, n = 30). In most of the subjects, but not all, the following characteristics were determined: physical performance capacity, blood biochemistry, growth and development, health related lifestyle factors, and morbidities. Comparisons were made with standard references or with matched pairs.

Results. When compared with matched pairs nutritional intake was found to be appropriate and closer to the RDA. Blood biochemistry showed lower cholesterol, iron and vitamin B12 levels. The number of a-typical subjects was very low. Growth and development of the vegetarian children was within the normal range. Physical performance capacity was comparable with matched non-vegetarians. Vegetarians had a healthier lifestyle (more physical activity, lower alcohol and tobacco consumption, lower medication use) and a lower morbidity compared with the Flemish population.

Conclusions: Generally, vegetarian eating patterns of the groups studied in the Flemish region seem to be adequate and closer to the recommendations. These health related findings can be used as an opportunity to advocate for a mainly plant based or even vegetarian diet. Vegetarian products become more and more available (shops, restaurants) and a recent national nutritional survey indicates that 11% of the subjects between 15 and 18 years of age choose regularly for typical vegetarian products (nuts, seeds, tofu, tempé). Especially the younger generation shows willingness to abandon the traditional meat-rich Flemish diet.
[19] Effective vegetarian diets for weight loss and glycemic control: a high vegetable protein diet perspective

David Jenkins

Low carbohydrate diets have been popular for weight reduction (Atkins, Eddies, South Beach, Zone) and they have been successful in proportion to the degree to which compliance has been achieved. On the other hand, the high content of animal products, high in saturated fat and cholesterol, may limit their use in those with hypercholesterolemia. Even with active weight loss on high saturated fat diets, serum LDL-C may rise above baseline and if such diets continue to be eaten when weight loss has ceased, a more atherogenic blood lipid profile may result. However, plant based vegan diets or diets without animal products, are generally associated with lower LDL-C and indeed plant proteins and vegetable oils have been shown to reduce serum lipids in most studies. Trials of vegan and vegetarian diets have been shown to reduce progression of CHD, improve diabetes control and reduce urinary albumin loss. Furthermore, individual components of a vegetarian diet, including nuts and fiber, and vegetarian diets in general, have all been associated with reduced CHD in cohort studies. Most recently, it has also demonstrated that low carbohydrate diets, high in vegetable fats and proteins as opposed to animal products, were associated with reduced CHD events in women. We have therefore determined the effect on weight loss and serum lipids of a low carbohydrate vegan diet high in soy protein and vegetable oil, under metabolic and ad libitum conditions. We found that despite similar weight reductions in the metabolic and real-world settings, the low carbohydrate vegan diet, high in soy protein and vegetable oil, showed improvements in serum lipids beyond that seen with an NCEP diet. We conclude that plant proteins and vegetable oils allow considerable flexibility in the nature of the nutritional profile used in weight loss programs. In the future, those individuals suited to either a higher carbohydrate or higher fat diet may be identified to maximize the health benefits.

[20] Effective vegetarian diets for weight loss and glycemic control: a low-fat vegan diet perspective

Neal Barnard

Diabetes and obesity are less prevalent in populations following largely plant-based (particularly vegetarian) diets, compared with other populations, and become increasingly prevalent in populations that increase intake of animal-based foods. In intervention trials, vegetarian and near-vegetarian diets reduce body weight and insulin resistance, and, in individuals with diabetes, reduce the need for hypoglycemic medications. A clinical trial compared a low-fat, low-glycemic-index, vegan diet with a diet based on American Diabetes Association guidelines in 99 individuals with type 2 diabetes for 22 weeks. Among participants whose diabetes medications remained unchanged, the vegan diet was associated with a reduction of hemoglobin A1c of 1.2 percentage points, compared with 0.4 for the ADA diet (P = 0.01). Changes in weight and in total and low density lipoprotein cholesterol were also greater in the vegan group. After an additional year of follow-up, reductions in hemoglobin A1c and in total and LDL cholesterol remained significantly greater among the vegan group. Putative mechanisms for the improved glycemic control among vegans include weight loss, reduced intramyocellular lipid, reduced intake of saturated fat and high-glycemic-index foods, or changes in iron status. In clinical trials, the acceptability of vegan diets is comparable to that of other therapeutic diets.
[21] Plant foods and plant-based diets: Protective against obesity?
P.K. Newby

Can consumption of plant foods and plant-based diets help to prevent childhood obesity? The objective of this talk is to examine the literature on this subject, including such topics as fruits, vegetables, grains, and fiber, as well as total dietary patterns. Potential biological mechanisms of action for the protective effect of plant-based diets will also be discussed. The goal is for participants to gain an understanding of the evidence base and determine whether such diets may be recommended for the prevention of childhood obesity. Knowledge gaps and methodological challenges in this research area will also be noted. The talk will conclude by highlighting research opportunities and directions for moving forward our understanding of the role of plant foods and plant-based diets in promoting healthy weight and preventing obesity among children.

Short Oral Presentations

[22] The association between childhood obesity and dietary intake
Vichada Lousuebsakul, Joan Sabaté

Background: Overweight children and adolescents are more likely to become obese as adults.

Materials and Methods: The association between dietary intake and risk of obesity was examined among 870 children, ages 7 to 18 years, attending Seventh-day Adventist schools in Southern California who completed a 106 item food frequency questionnaire. The relative frequency of consumption for 5 food groups was calculated: Meats, including poultry and fish; eggs and dairy products; cereals, legumes and nuts; fruits and vegetables; and vegetable protein. A child was classified as obese if his or her body mass index (wt/ht2) was above the 75th percentile value of the age and gender-specific population subgroup. Results: In a multivariate logistic regression model adjusting for age, and gender, several factors were significantly associated with obesity. Compared to those who did not consume any meat, children whose consumption of meats constituted 11% or more of their total food intake had significantly increased the likelihood of being obese by more than two-fold (OR: 2.36; 95%CI: 1.14-4.87). Children whose total food intake consisted of 21-24% and 25% or more of cereals, legumes and nuts had significantly reduced the odds of being obese by 51% and 61%, respectively, when compared to those who consumed the least proportion of this food group(16% or less).

Conclusions: Among Adventist schoolchildren, a high consumption of cereals, legumes, and nuts can prevent obesity, where as a high consumption of meat can increase the likelihood of being obese.
[23] Height, weight, and BMI among school-age children: soy consumers vs non-consumers
Karen Jocelido-Sieg, Keiji Oda, Joan Sabaté

Background: The nutritional adequacy of vegetarian diets to support normal growth and development among children has been questioned for a number of years and continues even today. Seventh-day Adventists (SDA) typically consume more soy products than the general population. In this study, we examined the relationship between soy consumption and anthropometric parameters in children and adolescents attending SDA schools in Southern California.

Materials and Methods: We analyzed anthropometric and dietary data from a 2-year longitudinal survey of 813 children and adolescents (50.5% boys, 49.5% girls) aged 6 through 18. Diet was assessed by food frequency questionnaire, which queried subjects about their consumption of 91 foods, of which 11 contained vegetarian proteins, mostly from soy. Subjects were characterized according to their consumption of soy products: non consumer (<1 time/wk), low consumer (1-6 times/wk), or high consumer (≥1 time/day). Gender-stratified analyses were done for height, weight and BMI. Results: Median (Q1, Q3) frequency of intake of soy protein products was 1.86 (0, 4) times/wk. Forty percent were non consumers, 40% were low consumers, and 19% were high consumers. For boys, consumers (low and high combined) were slightly taller than non consumers until age 15, while no discernable differences in weight were observed. BMI around 10-14 years of age was slightly lower among consumers. For girls, height was nearly the same in consumers and non consumers, but after age 15, non consumers grew taller. Weight and BMI around age 13-16 were slightly lower among consumers.

Conclusion: Findings from this study suggest that children at pre-adolescent age who consume soy protein products have lower BMI compared to non-consumers.

[24] Soy intake is related to a lower body mass index in adult women
Gertraud Maskarinec, Eva Erber, Alison G. Aylward, Yumie Takata, Laurence N. Kolonel

Background: Experimental and epidemiologic studies suggest that soy foods may promote weight loss. The goal of this study was to examine the effect of soy intake on body weight over the lifespan of women who participated in two previous epidemiologic studies conducted in Hawaii.

Materials and Methods: We assessed the relation between lifetime soy consumption and body mass index (BMI) among 1,418 women with Caucasian, Japanese, and Native Hawaiian ancestry. All subjects reported anthropometric measures, regular diet, and soy intake throughout life. The lifetime soy questionnaire was completed again by a subset of 356 women 5 years after study entry and the values indicated moderate agreement. Results: We regressed soy intake on BMI at study entry and at age 21 while controlling for confounding variables, computed least square means, and performed trend tests. Higher soy consumption in adulthood was related to a lower BMI (P = 0.02). This association was only significant for Caucasian women (P = 0.01); the difference in BMI between highest and lowest soy intake category was 2.35 kg/m² (P = 0.01). The women in the highest category also experienced a smaller annual weight change since age 21 (by 0.15 kg/year) than the low soy intake group (P = 0.01). We observed no association between early life soy intake and BMI. Low energy intake (P = 0.05) and high vegetable consumption (P < 0.0001) were significantly associated with a higher soy intake among Caucasian women.

Conclusions: Our results indicate that women consuming more soy during adulthood may have a lower BMI, but this may be due to other nutritional factors and behaviors that are common in women with high soy intake.
[25] Meat and fish intake and risk of coronary heart disease in the Nurses Health Study: preliminary results of twenty-four years follow-up
Adam Bernstein, Frank Hu, JoAnn Manson, Meir Stampfer, Walter Willett

Background: Interpretation of many prospective cohort studies examining the relation between meat and fish intake and risk of coronary heart disease (CHD) has been challenged by small sample sizes, single dietary assessments, short lengths of follow-up, and confounding recently by variables such as trans-fat and fiber. Moreover, many studies have largely looked at nutrients rather than foods, an approach which makes dietary recommendations difficult, as different foods with the same nutrient may have different effects on the risk of heart disease.

Materials and Methods: We followed 81,108 women participating in the Nurses Health Study who were free of cardiovascular disease, cerebrovascular disease, cancer, diabetes, and angina in 1980 for twenty-four years. Information on dietary intake of red meat, poultry, and fish was obtained at baseline and updated 7 times during follow-up by means of validated questionnaires. Outcome included fatal coronary heart disease and non-fatal myocardial infarction. Analysis was performed using a Cox proportional hazards model. Multivariate analyses were adjusted for age, smoking status, total energy intake, body mass index, alcohol consumption, cereal fiber, vitamin E supplement use, duration of multiple vitamin use, trans-fat intake, family history of heart disease, physical activity, and medication use (including postmenopausal hormones, aspirin, beta blockers, and cholesterol lowering therapy).

Results: Preliminary results show an increasing risk of CHD across quintiles of total red meat intake in age-adjusted but not multivariate analyses. Analyses of total fish intake show decreasing risk of CHD across quintiles in both age-adjusted and multivariate analyses. Further analyses of individual meats and fish are underway.

Conclusions: Preliminary findings of this long-term study confirm shorter-term study findings of no independent relation between total meat, poultry, or red meat intake and risk of coronary heart disease.

[26] The impact of a vegetable-rich diet on key markers of health in a cohort of Australian adolescents
Ross Grant, Carol Zeuschner, Trish Guy, Robyn Pearce, Bevan Hokin, John Ashton

Background: Childhood obesity is a widespread child-health problem in the developed world, including Australia. Overweight in childhood can lead to adult overweight and the development of risk factors for cardiovascular disease (CVD), including hypertension, dyslipidaemia, insulin resistance and type-2 diabetes. Effective strategies for reducing childhood obesity and improving child health are being actively sought. A vegetarian diet has been consistently shown to be an effective prophylaxis to many lifestyle diseases in the adult population and may therefore be beneficial in children. However the metabolic demands of adolescents are different to adults and the impact of a predominantly vegetarian diet on CVD markers in this demographic is unclear.

Materials and Methods: We compared key physiological and biochemical markers of health against responses to the SPANS 2004 "Diet and Lifestyle Survey" using a General Linear Model (GLM) univariate statistical procedure. 215 adolescents (14-15yrs) from 5 Adventist secondary schools in the Sydney and Hunter regions of New South Wales, Australia, participated in this study.

Results: Adolescents consuming predominantly vegetarian foods showed significantly better scores on recognised markers of cardiovascular health, including, BMI, waist circumference, total Chol/HDL ratio and LDL. Adolescents consuming nuts more than once per week, also showed lower scores for BMI and serum glucose irrespective of their vegetarian status. Markers of general health including haemoglobin and average height were not significantly different between vegetarian and non-vegetarian groups. Surprisingly, exercise on its own was not statistically associated with any of the risk factors tested.

Conclusions: (1) Vegetarian adolescents showed significantly better scores for recognised markers of cardiovascular health. (2) A vegetarian diet choice appears to be a more significant factor than exercise in promoting cardiovascular health in this age group.
[27] Quality of life in an aging population
Peter Pribs, Fiona Lewis, Tevni Grajales, Gary Fraser

Background: Previous research has shown that Seventh-day Adventists (SDA) have a decreased incidence of chronic diseases and live longer than the general population, but it is not clear if this increased life expectancy is associated with good Quality of Life (QoL).

Material and Methods: To determine QoL we mailed a validated “Short Form-36 questions” (SF-36) questionnaire to 119 SDAs 65 years and older. The survey measured QoL in eight areas of physical and mental health. There were 72 subjects in our study who also participated in the Adventist Health Study 2 (AHS2). Using QoL as outcome and the AHS2 questionnaire as the source of nutritional and lifestyle information we correlated nutritional and lifestyle variables to determine which of them contributed to the better QoL of SDAs. Data were analyzed using ANOVA and Structural Equation Modeling Techniques with SPSS statistical software.

Results: Using ANOVA, we compared scores for the general US population with SDAs for ages 65-74 years old and 75 and older for both sexes. The SDAs scored better in every area of QoL (general, physical, social, oral and mental health; bodily pain and vitality); however more of the differences for the 75 and older were significant. We compared vegetarian SDAs with non-vegetarian SDAs and because of the small sample size the differences were not significant. Nevertheless, the results do suggest an advantage of being vegetarian with advanced age. We developed a theoretical model that explains the correlation between different characteristics of lifestyle and the physical and mental health of older SDAs.

Conclusion: The advantage of the SDA and vegetarian lifestyle on QoL seems to be accentuated with progressing age.

(Conclusion of short oral presentations)

[28] Predicting serum 25-hydroxyvitamin D levels
Jacqueline Chan
Numerous studies have examined vitamin D levels in various populations. All indicate that deficiencies in vitamin D are widespread. This presentation examines the Adventist Health Study-2 (AHS-2) data to discover the current sources of vitamin D for this nationwide population. Analyses on a sub-group of AHS-2 subjects shed light on the following questions. What is/are the major source(s) contributing to serum 25 hydroxyvitamin D (s25OHD) levels? Does age itself affect the amount of vitamin D produced in the skin or are there other factors associated with age that might be the cause for age-related declines in s25OHD levels? How different are the mean levels of s25OHD levels of blacks and whites? Is it more than skin color that contributes to these differences? What is the difference between vitamin D2 and D3 and how much does this difference contribute to the overall s25OHD status? Are vegetarians, especially vegans, at greater risk of vitamin D deficiency than non-vegetarians? What resources are available to provide more accurate, relatively simple means for determining geographical differences in UVB strength, than latitude? Just how do you determine amount of sun exposure from questionnaire data?
[29] Demographic profiles and cultural aspects of barriers to vegetarianism in the U.S.
Susanne Montgomery
While it is clearly established that a diet predominantly made up of fruits, vegetables, legumes, grains and nuts can alter the risk of many chronic diseases such as several cancers, CVD, and diabetes, the demographic profile of persons in the U.S. who make the dietary choice to limit or exclude meat is unknown and expected to be small. Seventh-day Adventists (SDA), a Christian denomination with a strong healthy lifestyle commitment, are known to have one of the larger groups of persons committed to eating a plant-based diet. This paper intends to explore the demographic profiles of persons eating various degrees of a plant-based diet in two national samples: the NHANES and the AHS2 study. In addition, we will begin to explore barriers to eating a plant-based diet. Using 2003/04 age-matched data (30-59) from the NHANES study (N=1849), and the AHS2 study (N=37,430), we determined what proportions of respondents reported varying degrees of plant-based eating—those who reported eating vegetables only (1.1% vs. 35.2%), those who ate vegetables and fish (1.7% vs. 8.7%), those who ate vegetables and poultry (3.8% vs. 3.4%), and those who ate vegetables, fish and poultry (8.7% vs. 13%), versus those who reported eating meat (90.2% vs. 39.7%) on a regular basis. Demographic profiles on these sub-groups and comparisons by race/ethnicity (non-Hispanic White, non-Hispanic Black and Hispanic) will be presented as will the results of a literature review and a small qualitative pilot study (N=20) to explore cultural factors impacting barriers to plant-based eating.

[30] Vegetarian nutrition: Intended and actual effects
Ingrid Hoffmann, Katharina Bernsmeyer, Lena Wagner
Vegetarian nutrition is often recommended and practiced for individual reasons such as the prevention of nutrition-related diseases and for societal reasons such as ethical and religious concerns. More recently, ecological reasons gained importance. Most scientific studies on the effects of vegetarian nutrition focus on single aspects, predominantly on health aspects. A lot of detailed information is available. However, to get a deeper insight into the actual effects of vegetarian nutrition, its complexity needs to be considered. Vegetarian nutrition simultaneously affects the dimensions health, environment, society and economy. Since the effects are interlinked, side-effects and feed-back loops occur, which may enhance or diminish the originally intended effects. For example omitting meat and meat-products from the diet is for vegetarians associated with a lower risk of nutrition-related diseases. In addition, such a diet is related to a lower environmental impact (e.g. lower CO2-emissions from agricultural production) that on long-term may also affect the health of the general population. Hence, for statements about the actual effects of vegetarian nutrition and especially in the context of increasing global problems it is essential to consider its complex interrelatedness.
[31] Vitamin B12 and homocysteine status among vegetarians—a global perspective
Ibrahim Elmadfa, Ingrid Singer
There is evidence of health benefits of appropriately planned vegetarian diets. However, low intake or exclusion of animal products may affect cobalamin status and lead to an elevated homocysteine level. Hyperhomocysteinemia is seen as an independent risk factor for cardiovascular diseases and may also play a role in cognitive function in older persons. Therefore, the status of vitamin B12 and homocysteine in vegetarians and especially in vegans warrants attention. However, there are only a limited number of studies on this topic. Thus, an enquiry in the online database MEDLINE for the terms “Vitamin B12 and homocysteine and vegetarians” and “Vitamin B12 and homocysteine and vegans” in title/abstracts yielded only 13 articles that were published between January 2003 and October 2007. The majority of these investigations point to a reduced status of vitamin B12 in vegetarians and especially vegans, regardless of the country of origin. It could be seen in Indian as well as in German and Dutch vegetarians. Findings from our own study in vegetarians, vegans and omnivorous controls confirm these results. A 24 h recall and blood analyses showed that although the average vitamin B12 levels in the plasma were adequate in most of the subjects regardless of their diets, vegetarians and especially vegans had a significantly lower intake of this vitamin. Furthermore, 65% of the vegans and 52% of the vegetarians had moderate hyperhomocysteinaemia. This disturbance is also promoted by folate deficiency and has a genetic background, making certain insufficient supply of folate. The high folate intake that is usual in vegetarians may partially mask the negative B12 status. Nevertheless, adequate intake of vitamin B12 by vegetarians and especially vegans needs special attention. This is of particular importance in countries where vegetarian diets are chosen out of poverty.

[32] Dairy foods—should they be a part of a healthy vegetarian diet? PRO
Connie M. Weaver
Three servings of milk and milk products daily were recommended for most calorie groups in the 2005 U.S. Dietary Guidelines because of their nutrient density and relationship to health. Three servings of dairy products contribute substantially to meeting Dietary Recommended Intakes for calcium, potassium, magnesium, riboflavin, vitamin A, protein, vitamin B12, thiamin, zinc, phosphorus, and vitamin D. The ability to achieve recommendations for calcium and potassium are severely compromised without milk products in the patterns. Supplements are available for calcium, but this is not a practical alternative for potassium. Low lactose dairy products are available for those with lactose malabsorption. Calcium fortified soy milk has a similar nutrient profile to milk. However, national surveys suggest few individuals who avoid dairy products select alternatives to meet nutrient requirements provided by dairy products. The benefits of three servings of milk and milk products to health have not been studied for alternatives to milk. Recent reports that question the benefits of calcium supplementation for bone health or safety of consuming dairy products lack the strong evidence base for public health recommendations for daily consumption of milk and milk products, especially for building strong bones.

[33] Dairy foods—Should they be a part of a healthy vegetarian diet? CON
Walter Willett
Abstract unavailable at press time
Thursday, March 6, 2008—Morning

Concurrent Short Oral Presentations 2
Session 2A - Nutrition and Chronic Disease

*Chair: Serena Tontstad*
*Co-Chair: Stoyan Grakov*

**Randall Visitors Center**

[34] A vegetarian source of docosahexaenoic acid from microalgae lowers fasting triglyceride levels  
Alan S. Ryan

[35] Supplemental plant-derived nutrients decrease cardiovascular disease risk in metabolic syndrome  
Deanna M. Minich

[36] Cruciferous vegetables alter UGT activity, as measured by serum bilirubin concentrations  
Sandi L. Navarro

[37] Meat consumption and the risk of cancer: A meta-analysis of case-control and cohort studies  
Dagfinn Aune

[38] Comparing calcium absorption of fortified soymilk to cows milk in osteopenic post menopausal women  
Anne Lise Tang Fook Cheung

7:45-9:00 am
Concurrent Short Oral Presentations 2
Session 2B - Nutritional Status/Assessment

*Chair: Ingrid Hoffmann*
*Co-Chair: Kathryn Knecht*

**Randall Visitors Center**

[39] A comparison study of Buddhist vegetarians and Seventh-day Adventist vegetarians in West Malaysia  
Wai Fong Chan

[40] Light exposed mushrooms: From development to market of naturally enhanced plant source of vitamin D  
Uma S.Babu

[41] Vitamin E status and phospholipid composition of erythrocytes in vegetarians and omnivores  
Ibrahim Elmadfa

[42] Vitamin B12 and homocysteine status in vegetarian and non-vegetarian Australian adolescents  
Bevan Hokin

[43] Diets provided to adolescent females in Uganda's boarding schools do not meet iron requirements  
Sarah Ngalombi

ICVN
5th International Congress on Vegetarian Nutrition
Thursday, March 6, 2008—Morning

9:10-11:20 am  **Symposia: Food based versus nutrient based dietary guidelines**  
*Chair: David Jacobs*

Dietary guidelines have traditionally not emphasized specific plant foods that are integral to a healthy vegetarian diet. This will be a forum to discuss which plant foods need to be better positioned in the upcoming dietary guidelines and how we can go about accomplishing that.

[44] Food, not nutrients, is the fundamental unit in nutrition  
*David R. Jacobs, Jr.*

9:40-10:00 am: Break

Panel: How to better position vegetarian diets in the upcoming dietary guidelines  

11:20 am-12:50 pm  **Symposia: Plant based diets and aging**  
*Chair James Joseph*  
*Co-Chair: Gary Fraser*

Epidemiological evidence on the role of plant foods in longevity will be presented. The role of specific plant foods in reducing age related diseases of the brain will also be considered. Another aspect of longevity, calorie restriction will be discussed from the perspective of plant based diets.

[49] Epidemiological perspective on aging, longevity and plant based diets  
*Walter Willett*

[50] Role of antioxidants from berries and other sources in brain aging and diseases associated with aging  
*James Joseph*

[51] Diet restriction versus diet selection: A convergence of concepts  
*Donald Ingram*
Thursday, March 6, 2008—Afternoon

12:50-2:00 pm  Lunch

2:00-3:30 pm  Symposia: Current issues on nuts
   Chair: Michelle Wien

   The role of nuts in reducing risk factors for cardiovascular disease has been well established. Findings with respect to emerging risk factors for CVD and other chronic diseases, like diabetes and obesity, will be discussed from the epidemiological perspective and from the human intervention studies.


   [53] Nuts and newer cardiovascular disease risk factors
   Emilio Ros

   [54] Nuts, metabolic syndrome and diabetes
   Cyril Kendall

3:30-3:50 pm  Break
3:50-5:20 pm  Symposium: Climate change and food production—dietary choices  
Chair: Sam Soret  
Co-Chair: Seth Wiafe

Recognizing the increasing concerns with respect to global warming, specific data on the impact of production for various diets will be presented. Human consumption patterns have a profound impact on global warming. The session will also discuss the implications of global warming on food production for the future.

[55] The Environmental Impact of Dietary Preference  
Hal Marlow

[56] Potential contribution of food consumption patterns to climate change  
Annika Carlsson-Kanyama

[57] The prospects of food production (and consumption) in the context of global climate change  
Gidon Eshel

5:20-5:30 pm  Closing Remarks
Abstracts

[34] A vegetarian source of docosahexaenoic acid from microalgae lowers fasting triglyceride levels
Alan S. Ryan, Michelle A. Keske, Connye N. Kuratko, James P. Hoffman, Edward B. Nelson

Background: Elevated triglycerides (TG) represent an independent risk factor for cardiovascular disease. For TG lowering, the American Heart Association (AHA) recommends omega-3 fatty acids, docosahexaenoic acid (DHA) and eicosapentaenoic acid (EPA) at 2-4 g/day.

Materials and Methods: To determine the independent effect of DHA supplementation on TG lowering, studies with outcomes related to Martek algal-derived DHA and TG levels were identified. Data from these studies were extracted and expressed as daily dose of DHA versus percent (%) change from baseline TG level.

Results: 16 studies were identified: 12 studies supplemented with algal oils from Cryptothecodinium cohnii and 4 from Schizochytrium sp. (both oils contain 35-40 % DHA, <3 % EPA). 12 studies investigated normal subjects. The remaining 4 studies investigated hypertriglyceridemic subjects (TG >150 mg/dL) of which two were conducted with concomitant statin therapy. DHA supplementation significantly reduced fasting TG in a dose-dependent fashion, regardless of type of algal oil or baseline TG level. Supplementation of 1-2 g/day of DHA, with or without concomitant statin therapy, effectively lowered TG by 15 - 20%. The absolute decrease (mg/dL) in TG in the hypertriglyceridemic subjects was markedly greater than that observed in normal subjects.

Conclusions: Algal-derived DHA alone (essentially devoid of EPA) is effective in lowering fasting TG levels whether as the sole agent or co-administered with a statin. In the studies reviewed, TG reductions were achieved using DHA alone at a dose lower than that currently recommended by AHA for the combination of DHA and EPA.

[35] Supplemental plant-derived nutrients decrease cardiovascular disease risk in metabolic syndrome
Deanna M. Minich, Robert H. Lerman, Gary Darland, Joseph J. Lamb, Jeffrey S. Bland, Matthew L. Tripp

Background: No dietary consensus exists for metabolic syndrome (MetS). Various plant based foods such as soy and almonds have been shown to be effective for targeting cardiovascular parameters implicated in MetS. The objective of this study was to examine the role of supplemental phytomolecules known to modulate intracellular insulin signaling and inflammation together with plant-based cholesterol-lowering foods on cardiovascular disease (CVD) risk in MetS.

Materials and Methods: Volunteers (n=44) with MetS and hypercholesterolemia were randomized to either a Mediterranean-style, low glycemic load diet (MED) (n=19) or MED plus targeted phytomolecules (soy protein, plant sterols, rho iso-alpha acids from Humulus lupulus L., and proanthocyanidins from Acacia nilotica bark extract) (n=25). CVD risk markers were analyzed at baseline, 8, and 12 wk.

Results: Despite no caloric restriction, both groups lost equal weight over 12 wk (5.9 ± 0.67 vs 5.7 ± 0.97 kg, PED vs MED). PED had greater reductions in total cholesterol, triacylglycerol (TG), cholesterol:HDL-C, and TG:HDL-C at 12 wk (P<0.05). Only PED had increased HDL-C (P<0.05) and decreased TG:HDL-C (P<0.001). At 12 wk, PED had 43% net resolution of MetS vs 22% of MED subjects. Phytomolecule supplementation led to a greater decrease in CVD risk compared with diet alone (P<0.001).

Conclusions: Supplemental phytomolecules added to a Mediterranean-style, low glycemic load diet improves net resolution of MetS and decreases CVD risk more than diet alone, independent of weight loss or caloric restriction.
[36] Cruciferous vegetables alter UGT activity, as measured by serum bilirubin concentrations
Sandi L. Navarro, Karen Makar, Shuying S. Li, Lin Li, John D. Potter, Johanna W. Lampe

Background: Isothiocyanates (ITC), secondary glucosinolate metabolites from cruciferous vegetables, may reduce cancer risk by upregulating phase II conjugating enzymes, including UDP-glucuronosyl transferase (UGT) 1A1. UGT1A1 glucuronidates bilirubin, estrogens, and exogenous compounds, including dietary carcinogens (e.g., heterocyclic amines and polycyclic aromatic hydrocarbons). The UGT1A1*28 genotype has an additional TA repeat in the promoter region that is associated with 50% lower transcription compared to the wild-type (*1/*1).

Materials and Methods: We evaluated, in a randomized, controlled, cross-over feeding trial in 70 healthy humans, the effects of 3 vegetable diets, single- and double-dose cruciferous (i.e., broccoli, cauliflower, cabbage, radish sprouts) [1xC] and [2xC] and cruciferous plus apiaceae (i.e., carrots, celery, parsnips, parsley, dill) [1xC+A] compared to a fruit and vegetable-free, lacto-ovo basal diet. We measured serum bilirubin concentrations on days 0, 7, 11 and 14 of each 2-week feeding period to monitor UGT1A1 activity and determined effects of the UGT1A1*28 variant on this response.

Conclusions: Cruciferous vegetable supplementation increased UGT activity, as measured by serum bilirubin concentrations, and this effect differed by UGT1A1*28 genotype. Differences in serum bilirubin concentrations occurred with a lower amount of cruciferous vegetables and to a greater extent among individuals with the UGT1A1*28 genotype. These results have implications for decreased cancer risk through dietary intervention, particularly within this vulnerable sub-group.

[37] Meat consumption and the risk of cancer: A meta-analysis of case-control and cohort studies
Dagfinn Aune, Marit B. Veierød, Giske Ursin

Background: The relationship between meat consumption and cancer risk has been investigated in many studies, but the results have been inconclusive for several cancer sites. To clarify this relationship we conducted a systematic review of meat consumption and cancer risk at all the sites which had been investigated by a minimum number of five studies.

Materials and methods: The analysis was conducted by first searching several databases for studies on meat consumption and cancer risk, from their inception to October, 2007. Risk ratios, incidence rate ratios and odds ratios were pooled by use of a random-effects model.

Results: There was an increased risk of cancer of the lung, pancreas, liver, colorectum, breast, ovaries, endometrium, prostate and kidney with a high total meat intake. Higher intake of red meat was associated with increased risk of cancer of the mouth and pharynx, esophagus, lung, stomach, pancreas, colorectum, breast, endometrium, kidney and of non-Hodgkin's lymphoma, while higher intake of processed meat was associated with increased risk of cancer of the mouth and pharynx, nasopharynx, larynx, esophagus, stomach, pancreas, colorectum, breast, prostate and adult and childhood (maternal intake during pregnancy) brain cancer. In addition, several individual meat items were associated with increased risk of some types of cancer. For some sites and meat types there were discrepancies between the results from case-control and cohort studies or there was unexplained heterogeneity.

Conclusion: It seems likely that reducing meat consumption will decrease the risk of cancers of the breast, lung, pancreas and stomach and very likely that colorectal cancer risk will be reduced. More large population-based case-control and cohort studies are needed to confirm some of these findings.

5th International Congress on Vegetarian Nutrition
[38] Comparing calcium absorption of fortified soymilk to cows' milk in osteopenic post-menopausal women
Ann Lise Tang Fook Cheung, Gisela Wilcox, Boyd Strauss, Karen Z Walker, John F Ashton, Lily Stojanovska

Background: Vegetarians commonly consume soymilk instead of cows' milk as a good source of calcium. It is very important to ensure adequate amounts of calcium in the diet to minimise osteoporosis which is a serious health threat for aging post-menopausal women. Soymilk is also often consumed by women to reduce menopausal symptoms. Native soymilk contains significantly less calcium than cow's milk. Therefore, calcium is added to soymilk as a fortificant and it is unclear whether this added calcium is absorbed efficiently.

Materials and Methods: The study compared calcium absorption of fortified soymilk to cows' milk in 12 osteopenic post-menopausal women using a randomised single-blind cross-over study. Anthropometric measurements of weight, height and bioelectrical impedance analysis (BIA) were taken and calcium absorption was measured using a single-isotope radiocalcium method. Participants consumed an oral dose of five μCi of 45Ca in 24 mg of calcium carrier from each drink.

Results: The mean (± SD) age and BMI were 57.6 (± 5.3) yr and 25.8 (± 5.1) kg/m2, respectively. All participants had a sub-optimal to normal vitamin D levels, mean = 66.0 (± 14.0) nmol/L. The mean fractional calcium absorption (%) values from soymilk and cows' milk were 0.66 (± 0.15) and 0.71 (± 0.15) respectively, and there was no significant difference (P>0.05).

Conclusion: This study indicates that calcium absorption from fortified soymilk is comparable with that of cows' milk. Therefore, addition of fortificants in beverages could be an effective way to ensure an adequate intake of dietary calcium.

[39] A comparison study of Buddhist vegetarians and Seventh-day Adventist vegetarians in West Malaysia
Wai Fong Chan, Gina Siapco

Background: The concept that a vegetarian lifestyle leads to better health outcome has become popular in recent years in Malaysia and an increase in the number of vegetarians has been observed. In Peninsular Malaysia, prominent among the vegetarian population are the Buddhists and Seventh-day Adventists (SDAs). Since these two groups differ in their religious practices and beliefs, we wanted to find out if Buddhist vegetarians differ from SDAs in terms of lifestyle practices and selected health indicators.

Materials and Methods: Seventy-seven vegetarians (37 SDAs and 40 Buddhists), aged 20 to 76, volunteered to participate in the study. Participants self-administered a simple lifestyle questionnaire and provided three-day food records. Body composition analysis was determined using the Tanita® bioelectric impedance analysis scale. Fasting blood samples were taken for lipid profiling. In addition, a sphygmomanometer was used to measure blood pressure readings.

Results: Both groups subscribe to the vegetarian diet due to health reasons. We found no significant differences between the lifestyle practices of these two groups of vegetarians. In addition, there are no significant differences in waist circumference, body mass index (BMI), % body fat, lean body mass, blood pressure, serum total cholesterol, serum LDL-cholesterol, serum HDL-cholesterol, serum triglycerides, and total cholesterol/HDL ratio. Results are all within normal limits according to the standards delineated by the World Health Organization. Results indicate that, for this group of volunteers, the health-promoting effects of a vegetarian lifestyle transcend religious beliefs and cultures. Similarities in the health indicators of these two vegetarian groups could be attributed to their compatible dietary and lifestyle practices.
[40] Light exposed mushrooms: From development to market of naturally enhanced plant source of vitamin D

Mona S. Calvo, Larry H. Garthoff, Mary Jo Feeney, Charlee Kelly, Uma S. Babu

**Background:** Vegan and vegetarian diets are extremely limited in vitamin D, because very few foods not of animal origin contain vitamin D, and few foods other than cow's milk are highly fortified. A growing number of studies show the importance of maintaining adequate vitamin D from sunlight induced skin synthesis or dietary intake for the prevention of chronic diseases, notably cancer, diabetes, and tuberculosis. Vitamin D's emerging role in the prevention of these chronic diseases and the regulation of immune response has identified the need for more vitamin D rich foods that would be accepted and consumed by the entire population in North America.

**Method:** Consistent with FDA's mission to ensure the safety and nutrient adequacy for the entire population, the FDA introduced the concept of developing a vitamin D rich food without fortification based on the fact that all edible mushrooms naturally contain small amounts of vitamin D2. This level can be markedly enhanced by exposing the mushrooms to sunlight or UVB light which converts ergosterol to vitamin D2. Joint efforts involving the FDA and the mushroom industry focused on developing processes for post-harvest, light exposure of white button, crimini (brown) and portabella mushrooms to arrive at a stable, significant content of vitamin D2.

**Results:** Initial results showed that vitamin D2 content was as high as 86.9 µg (3476 IU) or 869% of the Daily Value (10 µg) per serving, after 5 min. exposure of harvested white button mushrooms. Subsequent studies using crimini and portabella showed similar results. These mushrooms will be used at FDA to test the bioavailability and effects on immune response using animal models.

**Conclusion:** Naturally enhanced vitamin D2-containing white button, crimini and portabella mushrooms are anticipated to be available in the market place by early 2008, providing 100% of the Daily Value of vitamin D2 per serving size (84 g). These mushrooms will be a significant plant source of vitamin D2 for vegans and vegetarians.
[41] Vitamin E status and phospholipid composition of erythrocytes in vegetarians and omnivores
Ibrahim Elmada, Margit Kornsteiner

Background/Aims: The objective of the study was to analyse the vitamin E status and phospholipid composition of erythrocytes in vegetarians and omnivores. Detailed analyses were carried out for long chain polyunsaturated fatty acids (LC(n)-3 and LC(n)-6) in long term markers like sphingolipids (SL), phosphatidylcholine (PC), phosphatidylserine (PS), and phosphatidylethanolamine (PE) of erythrocytes.

Method: The study included 98 adult volunteers of both genders from Austria, of which 23 were omnivores, 25 vegetarians, 37 vegans and 15 semi-omnivores. All volunteers were categorized into omnivores (consume all foods), vegetarians (consume no meat, but eggs, or dairy products), vegans (consume no meat, poultry, fish, eggs, or dairy products), or semi-omnivores (mostly fish and poultry based on food frequency questionnaires). This resulted in groups of different sizes. Vitamin E and fatty acid analysis were carried out with HPLC and GC.

Results: Omnivores had the lowest α-tocopherol equivalents (α-TEs), α- and γ-tocopherol contents in erythrocyte packed cells (EPC), which was statistically significant compared with vegetarians. The analysed α-TEs (µg/g EPC) were 0.76 ± 0.30 (omnivores), 1.09 ± 0.38 (vegetarians), 0.98 ± 0.40 (vegans) and 1.04 ± 0.26 (semi-omnivores). The erythrocyte fatty acid analysis in the phospholipid fractions showed that the four dietary groups did not differ significantly in the total SFA (saturated fatty acids), TFA (trans-fatty acids), MUFA (monounsaturated fatty acids) and PUFA (polyunsaturated fatty acids). Vegans and vegetarians had significantly lower portions of C 20:5n-3, C 22:5n-3 and C 22:6n-3 and ratios of the sum of LC(n)-3 and LC(n)-6 in PC, PE, and partly PS.

Conclusion: The biochemical improvement of the LC(n)-3 fatty acid status should be a main nutritional target in vegetarians and vegans.

[42] Vitamin B12 and homocysteine status in vegetarian and non-vegetarian Australian adolescents
Bevan Hokin, Ross Grant, Ayse Bilgin, Carol Zeuschner, Trish Guy, John Ashton

Background: In countries where food fortification with vitamin B12 is limited by authorities, the vitamin B12 status of adult vegetarians has been shown to be deficient with an inadequate intake, the predominant cause. The incidence of vitamin B12 deficiency in Australian adult vegetarians has been previously reported, but the incidence of deficiency and its potential health impact on adolescents is unknown.

Materials and Methods: Two hundred and fifteen adolescents (14-15yrs) participated in this study. Participants were classified as vegetarian, if the consumption of red meat, chicken or fish was less than once a week. Based on this definition, 53 participants were placed in the vegetarian category with the remaining (154 with complete records) participants classified as non-vegetarian. Vitamin B12 and homocysteine results were compared with diet and lifestyle questionnaire responses.

Results: B12 levels for non-vegetarians were on average 27.6% higher than the vegetarian participants (p<0.001). There was no statistically significant difference in homocysteine levels between vegetarians: Mean 9.4 (8.4-10.5) and non-vegetarians: Mean 9.1 (8.7-9.5) (p=0.787). The frequency of breakfast consumption per week produced a significant effect on serum vitamin B12 levels. Vegetarian adolescents who ate breakfast twice or less per week had a 14.5% lower serum vitamin B12 level compared to the children who ate breakfast three times or more per week (p=0.003). The frequency of breakfast consumption was negatively correlated to blood homocysteine levels where the difference in homocysteine levels between the two breakfast categories was on average 1.6 mmol/L (p<0.001).

Conclusions: Many adolescent vegetarians had values that fell outside reference intervals considered to be typical of asymptomatic populations. The diets consumed by the vegetarian students probably supply inadequate vitamin B12. The importance of adequate vitamin B12 intake should therefore be stressed to parents of vegetarian children.
[43] Diets provided to adolescent females in Uganda's boarding schools do not meet iron requirements
Sarah Ngalombi, Joyce Kikafunda, Agnes Namutebi

Background: The predominately vegetarian diets provided to female adolescents (15-18 years) in central Uganda may not meet their iron requirements due to the high intake of iron absorption inhibitors (phytates, fibre and tea) and low intake of the absorption enhancers (animal flesh and vitamin C).

Materials and Methods: We carried out a cross-sectional study involving six boarding schools and 224 students. Dietary intake was assessed by obtaining food frequency intake (over a three months period) and three 24-hour food recalls on three non-consecutive days and the wfood2(1997) food analysis computer program converted the food intake into nutritional values. Hemoglobin concentration and Body Mass Index were used to determine nutritional status. Results: The students were generally well nourished as the majority (81.3%) were within the normal BMI (18.5-25) values and the intake of protein (85.9 ± 35.6 g/day) and energy (2305 ± 889 kcal/day) were within the national recommended values. However the intake of total iron (23 ± 11.6 mg/day), bio-available iron (0.92 ± 0.6 mg/day) and the iron absorption enhancer vitamin C (18.1 ± 36.8 mg/day) were significantly (P< 0.01) below their respective RDA's of 30 mg, 2 mg and 40 mg, with the majority (69.5%, 96.5% and 85% respectively) not meeting the required intakes. Intake of the absorption inhibitors fibre (51.4 ± 26.5 g/day), phytate (435.4 ± 2159 mg/day) and tea/coffee (248.6 ± 258 ml/day) was also very high. The Haemoglobin concentration (10.1 ± 1.0 g/dl) was significantly below the WHO cut-off for anaemia (<11 g/dl) and a high percentage (75.6%) of the subjects were anemic.

Conclusion: The diet of female adolescents in Uganda may not be able to meet the iron requirements probably due to the low intake of iron absorption enhancers and high intake of the inhibitors, all of which further jeopardizes the bio-availability of the less absorbable haem iron which is the main majority constituent of this predominately vegetarian diet.

[44] Food, not nutrients, is the fundamental unit in nutrition
David R. Jacobs, Jr.

To maximize progress in the understanding of diet and health, “think foods first.” Nutritional theory developed partly based on progress against deficiency diseases (eg, vitamin C and scurvy). A further impulse to formulate nutrition in terms of individual nutrients arose from a general tendency in science to understand the world in simplest terms, and nutrients seemed to be the simplest representation of diet. Yet, chronic disease risk findings for individual nutrients given as isolated supplements, using the rigorous randomized clinical trial design, have been disappointing, or even adverse. In contrast, low chronic disease risk associated with diet patterns such as “prudent” or “Mediterranean” is among the most consistent and enduring in observational epidemiology, suggestive of food synergy. The reductionist formulation of nutrition in terms of health effects of individual nutrients seems limited and liable to error. Food, which was alive, has an orchestrated balance of constituents, such as antioxidants complementary to highly oxidizable fatty acids. The extent of this complementarity and how much complementary constituents survive digestion are important research topic. The strategy of fortifying foods with purified supplements may not have the same effect on health as would the equivalent amount of the same constituent contained in natural food.
[45] How to better position vegetarian diets in the upcoming dietary guidelines
Victor Fulgoni III
Abstract unavailable at press time

[46] How to better position vegetarian diets in the upcoming dietary guidelines
Kathryn Greaves
Soy protein has both an intrinsic value to improve the health of consumers, as well as an extrinsic value as a replacement for animal proteins, particularly with respect to heart health. Randomized clinical trials conducted over the past nine years since the time of the health claim, continue to show cholesterol lowering benefit with intake of soy protein. Soy is a source of a highly digestible, complete protein containing essential amino acids at adequate levels to meet the needs of adults and children two years and older. Most vegetable sources of protein lack appropriate levels of essential amino acids to meet human requirements. As a result, and as dietary guidelines evolve to emphasize consumption of plant-based diets, the inclusion of recommendations related to protein intake and protein quality will be necessary. Soy protein is an essential component of plant-based diets and can play a prominent role in promoting the health and well-being of the consumer.

[47] How to better position vegetarian diets in the upcoming dietary guidelines
Ella Haddad
Although publications supporting the Dietary Guidelines for Americans 2005 state that vegetarian diets can meet all nutrient requirements and offer consumer education tips and resources for vegetarians, they stop short of recommending the vegetarian diet as an option for healthy eating. The Dietary Guidelines are intended to protect against chronic disease in American adults, but evidence showing that vegetarian diets are associated with longevity, healthier body weights, and may effectively decrease major chronic disease risk received little attention. To better position vegetarian diets in the Dietary Guidelines, the research base for vegetarian studies needs to be expanded to include multi-center trials of the diet in individuals with various chronic disease conditions, as well as in-depth studies on the ecological impact of the diet. There must also be consensus among academicians and researchers on what constitutes a healthy vegetarian diet. More specifically we must explicitly define the parameters that describe the vegetarian eating pattern.

[48] Putting vegetarian diets at the center of the plate: Lessons learned and key strategies for updating the Dietary Guidelines for Americans
Amy Lanou
As we head into the 2010 revisions of the Dietary Guidelines for Americans, researchers, educators, and other stakeholders, will need to learn from past efforts and work collaboratively to get vegetarian diets featured in the guidelines. Utilizing evidence-based arguments for disease prevention will provide credibility as these groups urge the Dietary Guidelines Advisory Committee (DGAC) and government decision makers to acknowledge the importance and viability of vegetarian diets for promoting optimal health of Americans. Key strategies include successfully placing 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. Vegetarian and vegan diets are built from foods from plant sources; by definition they exclude meat. As such, they present an enormous industry relations problem for government agencies working hard to avoid recommending “eat less” of anything while still stretching to provide useful nutritional advice to consumers. Given this history, it will require a concerted effort by researchers, educators, health professionals, and consumers using a variety of timely methods to put vegetarian diets in the rightful place at the center of the plate.
[50] Role of antioxidants from berries and other sources in brain aging and diseases associated with aging.

J.A. Joseph, B. Shukitt-Hale, D. Bielinski, Lauren Willis, and D. Fisher

Numerous epidemiological studies have indicated that consumption of a diet containing high amounts of fruits and vegetables may prevent age-related disease such as Alzheimer Disease (AD). A recent report, for example, has indicated that individuals who consumed a diet containing 2.5 servings of fruit and vegetables/day were 40% less likely to develop AD. Research from our laboratory has suggested that dietary supplementation with fruit, nut or vegetable extracts high in antioxidants (e.g., blueberry, BB, blackberry, cranberry, concord grape juice, strawberry, Sb, walnuts) can decrease the enhanced vulnerability to oxidative stress (OS) that occurs in aging and these reductions are expressed in part as improvements in motor and cognitive behavior. In addition to their antioxidant and anti-inflammatory activities, multiple mechanisms may be involved in the beneficial effects observed from these supplementations. These mechanisms include: a) enhancement of neuronal communication, b) signaling associated with learning and memory; c) neurogenesis, d) as well as reductions in oxidative/inflammatory stress signaling. We believe that this information can then be utilized to show that the possible addition of colorful fruits such as berryfruits and nuts such as walnuts to the diet can possibly increase “health span” in aging, and provide a “longevity dividend” or economic benefit for slowing the aging process by reducing the incidence and/or delaying the onset of debilitating neurodegenerative disease.

[51] Diet restriction versus diet selection: A convergence of concepts

Donald Ingram

As demonstrated in a variety of animal models, diet restriction (DR) has proven to be the most robust means to retard aging. Reducing intake of a nutritious diet by 20-50% can increase lifespan, reduce the incidence and retard the onset of chronic diseases, enhance stress protection, and maintain youthful function. Recent reports of persons electing to practice DR as well as formal clinical studies indicate such regimens can positively impact indices of health and risk factors for chronic disease. Nonetheless, if evidence existed that life-long DR could produce beneficial effects in humans, implementation would be problematic due to difficulties of compliance as well as other quality of life issues impacted by DR. Diets rich in fruits and vegetables have also been related to enhanced health and longevity in human studies, while animal studies demonstrate anti-aging effects of such diets paralleling those observed in DR. Emerging research in the mechanisms of DR points to “hormesis” which enhances stress protection. An exciting concept creating convergence between diet restriction and diet selection is that many of the plant polyphenols produced in response to stress act as hormetic signals when consumed by animals to activate stress protection through similar mechanisms of DR.
[52] Nuts and health - Epidemiological perspective: What's new?

Joan Sabaté

Epidemiological studies have been remarkably consistent in demonstrating an association between nut consumption and a reduced risk of coronary heart disease. In a summary estimate of four major epidemiological studies, the average risk of coronary heart disease was 37% lower among subjects who consumed four or more servings of nuts a week compared with those who seldom or never ate nuts, with an average reduction of 8.3% for each incremental serving per week of nuts consumed. The U.S. Food and Drug Administration issued in 2003 a health claim stating that eating nuts (1.5 oz/day, 43 g/day) may reduce the risk of heart disease. Scores of human dietary intervention studies have been conducted investigating the effect of nuts on blood lipids and other biological indexes of heart diseases. Much less research has been conducted on other health outcomes and only few of the studies were epidemiological in nature. Recent epidemiological studies have shown an association with frequent nut intake and lower risk of diabetes mellitus, cholecystectomy, and several cancers. Also, nut consumption seems to be associated with lower body weight, and lower risk obesity and weight gain. Interestingly, all epidemiological studies of dietary scores/patterns that include nuts consistently report beneficial health outcomes.

[53] Nuts and newer cardiovascular disease risk factors

Emilio Ros

Most nuts contain abundant monounsaturated fatty acids, while walnuts are rich in both n-6 and n-3 polyunsaturated fatty acids. Healthy fats contribute to the beneficial effects of nut intake observed in epidemiological studies (prevention of coronary heart disease and diabetes) and feeding trials (cholesterol lowering). However, nuts are complex matrices containing many bioactive compounds. By virtue of the unique composition of nuts, their intake could influence oxidative stress, inflammation, and vascular reactivity. In nut feeding trials, effects on these new cardiovascular risk markers have been less investigated than lipid effects, but the emerging picture is that they also are positively influenced by nut consumption. Protection of LDL oxidation by nut intake has been documented in in vitro experiments, animal models and a few clinical studies. Most antioxidants are located in the pellet of nuts and are lost when they are peeled. Regarding inflammation, there is no clear evidence that nut intake lowers C-reactive protein, but it may be associated with lower cytokine levels. Walnuts are the only nuts formally tested for effects on endothelial function. After both walnuts diets and single walnuts meals, favourable changes of vasoreactivity have been observed. Thus, nut feeding may beneficially affect cardiovascular risk beyond cholesterol-lowering.
[54] Nuts, metabolic syndrome and diabetes

Cyril Kendall

Nuts have been shown to improve the blood lipid profile and have been associated with a reduced risk of coronary heart disease (CHD). Recently interest has grown in their potential to improve other aspects of the metabolic syndrome and in the control of postprandial glycemia and diabetes. Data from the Nurses Health Study indicates that nut consumption is associated with a reduced risk of developing. Randomized controlled trials (RCT) of patients with type 2 diabetes have confirmed the beneficial effects of nuts on blood lipids also seen in non-diabetic subjects, but the trials have not reported improvement in HbA1c or other glycated proteins. Acute feeding studies with pistachios have demonstrated their ability to reduce postprandial glycemia in a dose dependent fashion. Reduced postprandial glycemia has been demonstrated with pistachios when eaten with a variety of different commonly consumed carbohydrate meals. Furthermore, there was evidence of reduced postprandial oxidative stress associated with nut consumption. Nuts may also be effectively incorporated into the diets of individuals undergoing weight loss. Nuts have a healthy macronutrient profile, high in MUFA and PUFAs, vegetable protein and fiber and low in available carbohydrate. Consumption of nuts in the diet may therefore improve the overall nutritional quality of the diet. Due to their ability to improve blood lipids and possibly to reduce oxidative stress and inflammation, promote weight loss and to improve glycemic control, nuts may be of benefit for inclusion in the diets of individuals with the metabolic syndrome and diabetes.

[55] The environmental impact of dietary preference

Hal Marlow

Food demand influences agricultural production. Modern agricultural practices have resulted in polluted soil, air and water, eroded soil, dependence on imported oil, and loss of biodiversity. The goal of this research was to investigate the environmental impact of the agricultural production inputs; pesticides and fertilizers, water, and energy used to produce commodities for a vegetarian and nonvegetarian diet in California. The working assumption was that a greater number and amount of inputs was associated with a greater environmental impact. The literature supported this notion. To accomplish this goal, dietary preferences were quantified using the Adventist Health Study and California State agricultural data were collected and applied to State commodity production statistics. These data were used to calculate different dietary consumption patterns and indices to compare the environmental impact associated with dietary preference. Results show the Adventist vegetarian diet required 5.41 times less water, 2.48 times less primary energy, 12.9 times less fertilizer, and 1.4 times less pesticides than did the Adventist nonvegetarian diet. It is clear that the production of a SDA nonvegetarian diet required the inputs of significantly greater amounts of water, primary energy, fertilizers and pesticides when compared to the SDA vegetarian diet. The greatest contribution to the differences came from the consumption of animal products; eggs, broilers, and beef in the diet. From an environmental perspective, what a person chose to eat made a difference. Viewed from the individual lens, the difference in the dietary choices of the SDA vegetarians and nonvegetarians do not appear to support profound conclusions. However, with the added perspective of time and numbers the differences become quite pronounced and may have the potential for tremendously different impacts to the environment.

ICVN
5th International Congress on Vegetarian Nutrition
[56] Potential contributions of food consumption patterns to climate change
Annika Carlsson-Kanyama
Anthropogenic warming is mainly caused by emissions of greenhouse gases such as carbon dioxide (CO2), methane (CH4) and nitrous oxides (N2O) with agriculture as a main contributor for the two latter gases. But also other parts of food system contribute, CO2 emissions emanate from the use of fossil fuels in transportation, processing, retailing, storage and preparation. Food items differ substantially when greenhouse gas emissions are calculated from farm to table. A recent study of about 20 items shows that the span is from 0.4 kg per kg edible product up to 30 kg. For protein rich food such as legumes, meat, fish, cheese and eggs the difference is a factor 30 with the lowest emissions per kg for legumes, poultry and eggs and the highest for beef, cheese and pork. The large emissions for ruminants are largely explained by CH4 emissions from enteric fermentation. For vegetables and fruits, emissions are usually not more than 2.5 kg per kg product even if there is a high degree of processing and substantial transportation. Products transported by plane are an exception as emissions may be as large as for certain meats. Emission from foods rich in carbohydrates such as potatoes, pasta and wheat are less than 1.1 kg per kg edible food. We suggest that changes in the diet, towards more plant-based foods, towards meat from animals with little enteric fermentation and towards foods processed in an energy efficient manner present an interesting and little explored area for mitigating climate change.

[57] The prospects of food production (and consumption) in the context of global climate change
Gidon Eshel
While the conference focuses on nutritional aspects of plant based diets, personal preference also has staggering environmental significance; dietary choices alter substantially the radiative budget of the Earth's surface. It affects the quality of surface and ground waters and is a huge contributor to air pollution, among many other deleterious effects. In my talk I will review some of these factors, and compare several realistic and calorically-equivalent plant- and animal-based meals in terms of their greenhouse gas consequences.
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# Session 2

**Category 4: Nutrition and Chronic Disease**

**7:15-8:00 pm**

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**Category 5: Nutrition Assessment**

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Category 7: Others
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Poster Abstracts

P101
Meat Consumption and the Risk of Type 2 Diabetes: A Meta-Analysis of Case-Control and Cohort Studies

Dagfinn Aune1, Giske Ursin1, Marit Bragelien Veierod1, Department of Nutrition, Institute of Basic Medical Sciences, University of Oslo, Oslo, Norway, 2Department of Preventive Medicine, University of Southern California, Los Angeles, CA, US, 3Department of Biostatistics, Institute of Basic Medical Sciences, University of Oslo, Oslo, Norway

Background: The incidence of type 2 diabetes is increasing rapidly in many populations around the world and dietary factors are likely to have an important impact on diabetes risk. Several previous studies found a positive association between meat consumption and the risk of developing type 2 diabetes, but the results have been inconsistent. To clarify this relationship we conducted a systematic review and meta-analysis of meat consumption and type 2 diabetes risk.

Materials and methods: The analysis was conducted by first searching several databases for studies on meat consumption and diabetes risk, from their inception to October, 2007. Risk ratios, incidence rate ratios and odds ratios were pooled by use of a random-effects model. Results: The pooled relative risk (RR) for developing type 2 diabetes was 1.25 (95% CI: 1.09-1.44, n=12) for high vs. low intake of red meat, 1.42 (95% CI: 1.24-1.65, n=48) for processed meat and 1.42 (95% CI: 1.12-1.79, n=17) for total meat. Individual meat items were also associated with increased risk; the pooled RR was 1.25 (95% CI: 1.10-1.42) for hamburgers, 1.37 (95% CI: 1.19-1.57) for bacon, 1.31 (95% CI: 1.19-1.43) for hot dogs and 1.25 (95% CI: 1.09-1.44) for other processed meats, but there were relatively few studies on subtypes of meats. There was evidence of heterogeneity for several of these findings which to some degree was explained by study characteristics. Conclusion: These results suggest that meat consumption increases the risk of type 2 diabetes and that decreasing meat intake may be another modifiable risk factor for this increasingly common disease. More studies are needed to clarify whether or not the effect of meat intake on diabetes risk is mediated through increased weight gain and for further exploration of subtypes of meats and diabetes risk.

P102
Fruit and Vegetable Consumption among California Adults with Serious Mental Illness

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Background: An unhealthy lifestyle often is observed among individuals with serious/persistent mental illness. This study examined daily consumption of fruits and vegetables among individuals with and without serious mental illness, as well as relationships to other lifestyle factors (smoking, drinking, exercise). Multivariable regression was used to examine other factors associated with daily consumption of fruits and vegetables. Materials and Methods: The California Health Interview Survey, conducted biannually by UCLA since 2001, is a large, population-based, random digit dialing telephone household survey covering many health-related topics. The 43,020 completed results obtained in 2005 are representative of all 26.4 million adults in California. Serious mental illness was defined by a Kessler 6 score of 13 or greater (range 0 to 24), and the number of daily fruits and vegetables (excluding French fries) was determined through a diet frequency instrument. Survey-adjusted analysis was done using Stata 9.2. Results: Severe mental illness was found in 1,658 surveys, which is representative of one million persons (5.8% of all California adults). Those with mental illness ate fewer daily servings of fruits and vegetables than the general population, mean 4.52 vs. 4.94, p<0.001. They also were less likely to be active at least 20 minutes a day (30% vs. 58.5%) and more likely to smoke daily (26.5 vs. 9.8%). But not more likely to be daily drinkers (23.4 vs. 25.7%). Bivariate comparisons did not find significant relationships between fruit and vegetable consumption and exercise/smoking/drinking. Factors positively associated with higher fruit and vegetable consumption include male gender, college graduate, non-Citizen, and being married, whereas being uninsured was associated with reduced consumption. Conclusions: Community-based adults with serious mental illness have poor health habits, including reduced consumption of fruits and vegetables; however, smoking, drinking, and exercise do not appear to be strongly related to fruit and vegetable consumption.

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Association of Diet and Body Mass Index in Vegetarians and Non-Vegetarians

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This report is based on two cross-sectional surveys of random samples of Seventh-day Adventists aged 12 to 65 years of age in Australia and New Zealand. The first survey of 4,197 participants was conducted in 1989-90 and the second similar survey of 3,485 participants was conducted in 2003. Participants completed an anonymous self-administered questionnaire on health, lifestyle, diet and drug use. We asked respondents to report their current weight and height, with this data we calculated Body Mass Index (BMI). We also asked a simple direct question regarding dietary status with three response choices: "How would you describe your USUAL dietary lifestyle?" 1. Total vegetarian (Vegan)—(no animal products); 2. Lacto-ovo vegetarian—(no meat but eggs and/or dairy products); 3. Non-vegetarian—(diet includes meat, fish, chicken). Of the participants 30 years or older 4.8% were vegan, 48.2% lacto-ovo vegetarian and 45.2% non-vegetarian. In 2001, 13% of adolescents, 29% of 19-29 year-olds and 53% of those 30 years and older were classified as overweight or obese. For each of the three age-groups we will compare the usual dietary status with BMI.
P104  
Reliability of Estimates of Serum and Urinary Isoflavones  
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Background: Many studies have used serum estimates of soy isoflavones as an index of dietary intake. Yet, an imprecise measured variable has a reduced correlation with other factors. The laboratory may measure the value in a spot serum accurately, but as a measure of long-term morning serum levels it will contain much random error, because the serum half-life of these compounds is relatively short (6-8 hours) and subjects often eat these foods in a sporadic inconsistent fashion. Thus a spot serum estimate largely reflects intake of soy foods from the previous day.  
Materials and Methods: We obtained repeat fasting serum from 28 AHS-2 calibration subjects, initially randomly chosen but finally a group who could provide the second sample during a two week window. The two samples were separated by 1-2 years. Of these subjects, 22 also completed a brief 1-page questionnaire about their intake of soy-containing foods during the previous day. Results: The intra-class correlation coefficient (ICC) for serum isoflavones was low at 0.20 (95% confidence interval 0.0-0.45). This is the ratio s2b/(s2b+s2w). Incorporating data from the previous day’s diet effectively in effect estimated an ICC as if all subjects ate at their long-term averages the previous day. This ICC was much higher at 0.39. Although we did not obtain two urinary estimates, the validity correlation from one overnight urine compared to repeated dietary recalls, has the algebraic implication of an ICC that is at least 0.50 and probably much higher. This however is over a shorter time period of about 6 months. Conclusion: We conclude that using serum isoflavone levels to predict disease risk will lead to severely attenuated estimates. Urinary values are to be preferred. For short half-life biological variables, the method that we describe allows the formation of a variable with more stable performance characteristics.

P105  
Regression Calibration of Dietary Variables When There Are Many Zero Intakes  
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Background: Regression calibration allows some correction for measurement error in a dietary analysis. It calibrates the questionnaire data to a more accurate reference dietary method. The expected value of the truth(T), conditional on covariates, is entered to the disease regression rather than the questionnaire data(Q). However there is a potential problem when many in the population do not eat a particular food. For instance meat – How does the calibrating equation perform in these highly non-Gaussian circumstances? Materials and Methods: Using EPIC study data, with nut consumption as the exposure and colon cancer as the outcome, we used a linear calibrating equation or a mixture model. The mixture model was in two parts, first when Q=0 and second a linear model when Q>0. Using a single linear model the residuals are clearly heteroscedastic and non-normal, which is allowed by the regression calibration algorithm. When Q=0 there will be some values of T>0. When T=0 there will be very few with Q>. If fact T is not observed, rather it, a reference dietary method. This results in further complications. Results: An un-calibrated logistic disease regression produced an Odds Ratio for the nut/colon cancer association of 0.911 (p=0.276), per gram of nuts per day. Using a single linear calibrating equation this changed to 0.65 (p=0.167). When separate calibrating equations were used the OR was also 0.63 (p=0.145). The residuals of the calibrating equations were examined carefully, and there were no strong deviations from expectation indicating reasonably good model fit even close to zero intake values. Conclusion: We conclude that simple linear calibrating models can be used in this situation, but model fit should be checked carefully where Q=0. Further work should be undertaken to explore the adequacy of bootstrap standard error estimates where there is heteroscedasy.

P106  
Characteristics of Dairy Food Consumption in the AHS-2 Population  
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Background: The Adventist population has a wide range of dairy food consumption. Many lacto-ovo vegetarians obtain much of their fat and protein from dairy sources and particularly emphasize these foods. Others trend toward veganism and eat sparingly of these products. These foods are of great biological interest at present being possibly implicated in the risk of colorectal cancer (decreased), and prostate and ovarian cancers (increased). As a source of saturated fat they are probably also implicated in risk of cardiovascular disease. Aside from saturated fats they contain lactose, conjugated linoleic acid and CLA and CLA saturated fatty acids, factors that may be biologically active. Materials and Methods: In AHS-2 we are able to measure intake of dairy fat and protein with good validity using both food frequency and dietary recall methods on a representative subsample. Results: Mean intake (SD) of dairy fat and protein respectively are 4.05(4.94) and 5.74 (6.56) grams per day, using food frequency questionnaire data. The validity correlations of these measures when compared to the median of six 24 hour recalls are 0.62 and 0.64 (corrected for within person error in the recall). The intra-class correlations are 0.62 and 0.64 respectively. A comparison of food frequency results from Black and non-Black subjects showed intake of dairy fat was 18.5% lower in blacks (p<0.0001) and dairy fat was 19.1% lower (p<0.0001). The distribution of intake of dairy fat and dairy protein did not show bimodality that could reflect a high dairy subgroup of vegetarians. However the standard deviations were quite high. Conclusion: This population provides high quality dietary data on these variables with a wide range of intake that will allow powerful analyses when evaluating their effects on risk of disease.
P107
Secular Trends in Body Mass Index among U.S. Adult Adventists and Different Ethnicities, 1925-2005
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Background: Obesity is a growing public health problem in the US, as a result its adverse affects on morbidity, mortality, disability, psychosocial functioning, etc. The scientific literature documents that vegetarians consume diets more consistent with current nutritional guidelines than non-vegetarians. The Seventh-day Adventist (SDA) population includes a substantial proportion of vegetarians. Data show a lower prevalence of overweight among vegetarians compared to non-vegetarians, among both SDAs and non-SDAs. The purpose of this study is to examine very long-term (eight decades) secular trends in BMI of US SDA adults in which tobacco use rates are exceedingly low. Some researchers have implicated the decline in cigarette smoking as a causal influence in the increase in obesity in the US.

Methods: Never-smoking subjects in the AHS-2 cohort recalled their body weights at different age decades in the past. We compared BMI at the same ages but different calendar decades, and also between different birth cohorts (1905-1965) as subjects aged. A validity sub-study in 4317 White subjects was also conducted, comparing the current recollection of their weights in 1976 to the weights they reported at that time. Results: These last correlation coefficients were between 0.82 and 0.89 at different ages. Gender-specific analyses of BMI trends in 65,654 never-smoking subjects were further disaggregated by race/ethnicity. The secular trends in BMI at the same ages showed dramatic increases with calendar time in all population subgroups studied. Comparing trends with aging in different birth cohorts similarly revealed that the older birth cohorts gained much less weight with age than the more recent birth cohorts. Recent weight gains were especially marked in Black women. Conclusion: These data strikingly illustrate recent adverse trends in weight status, even in this relatively health-conscious population, that are unrelated to changes in smoking status.

P108
Black Adventists' Adherence to Recommended Physical Activity Levels Based on Socioeconomic Status
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Background: Healthful living has been promoted from the early days of the organization of the SDA Church (Church), which was first presented by Ellen White in the late 1800's and early 1900's. Although White's statements were not based on empirical data, she asserted the following: exercise aids in proper digestion of foods, enhances blood flow, increases function of all of the body's organs, and helps reduce the effects of chronic illnesses; a simple vegetarian diet of natural foods—fruits, grains, nuts—reduces the risk for developing debilitating diseases and helps rebuild and restore the body to normal function after illness, and many other healthful practice suggestions. Rationale: The purpose of this study was to determine the physical activity practices of Black SDAs. The three aims of this study were 1) to determine if Black SDAs meet CDC recommended physical activity level, 2) to investigate the association between physical activity (PA) and socioeconomic status (SES), and 3) to identify predictors for Black SDAs engaging in PA.

Methods: Data from 20,472 respondents who completed the Adventist Health Study-2 (AHS-2) survey was analyzed. Instrumentation. The survey is a 48 page instrument that asks questions about medical history, eating habits, physical activity, and other demographics. Data Analysis. Proportions were determined using descriptive statistics, association between PA and SES was determined using chi-square test for independence, and logistic regression was used to identify predictors of engaging in physical activities.

Results: Although 53% of respondents had a regular exercise program, only 31.4% met CDC's recommended level of exercise and 68% of those individuals were overweight or obese. Chi-square analysis revealed a statistically significant association between physical activity and SES (p<0.0001). Educational level was identified to have the main effect on PA. Discussion: Black SDA would benefit from changing PA practices to meet CDC's recommendations.

P109
Dietary Supplement Intake Patterns in the Adventist Health Study-2
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Background: Vitamin use and vegetarianism are both health-seeking behaviors and vegetarians have been reported to exhibit increased dietary supplement intake. Materials and Methods: The Adventist Health Study-2 (AHS-2) consists of a large cohort of health-conscious vegetarians. Respondents (n=67095) were queried by questionnaire regarding their use of dietary supplements, diet, general health (excellent, good, fair/poor), and demographic information. Diet was characterized as vegan, lacto-, semi-, pescos, and non-vegetarian. This work focused on the characterization of supplement intake patterns in AHS-2. Results: Three-fourths of respondents (74.3%) reported taking at least one supplement per day. Of these, 35.2%, 34.5%, and 30.3% took 1, 2, 3, and 6 or more supplements, respectively. Use of any supplement was significantly associated with females, non-blacks, older age, those with a college education, dietary patterns, and health (with vegans and those with excellent health less likely to take supplements). In adjusted analyses, multivitamin use was higher in females, non-blacks, older age, and those with college education. Individuals reporting a vegan diet compared to other dietary pattern were significantly less likely to use multivitamins, and pescos-vegetarians were most likely to use multivitamins. Women were more likely than men to use vitamin B12, vitamin D, calcium, and soy supplements. Blacks compared to non-blacks were more likely to use soy supplement, but less likely to use vitamin D and calcium. Non-vegetarians and pescos-vegetarians compared to vegans were less likely to use vitamin D, calcium, and soy supplement, but less likely to use vitamin B12. Use of fish oil and cod liver oil was greater among females, blacks, older people, and among those with higher frequency of fish consumption (times/week). Conclusions: Supplement intake is widespread in this population and affected by demographic factors including dietary pattern. Interestingly, vegans were least likely and pescos-vegetarians most likely to use supplements.

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The Association Between Selected Dietary Factors and Risk of Hip Fracture in Blacks and Non-Blacks
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The role of dairy products, soy intake and animal and plant protein for bone health and fracture risk continues to be discussed. Some find protective effects of plant protein and harmful effects of animal protein while others report opposite findings. During the last decade, alternative milks have become very popular. It is unclear what effect this change will have on risk of osteoporosis and fractures. A total of 60,325 black and non-black subjects are enrolled in the Adventist Health Study-2, a large NCI funded cohort study. At baseline subjects completed a comprehensive lifestyle questionnaire including data on soy foods including soy milk. Two years after enrollment, they responded to a short follow-up questionnaire which included information on hip fracture since enrollment. For these analyses, all subjects with prevalent osteoporosis at baseline will be excluded. A total of 240 reported having a hip fracture during the 2-year follow-up period. Rates of hip fracture were virtually identical among black and non-black males. However, among females, non-black women had higher rates than black women among those 80 years or older (3.3% vs. 0.7%). About 30% are vegetarians (never eat meat or fish) and a large proportion consume soy protein at similar levels as Asian populations. Fracture risk among vegans, lacto-ovo vegetarians and omnivores will be presented as well as the association between protein intake (animal and plant based), dairy intake and soy protein and risk of hip fracture. All analyses will be adjusted for body mass index, education, hormone therapy and previous fractures in multivariate analyses.

P111
The Association Between Intake of Foods Rich in Protein and Risk of Hip Fracture in Non-Hispanic Caucasian Women. Results from the AHS-2.
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During the last decade, there has been increasing focus on the role of protein for bone health. However, whether proteins from plant or animal sources have different effects on bone health seems unclear at this point. We therefore studied the association between legumes and meat intake on risk of hip fracture in a population with relatively low protein intake. A total of 28,315 Caucasian females enrolled in the Adventist Health Study-2, a large NCI funded cohort study. Of these, 50% were vegetarian (never eat meat, but most of them consume dairy and eggs). All women completed a comprehensive lifestyle questionnaire, including a detailed food frequency questionnaire (FFQ), at baseline. Two years after enrollment, they replied to a short follow-up questionnaire which included information on hip fracture due to minor trauma/slow since enrollment. All women with prevalent osteoporosis and/or a history of hip fracture at baseline as well as those with missing values on the exposure variables and confounders were excluded for analyses. A total of 124 reported having a hip fracture during the 2-year follow-up period. In multivariate analyses, risk of hip fracture was positively associated with age (OR=1.19;95% confidence interval (CI): 1.11-1.26) and inversely associated with protein-containing foods such as legumes (OR=0.11;95%CI:0.02-0.53) comparing >1 times/day vs. <1 times/week. We also found an inverse association with meat intake (OR=0.58;95%CI:0.29-0.99) comparing 1-3 times/week vs. never, although this did not reach statistical significance. Among the vegetarians (never used meat), the protective effect of legumes remained virtually unchanged (OR=0.07;95%CI: 0.02-0.70) for the same comparisons. We conclude that protein intake seems to be important for fracture risk and more studies are needed to assess the role of vegetable protein versus animal protein.

P112
Cheese Intake and Soymilk Consumption are Beneficial to Bone Health in Postmenopausal Women: Results from the Adventist Health Study-2.
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Background: Dietary products are promoted as good sources of calcium and important for bone health. Recently soy- and other plant-based milks have become popular substitutes for milk and are marketed with important health claims.
Materials and Methods: The association between dairy and soymilk intake and bone ultrasound assessment (BUA) of the calcaneus was examined among 337 postmenopausal Caucasian women who were already part of the Adventist Health Study-2 (AHS-2) and who had completed an extensive lifestyle and dietary questionnaire at enrollment. The women were part of two clinic studies of the AHS-2 where calcaneal BUA was performed. The association between osteoporosis (t-score <-1.8) and dairy products (cheese, milk, yogurt and ice cream) and soymilk intake as well as selected lifestyle factors (age, body mass index (BMI), education, hormone therapy, smoking, previous minor accident fractures, self-reported health status) was assessed in multivariate analyses using logistic regression. Results. As expected, osteoporosis was positively associated with age (OR= 1.08; 95%CI: 1.05-1.11) and inversely associated with BMI (OR=0.96; 95% CI: 0.85-0.98) and current hormone therapy (OR=0.28; 95% CI: 0.12-0.57). Compared to women who did not use dairy products (milk, cheese, yogurt), those using these 1+/day had lower risk of osteoporosis (OR=0.38; 95%CI:0.15-0.90). Among the individual dairy products, only cheese showed a significant protection. (OR=0.28; 95%CI: 0.12-0.65; p trend=0.06) for women eating cheese >1 times/week vs. <1 time/week. Women drinking soymilk 5+ times/week had 62% lower odds of osteoporosis (OR= 0.38; 95%CI:0.17-0.848 p trend=0.02) compared to women who never consumed soymilk. Conclusions. Osteoporosis was positively associated with age and inversely associated with BMI, estrogen usage, dairy intake, cheese intake, and soymilk intake. Further studies are needed to assess the relationship between osteoporosis and other dietary factors as well as the relationship of these among different racial groups, in pre-menopausal women and among men.

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Comparison of Broadband Ultrasound Measurement of the Calcaneus Between Vegetarian and Non-Vegetarian Men: Results from the Adventist Health Study 2.
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Background. Most studies have found no difference in bone mineral density (BMD) between vegetarian and non-vegetarian females. Data on bone health and diet among men are few. Materials and Methods. The association between vegetarian status and calcaneal broadband ultrasound attenuation (BUA) among men was examined among 226 vegetarian men (never use meat) and 290 non-vegetarian men enrolled in the Adventist Health Study-2 (AHS-2). At enrollment, all men completed a large lifestyle and dietary questionnaire. The men are part of the main calibration study of the AHS-2 or part of a convenience sample to study the feasibility of conducting clinics. As part of the clinic, BUA of the calcaneus was performed using a contact bone ultrasound analyzer (CUBA) system. Vegetarian status was further classified into lacto-ovo-vegetarian (eats eggs and milk products, but no meat) and vegan (eats no animal products). Student t-test was used to compare mean BUA measurement between vegetarian and non-vegetarian men within each 10 year age group. Linear regression was used to examine the association between age and BUA measurement. Analysis of covariance was used to determine the difference in age-adjusted BUA between vegan, lacto-ovo-vegetarian and omnivorous men. Results. No difference was found in mean, age-adjusted BUA between vegans, lacto-ovo-vegetarian and omnivorous men (p=0.5). As age increased, the BUA decreased in all dietary groups. Average decrease in BUA per decade of aging was 2.5 MHz among vegetarian (p < .0001) and 3.2 MHz among non-vegetarian men (p < .0005). No difference in BUA was found between vegetarian (vegan or lacto-ovo-vegetarian) and non-vegetarian men when comparing within each of the age-decades. Conclusions. Our findings confirm previous reports of no difference in bone health according to vegetarian status. Further studies are needed to assess whether additional dietary and lifestyle factors affect BUA among men.

P114
Blood Pressure and the Vegetarian Diet in Black and White Adventist—AHS-2
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Background. High blood pressure (BP) affects a high proportion of older Americans particularly Black Americans. A few studies have presented evidence that vegetarians have lower BP's than others and we seek here to evaluate this association in AHS-2 participants, both Black and non-Black. Materials and Methods. As part of a calibration study, that represents the whole cohort, 380 Black and 483 non-Black participants had their BP's measured using a standard protocol with an automated Omron sphygmomanometer. Dietary data was gathered from a food frequency questionnaire that allowed subjects to be categorized to vegetarian (lacto-ovo and vegan), semi-vegetarian and non-vegetarian. Regression analyses were used to associate diet with BP levels, or with a binary variable we called hypertension (BP>140/90 or on treatment for hypertension). Results. Systolic BP's were 3.49 mm Hg lower in vegetarians than non-vegetarians (p=0.05), adjusting for age, gender, ethnicity and exercise. Similarly, diastolic pressures were 3.31 mm Hg lower in the vegetarians (p=0.001). For the endpoint of hypertension, as defined, the vegetarian diet was associated with an odds ratio of 0.70 (p<0.05) compared to non-vegetarians. Black subjects had systolic and diastolic BP's that were 6.65 mm Hg (p<0.001) and 3.53 mmHg (p<0.001) higher than non-Black subjects. Conclusions. Adventists adhering to a vegetarian diet have lower blood pressures. Black subjects have higher BP's than non-Black subjects. Further analyses will evaluate the dietary associations within the racial groups, and evaluate BP levels excluding subjects taking anti-hypertensive therapy.

P115
Relationship Between Objectively Measured Physical Activity, Body Fat, and Insulin Resistance
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Background. To examine the relationship between total physical activity (PA) and PA at various intensity levels with insulin resistance at increasing waist circumference and skinfold thickness levels. Materials and Methods: A cross-sectional study of 613 adolescents (352 girls, 261 boys), mean age 15.5 ± 0.5 years from Estonia (n=64) and Sweden (n=275). Total PA and time spent at various intensity levels were measured by accelerometry. Body fat measures included waist circumference and the sum of five skinfold thicknesses. Fasting insulin and glucose were assessed and insulin resistance was calculated according to the homeostasis model assessment (HOMA). Multiple linear regression analysis was used to determine the association between markers of insulin resistance and PA parameters. Differences in HOMA tertile levels of all PA parameters were tested with ANCOVA. All estimates were adjusted for age, sex, country, waist circumference and pubertal development. Results: All PA parameters except for low PA were significantly and inversely correlated with HOMA. Body fat estimators were positively correlated with HOMA. When stratifying by tertiles of waist circumference and comparing the highest versus the lowest tertiles of PA parameters, only in the highest tertile of waist circumference were seen significant differences in HOMA levels. Repeating the analysis with tertiles of skinfold thicknesses yielded similar results. Conclusion: The results emphasize the role of PA in sustaining metabolic balance in adolescence and particularly in subjects with higher body fat levels.
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Effect of Increasing Meat Intake on Chronic Disease Outcomes: Implications for Emerging Economies
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Measuring the health effects of increasing meat intake has huge relevance to emerging economies in China, India, and Latin America where newly affluent adults are eating more meat and, in some instances, abandoning traditional faith-based vegetarian practices in favor of a Western diet. For the past 50 years, The Adventist Mortality Study and Adventist Health Studies (I and II) at Loma Linda University have been conducting prospective studies to examine the relation between the vegetarian diet and chronic disease outcomes among US members of the Seventh-day Adventist church. Adventists share some similarities with populations in Asia and South Asia since a sizable proportion (about 1/3) follow, due to reasons of faith, a vegetarian diet pattern. We have previously reported that Adventist vegetarians who increased their meat intake during 1960 to 1976 experienced a 3.6 year decrease in life expectancy during the 12 years that followed. In this presentation we will examine how such an increase in meat intake among vegetarians impacts coronary heart disease, diabetes, and cancer. The implications of these findings for the chronic disease burden in emerging economies will be discussed.

P201
Improving Fruit and Vegetable Consumption in Middle School Students
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Background. This study assessed the impact of monthly tastings of fruit and vegetables and related in-class Harvest of the Month (HOTM) activities on preference and consumption patterns of low-income Hmong and Caucasian middle school students. Also examined were associations between fruit and vegetable consumption and rates of overweight and elevated blood pressure. Materials and Methods. Sixth, seventh, and eighth grade students (N=154) at a middle school in northern California participated in the HOTM program and a pre-post eating patterns survey as well as a health screening. A control group of 46 matched students completed the survey and health screening, but did not participate in the HOTM program. The five month program included monthly tastings of a fruit or vegetable, related curricular activities, and parent newsletters. ANOVA and paired t-tests were used to assess pre to post HOTM differences. Chi-square was used to examine differences in variables between ethnicities. Results. Students increased fruit consumption by a mean of one-third serving per day (P<0.05), their preferences for vegetables (P<0.001), and their mean score for the statement that, “It is important to me to eat at least the recommended number of servings of fruit and vegetables per day.” (P<0.02). There were no changes for control students. 44% of all students were either overweight or at risk for overweight. White, but not Hmong, students who consume two or more fruit servings per day have a significantly lower mean body mass index (BMI) compared to those consuming less than two (20.9 vs. 24.3, P<0.009). Overweight students have a higher mean systolic blood pressure than normal weight students (P=0.001). Conclusions. Study findings support the effectiveness of the HOTM program in improving fruit consumption and preferences for vegetables among low-income middle school students. Results also demonstrate the need for additional nutrition education efforts.

P202
Using the Internet to Promote Vegetarian Nutrition
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Background. As more and more people are turning to the Internet as their primary source of information, we created a website to explore its utility for promoting vegetarian nutrition information. Materials and Methods: Vegetarian-nutrition.info is a vegetarian nutrition education website launched in September 2004. The site is organized into several sections: vegetarian updates, nutrition briefs, health resources, books on vegetarian nutrition, vegetarian articles, position papers on nutrition and fitness in English, Spanish and French, a nutrition workshop, and herbs. Website usage statistics were obtained with Google Analytics (https://www.google.com/analytics), a free tool provided to webmasters by Google. It allows detailed tracking of visitor activity for all pages of the site, including visits and page views, source and geographic location of visitors, keywords used to find a page, time spent on each page, etc. We analyzed the site usage during a 12 months interval, starting with December 1st, 2006. Results: From December 1st, 2006 until December 1st, 2007, vegetarian-nutrition.info was accessed by large chart attached 142,396 unique visitors coming from 188 countries/territories who looked at 219,082 pages and spent an average of 1 minute and 14 seconds per page. 83.51% of visitors came from English-speaking countries: US (63.61%), Canada (7.35%), UK (6.56%), India (3.28%) and Australia (2.91%). The top five US states were CA (13.42%), NY (7.89%), TX (5.68%), FL (5.11%) and IL (4.26%). The number of absolute unique visitors increased from about 2,200/week to over 3,000/week. The most commonly viewed web information dealt with the health benefits of vegetarian diets, topics about onions, soy, mushrooms, and probiotics, and how one changes over to a vegetarian diet. Visitor topic preferences were somewhat different depending on their continent of origin, as seen in the attached graphs. Conclusion: The Internet can be a useful avenue for promoting vegetarian nutrition.
Science and Policy: Weighting the Evidence on Dairy and Weight Loss Claims
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In April 2004, a non-profit organization petitioned the Federal Trade Commission (FTC) to review the unapproved health claims that dairy product consumption facilitates weight and/or fat loss demonstrating that these claims are unsubstantiated and therefore are false and misleading. The FTC was requested to permanently prohibit the use of these claims and related marketing efforts, such as the "Milk your diet. Lose weight!" campaign and to require corrective advertising. At the time of the petition, none of the 9 published longitudinal studies showed weight loss over time in any population group although some observed inverse associations between body weight and dairy product intake. Further, in the 51 clinical trials investigating a relationship between dairy products or calcium on body weight conducted to date, 47 showed no effect (45) or an increase (2) in weight, while only 4 demonstrated weight loss. In May 2007, the FTC responded that, after consultation between the FTC and the United States Department of Agriculture (USDA), the USDA had decided to "discontinue all advertising and marketing activities involving weight loss claims until further research provides stronger, more conclusive evidence of an association between dairy and weight loss." However, neither the FTC nor the USDA is requiring corrective advertising. While this case demonstrates that scientific evidence can be used to hold industry accountable to health policy, an urgent need remains to provide consumers with access to correct information about the role of foods in weight loss and health. This and the important role scientists have in policy decisions and information dissemination will be discussed.

Vegetarianism and Personality Traits
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Background: Vegetarians have a lower blood pressure and lower cardiovascular mortality than omnivores. Besides traditional cardiovascular risk factors, negative psychosocial factors such as hostility, anxiety depression have been linked to coronary artery disease. In old Chinese literature, there was a passage "Those who eat grains appeared milder in temper and those who eat meat appear more hostile." We undertook this study to assess the personality differences between Taiwanese female vegetarians and omnivores to see if there is any association between the vegetarianism and personality traits. Material and Method: Two hundred female vegetarians and omnivores were recruited and tested by the following measurements: Chinese Hostility Inventory-Short Form, Type D Personality Inventory, Impulsion Scale and Chinese Personality Inventory. Results: Female omnivores have higher scores than female vegetarians on Expressive Hostility Behavior, Hostility Cognition, Hostility Affection, Type D Personality, Negativistic Social Inhibition and Impulsion. Meanwhile, female vegetarians have higher tendencies than omnivores on Industrialness (rt = 3.785, p < .001), Optimism (r = 2.255, p = .027), Agreeableness (r = -3.198, p = .002). Other-orientedness (rt = -5.018, p = .000). There are no correlations between the personality scores and the time duration of being a vegetarian with the effect of age controlled. Conclusions: There are significant personality differences between Taiwanese female vegetarians and omnivores, especially hostility, impulsion, negative affection and social inhibition tendency. However, the personality traits were not correlated with the duration of being a vegetarian, suggesting that these personality traits may be the reason for the selection of vegetarian diets and not the effect of such diets.

How Many Vegetarians Are There?
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Background: Many people express an interest in vegetarianism and may even say that they are vegetarian. Some surveys' criterion for being "vegetarian" is simply self-identification as a vegetarian. This frequently overestimates the number of people who never eat meat, fish, seafood, or poultry. We wanted to determine how many adults, adolescents, and children would say that they never eat meat, poultry, or fish/seafood as well as how many never use animal products. Materials and Methods: In conjunction with various pollsters, using a nationwide sample of 1000 to 2000 adults each time, we have conducted polls of adults in 1994, 1997, 2000, 2003, and 2006. We have conducted similar polls of 1000 children and adolescents in 1995, 2000, and 2005. Respondents were asked which of the following foods, they never eat:

- Meat
- Fish or Seafood
- Eggs
- Poultry
- Dairy Products
- Honey

Results: In 2006, 2.5 percent of adults aged 18 years or older said they never eat meat, fish, or fowl and, thus, are vegetarian. 1.4% never eat animal products (except possibly honey). Similar results were seen in 2003 (2.8% vegetarian; 1.8% vegan) and 2000 (2.5% vegetarian; 0.9% vegan). In 1994 and 1997, approximately 1% of those surveyed appeared to be vegetarian and 0.9-0.5% vegan. In 2003, 3% of 8- to 18-year olds surveyed were vegetarian; 1% were vegan. In 2000, 2% of those aged 17-18 years old were vegetarians; 1% were vegan. This is slightly more than in 1995. Conclusions: The number of vegetarians and vegans in the United States is currently relatively steady and appears to have increased over the past twelve years. Asking which foods are never eaten helps to eliminate some self-identified "vegetarians" who actually do eat meat from estimates of the number of vegetarians in the United States.
P206
Barriers, Perceptions and Beliefs Regarding the Adoption of a Plant-Based Diet among Meat-Eating African American and Latino Employees of a Committed Vegetarian Institution
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Background: Research indicates that a plant-based diet or a diet predominantly made up of fruits, vegetables, legumes, grains and nuts can alter the risk of many chronic diseases such as several cancers, CVD, and diabetes. African Americans and Latinos suffer disproportionately from these chronic diseases. This qualitative pilot study explores perceptions, beliefs and barriers regarding the adoption of a more plant-based diet among 20 meat-eating African Americans and Latinos who are familiar with a vegetarian diet due to working in an institution committed to this lifestyle. Methods: Using a semi-structured interviewing guide, 12 individuals were interviewed by graduate students training to be health professionals; a confirmatory focus group was used to validate emerging findings. Participants were selected using theoretical sampling and data were coded and themed using Grounded Theory methods. Results: Food choices tend to be guided by culture, cost, preparation knowledge, availability, and family tradition. In fact, respondents indicated meat to be central to most family meals. While their work exposure made them familiar with the concept of a vegetarian diet, they often disliked the taste of vegetarian food when eating at work, the potential health benefits were not seen as significant enough to outweigh familiar traditional food choices. This was compounded by a general lack of perceived ability to prepare tasty meals if restricted to vegetarian food choices. Conclusions: In order to increase plant-based foods among African Americans and Latinos, deep rooted cultural and familial eating patterns need to be taken into account. Interventions need to incorporate education in the preparation of plant-based foods that are similar to traditional foods in taste and presentation, and emphasize the different varieties available to improve accessibility.

P207
Role of African Leafy Vegetables in Enhancing Vegetarian Nutrition: A Kenyan Case Study

Background: There are over 200 species of leafy vegetables cultivated in Kenya. They are dense in nutrients like fiber and specifically micronutrients. ALVs are eaten as an accompaniment to a cooked starch paste known as ugali. This study sought to find out the role of ALVs in contributing to improved health (food and nutrition security) among communities in rural Kenya. Methods: Focus group discussions, 24-hour dietary recall was used to determine the frequency in which the ALV were consumed. Study was conducted in a period of 14 months. Results: ALVs are the main accompaniment eaten with ugali. The ALVs they highly valued culturally could be eaten on their own without a meat or other animal sources of vegetables. 78% of respondents refer to non-plant accompaniments as ‘vegetables’. Communities view the nutritional and perceived medicinal values provided by these vegetables and thereby recommend ALVs to the sick and groups with special needs. Communities are willing to cultivate ALVs on large scale for both household consumption and income generation. ALVs are used more during dry spells as they are adaptable to the erratic weather experienced in Kenya. Conclusions: African leafy vegetables are used as the main accompaniment to ugali and are used to break the monotony by providing dietary diversity, therefore form a significant contribution to vegetarian nutrition. They can be cultivated on large scale for income and improvement of economic status and general health (nutrition) of the communities. They contribute to conservation of biodiversity.

P208
Beliefs and Attitudes Toward Vegetarian Lifestyles Across Generations
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Background: Although there has been an increase in the interest and popularity of the vegetarian lifestyle overtime, it is not clear what the main reasons are as to why people adopt this lifestyle and whether these reasons differ considerably between generations. Material and Methods: We asked students in a large undergraduate nutrition class to recruit their parents and grandparents for participation in a lifestyle survey in order to observe generational changes in beliefs and attitudes toward the vegetarian lifestyle. Overall 456 participants completed the survey. We used a 29 item Food Frequency Questionnaire to accurately ascertain the vegetarian status of the respondent. Data was analyzed using ANOVA and Pearson correlation to check for internal validity of the data with SPSS statistical software. Results: Using the Food Frequency Questionnaire, we identified that 4% of the participants were vegans, 26% lacto-ovo-vegetarians, 4% pesco-vegetarians and 66% non-vegetarian. We created four generational categories: 11-20 years, 21-40 years, 41-60 years, and 61 and older. We asked four questions concerning reasons why they choose a vegetarian lifestyle - the moral reason (It is wrong to kill animals), the health reason (Vegetarians live longer and are less sick), the environmental reason (Vegetarian lifestyle is much more protective against the environment) and (because 80% of our respondent were Seventh-day Adventists) the faith reason (Being vegetarian is part of Adventist lifestyle). The results showed that the younger people (11-20) significantly agreed more with the moral reason (p=0.016). People ages 41-60 significantly agreed more with the health reason (p=0.008). Finally, younger people (11-20) significantly agreed more with the environmental reason (p=0.037). There were no significant differences concerning faith reason (p=0.338). Conclusion: There are significant differences across generations as to why people choose to live a vegetarian lifestyle.
P209
Internet Video Support Group for Diabetes
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Since August of 2007, the Physicians Committee for Responsible Medicine has been broadcasting a free weekly Webcast to provide education and support for people with diabetes. Each show follows a format that begins with a brief lecture on an aspect of vegan nutrition, followed by questions for our Nutrition Department staff, and a very popular cooking demonstration. Though taped ahead of time, the show has some interactive qualities in that questions, success stories and challenges may be submitted during each show for inclusion in future broadcasts. In addition, participants can track their weight and blood sugars each week with an online survey. A dual screen allows for PowerPoint slides to be shown simultaneously. Each show is viewed by an average of 1000 people. After the costs of equipment purchase, this is a very cost effective way to reach a large number of people. The technology required, the features that bring viewers back and the future plans for increasing the number of viewers will be presented.

P301
Oxalate Content of Chickpea Dip (Hummus) and Sesame Butter (Tahini)
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Background: Approximately 75% of all kidney stones are composed primarily of calcium oxalate, and hyperoxaluria is a primary risk factor for this disorder. Up to 50% of urinary oxalate originates from dietary oxalate intake. Material and Methods: Twelve types of canned chickpea dips (hummus dips), 12 types of restaurant-made chickpea dips, and 7 types of tahini (sesame butter) were analyzed for oxalate using an enzymatic method. Results: Total oxalate varied greatly among the food products tested ranging from 12.2 to 258.5 mg/100g of ready-to-eat weight. The range of total oxalate of the canned chickpea dips was 12.2-29.9 mg/100g. Total oxalate of analyzed restaurant-made chickpea dips ranged from 34.3 to 128.5 mg/100g. Tahini samples contained the highest concentrations of oxalate ranging from 123.3 to 258.5 mg/100g. Restaurant-made chickpea dips contained significantly greater concentrations of total oxalate than canned chickpea dips (67.7±26.7 mg/100g, 18.5±7.4 mg/100g respectively, P < 0.05). Conclusion: Tahini is the major source of oxalate in chickpea dips. The overall data suggested that chickpea dips are rich sources of oxalate. With an average intake of 50 g of chickpea dip per meal, patients with calcium oxalate kidney stones are recommended to limit their intake of restaurant-made chickpea dips.

P302
Pilot of a Vegan Healthy Eating Program for Obesity
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Background: Dietary modification programs for obesity management rely solely on health-related information to facilitate dietary change; however, the effects of a dietary change program incorporating both health and ecological-related information on dietary change and weight loss in obese adults are unknown. Methods: We piloted a "vegan healthy eating program" using a delayed intervention control in 24 obese adults recruited from three academic medical ambulatory care clinics. The program intervention consisted of six weekly, group-based, educational sessions. Outcome measures included dietary components via food frequency questionnaires, anonymous satisfaction surveys, and weight change. Results: Statistically significant reductions in animal products, percent fat, cholesterol and increases in fruits and vegetable servings and fiber were observed within the intervention group only. Mean intervention session satisfaction as measured by anonymous surveys using a 1-7 Likert scale (1=extremely unsatisfied, 7=extremely satisfied) was 6.2 (SD=1.1). Mean weight change was -1.25 kg (SD=1.35, n=8, p=0.035) in control subjects after 4.3 weeks, and -1.54 Kg (SD=2.25, n=25, p=0.002), -2.66 Kg (SD=3.5, n=25, p=0.001), and -4.02 Kg (SD=6.43, n=20, p=0.012) after 7.3, 15.6 and 41.7 weeks in intervention subjects, respectively.

P303
Effectiveness of Herbal-Based Preparations (Abhayomodak, Amaratavatuk) in Treating Anemia
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Background: Nutritional anemia is a global problem, is more severe in developing countries. Supplements of haemoglobin nutrients, generally given (specially iron) are noted to cause some side effects. Plant-based and herbal products are generally safe. A number of preparation given for the treatment of anemia in ayurveda are unexplored or not tested scientifically. Materials and Methods: Two different studies were conducted at different times. In the first study a no. of adolescent girls (Age, 14-18 yrs.) were screened, 30 volunteers, having haemoglobin 8-11 g/dl divided in two groups. One was supplemented abhayomodak and other with folic acid(60 mg iron, 100 mcg folic acid) daily, for three months. Haemoglobin level was again checked at the end of the study, some other parameters (mean corpuscular volume, mean corpuscular haemoglobin) were also checked before and after the study. Same research plan was followed for the second preparation. Results: In the first study it was seen that increase in haemoglobin level of experimental subjects was 2.7 g/dl (mean) and haemoglobin of the controlled group raised 2.1 g/dl (mean value). Other parameters also showed positive results in the experimental group. In the other study where the experimental group was supplemented with Amaratavatuk mean rise in haemoglobin was 2.5 g/dl and in control group it was 2.8 g/dl. Conclusions: Abhayomodak and Amaratavatuk, both herbal preparations were found to be significantly effective to cure anemia and they were also comparable to the pharmacological supplements.
P304
Preventive Aspect of Spices and Herbs Used as Supplements in Indian Vegetarian Diet
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Background: Indian vegetarian cuisine makes use of several herbs and spices; their utility is based on the health-promoting knowledge of Ayurveda. Abundant information regarding their supplemental values in Ayurvedic literature needs to be explored. Materials and Methods: This study will explore and review the literature of Ayurveda in relevance to herbs and spices used in Indian vegetarian cooking, as well as compare and contrast the information specific to different regions and styles. Research indicates that various herbs and spices possess hypolipidemic, anti-inflammatory, antitumor, free radical scavenging, hormone-stimulating properties and that they may also be useful adjuncts in helping reduce the risk of cardiovascular disease and cancer. Results: Herbs and spices are an integral part of every ethnicity. It is their flavor, aroma and taste that play a most important role in their culinary use. Recent studies into their nutritional and phytochemical aspects, reveal that herbs and spices may be accountable for their health-promotive effects that have been documented in Ayurveda. The time tested wisdom of Ayurveda about spices and herbs can be utilized readily for their multifold supplemental values. Conclusions: The present paper highlights some of the commonly used spices and herbs in Indian vegetarian diet and their Ayurvedic properties, classical indications, synergistic and health-promotive actions.

P305
Effect of Low Calorie Diets Supplemented with Almonds on Carbohydrates or Plasma Free Fatty Acids
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Background: This study investigated the change in specific plasma free fatty acids and their metabolites among overweight and obese participants receiving a formula-based low caloric diet (LCD) supplemented with almonds versus a formula-based LCD supplemented with alpha-linoleic acid (ALA) containing carbohydrates. Materials and Methods: Sixty-five overweight and obese adults (37 female and 28 male; age 27-79 years; BMI: 27-55 kg/m2) were randomly assigned to receive a formula-based LCD supplemented with either 84 grams of almonds per day or sunflower oil plus self-selected ALA-containing complex carbohydrates (CHO). The almond group consumed 0.065g ALA and 101g linoleic acid as compared to the CHO group which consumed 0.22g ALA and 9.6g linoleic acid daily. Calorie and protein composition was equivalent in both groups. Fasting plasma free fatty acid levels (ALA, eicosapentaenoic (EPA), docosapentaenoic (DPA), docosahexaenoic (DHA), linoleic, gamma-linolenic (GLA), dihomogamma-linolenic (DGLA), and arachidonic (AA)) were measured at baseline and week 24 during the medically supervised trial. Two-way ANOVA was used to explore mean differences between groups using STATA 8.0 statistical software. Results: The almond group was associated with greater reductions in weight (-18 vs. -11%) (p=0.0001) compared to the CHO group. From baseline to 24 weeks there was a significant difference between groups in percent change in ALA (-3.6 ± 12.0 in the CHO group; +41.8 ± 5.6 in the almond group) (p=0.007), however no significant difference was observed between the groups for EPA, DPA, and DHA. There was no significant difference in change in linoleic acid or its metabolites GLA, DGLA and AA between the groups. There was no significant difference in the change in n-6 to n-3 ratio between the groups. Conclusions: The inclusion of whole foods containing ALA may influence the level of change in metabolites in persons receiving a formula-based LCD during a period of active weight loss.

P401
Fun Foods that Fight for You
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An analysis of the new wave of super-foods and exotic fruits and vegetables, from around the world, that are being promoted to protect us from the major diseases of Western society. A review of the latest research on phytochemicals in these fruits and vegetables that possess anti-inflammatory, antioxidant, cancer-protective, cardiovascular-protective, and other properties. An analysis of the synergistic properties of these protective substances in plant foods that enhance our health.
P402
The Hypertensive Waist—First Step of the Screening of the Metabolic Syndrome in (Non) Vegetarian
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Background: The metabolic syndrome (MetS) is associated with an increased risk of both, cardiovascular disease and type 2 diabetes, so its early identification and appropriate treatment is compulsory. A practical and simple way to do it is to start with routine clinical parameters. Among them the large waist and high blood pressure could define the hypertensive waist (HTW) that would be to analyse the importance of the HTW in the screening of the MetS in vegetarians and non-vegetarians. Materials and methods: we screened for MetS 120 persons (60 vegetarians, 60 non-vegetarians) aged 15 or older, randomly selected from the general population. The clinical and anthropometric data were assessed by measuring glucose, triglycerides and total cholesterol were measured from capillary blood and HDL cholesterol was measured using enzymatic methods, 2005 IDF criteria for MetS were used from interpret the results. Results: the MetS was found in 33% of the non-vegetarians. The most frequent clinical couple was HTW (32%), non-vegetarians, HTW (19%), vegetarians, followed by hypertriglyceridemic waist (19%), non-vegetarians, HTW (9%), vegetarians. Comparing the prevalence of HTW and MetS we found a significant correlation between these 2 parameters (p<0.001) Conclusions: based on the frequency and easy-to-determine clinical parameters, the HTW clinical couple could be used as a starting point to screen for MetS in vegetarians and non-vegetarians. Our results indicate the advantages of the vegetarian diet in reducing MetS risk.

P403
Type of Vegetarian Diet, Weight Status, and Type 2 Diabetes
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Background: Vegetarians tend to have a lower body weight and less type 2 diabetes than non-vegetarians. Whether BMI and the prevalence of type 2 diabetes differ according to the type of vegetarianism has not been studied previously. Materials and Methods: In the Adventist Health Study 2 demographic, anthropometric, medical history and lifestyle data was collected from Seventh-day Adventists across the U.S. and Canada. Dietary intake was assessed using a food frequency questionnaire. Body weight, height, and treatment for type 2 diabetes within the past year were based on self report. Results: Among 88,642 participants, mean BMI was 23.6 kg/m2 in vegans, and was progressively higher in lacto-ovo vegetarians (25.7), pesco vegetarians (26.4), semi-vegetarians (27.3) and non-vegetarians (28.0). The presence of type 2 diabetes increased from 2.7% in vegans to 8.2% in non-vegetarians. Adjustment for age, gender, Black or non-Black ethnicity, educational level and income did not change the relation between BMI and diet. After adjustment for these factors and BMI, lacto-ovo vegetarians did not differ from vegans in risk of diabetes (OR 1.04; 95% CI 0.83-1.31), but pesco vegetarians (OR 1.74, 95% CI 1.65-1.85), semi-vegetarians (OR 1.38; 95% CI 1.05-1.76) and non-vegetarians (OR 1.96; 95% CI 1.57-2.45) had a higher risk of type 2 diabetes than vegans. Dietary category was not associated with birth weight. Conclusion: Vegan and lacto-ovo vegetarian diets are associated with a lower prevalence of type 2 diabetes than diets that include fish but not meat, or diets that include fish and meat.

P501
Comparison of Body Composition of Lacto-ovo Vegetarians and Omnivores
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Background: Lower intakes of saturated fats and cholesterol, and increased fiber and phytochemical intake are cited as contributory to reduced risk of cardiovascular disease in vegetarians. Body weight, BMIs, and low body fat also are known to lower risk for cardiovascular disease, but few studies have investigated body composition comparisons of lacto-ovo vegetarians (LOVs) and omnivores. Materials and methods: In a secondary cross-sectional analysis of data from two studies done at Loma Linda University, School of Public Health, Department of Nutrition, we compared the weight, fat-free mass, total body water, % body fat and BMI of 59 omnivores (18 males and 21 females) and 23 LOVs (6 males and 17 females). Results: After adjusting for age and gender, the fat-free mass, total body water, and BMI were significantly lower in the LOVs (p<0.05). Conclusions: We conclude that there are significant differences in body weight and BMI between lacto-ovo vegetarians and omnivores. Therefore a lacto-ovo vegetarian diet might contribute to a lower risk for cardiovascular disease.
P502
Measurement of Vegetarian Diet in a Select Population of Australians and New Zealanders
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This report is based on two cross-sectional surveys of random samples of Seventh-day Adventists aged 12 to 65 years of age in Australia and New Zealand. The first survey of 4,197 participants was conducted in 1989-90 and the second similar survey of 3,485 participants was conducted in 2001. Participants completed an anonymous self-administered questionnaire on health, lifestyle, diet and drug use. We asked a simple direct question regarding dietary status with three response choices. “How would you describe your usual dietary lifestyle?” 1. Total vegetarian—(no animal products); 2. Lacto-ovo vegetarian—(no meat but eggs and/or dairy products); 3. Non-vegetarian—(diet includes meat, fish, chicken). Of the participants 30 years or older 4.8% were vegan, 48.2% lacto-ovo vegetarian and 45.2% non-vegetarian. We will also report the frequencies for other age groups. We will compare these data to responses for food frequency questions (FFQ) (5 categories from never to 7+ times per week) for fish, chicken, beef or lamb, milk and eggs. Thus we will consider the congruence between the direct question and an index using the other FFQ variables to determine the validity of using a simple direct question to measure vegetarian diet status in an epidemiological study.

P503
Acid-Base Balance in Vegetarians and Non-Vegetarians
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Background. It was the aim of the present study to evaluate the acid-base balance in the food intake of vegetarians and non-vegetarians. It also was our aim to evaluate if additional intake concerning specific food items on the existing PRAL list was necessary for the comparison of the two dietary patterns. Materials and Methods. From our database (300 vegetarians and 400 non-vegetarians) we selected 30 vegetarians between the 18 and 24 years of age. They were matched according to sex, age, and BMI with 30 non-vegetarians. Using 3-days food records we estimated the acid-base status of the nutritional intake using the PRAL method as proposed by Remer et al. (2003). Since we were working with a specific population, consuming several food items not listed in the standard PRAL table, we used additional input on acid and base balance based on the protein, phosphorus, potassium, magnesium and calcium content of the food intake derived from the Belgian Nutrient Composition Table (NUBEL). Intakes were compared using the unpaired t-test. The significance level was set at p<0.05. Results. Total PRAL values as calculated with the standard table delivered a value of -16±45mEq/d for the vegetarians compared to 30±43mEq/d for the non-vegetarians (p<0.001). Adjusted PRAL calculation was respectively -33±50mEq/d for the vegetarians and 38±53mEq/d for the non-vegetarians (p<0.001). Conclusions. Our results corroborate the findings reported by Remer (2001) and indicate that vegetarian food intake brings about more alkaline outcomes compared to non-vegetarian diets. The use of the standard PRAL table was sufficient for discrimination between the two diets.

P504
Soy Use in Vegetarians and Non-Vegetarians
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Background. It was the aim of our study to quantify and compare the use of soy products in vegetarian and non-vegetarian subjects. Materials and Methods. A group of 109 vegetarians was compared with 97 non-vegetarians. Nutritional intake was estimated using 3 days diet record. For the analysis of the soy protein content all first and second generation soy products consumed by the subjects were listed in one of the following categories: (1) replacement for milk and dairy (2) replacement for meat, (3) unrefined carbohydrate sources, (4) refined carbohydrate sources, (5) bread spread (6) miscellaneous. Using the product information as provided by the manufacturer the soy protein content was calculated. Results. Seventy three percent of the vegetarians versus 40% of the non-vegetarians consumed soy products. Female vegetarians used more frequently soy products compared to male vegetarians (54% of the females and 46% of the males). The most commonly used soy products were replacement products for milk and dairy (group 1) and bread spread (group 5) with a comparable use for vegetarians and non-vegetarians. Replacement for meat (group 2) and miscellaneous products (group 6) were more frequently used by the vegetarians compared to the non-vegetarians. The mean total soy product intake was 166±150g for the vegetarians compared to 76±122g for the non-vegetarians (p<0.001). Mean soy protein intake was 3g±0.5g for the vegetarians versus 2.4g±0.5g for the non-vegetarians. Conclusion. Our results indicate that vegetarians consume more soy products compared to non-vegetarians. However, for the milk and dairy replacement products a comparable consumption was found for both groups. Especially products such as soy sauce and miso soup were used in larger quantities by the vegetarians compared to the non-vegetarians.
P505
Homocysteine Concentrations in Vegetarians and Non-Vegetarians
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Background: This pilot study seeks to evaluate whether homocysteine concentrations are higher in vegetarians and vegans compared to the reference values. Moreover, correlations between vitamin B12 and homocysteine and between folate and homocysteine are studied. Materials and methods: Fourteen vegetarians and 8 vegans were enrolled in this study. The group included 11 males and 11 females. Homocysteine, vitamin B12, and folate acid concentrations were assessed. Also other parameters that may influence homocysteine concentrations were determined: age, diet, vitamin B12 supplements, alcohol, and physical activity and sport. Results: No significant correlations were found between vitamin B12 and homocysteine nor between folic acid and homocysteine. However, a significant (p=0.045) higher homocysteine intake was found in the male group (18±11 μmol/l) compared to the female group (10±4 μmol/l). This difference cannot be explained by differences in vitamin B12 or folic acid concentrations, neither by differences in age, vitamin B12 supplementation, alcohol consumption, physical activity and sport. Finally, a higher prevalence of subjects with a concentration of homocysteine above 15 μmol/l in the vegan group compared to the vegetarian group was observed. Conclusions: Within the limitations of this study we may conclude that our findings are in contrast with the literature what concerns the correlation of homocysteine with vitamin B12 and folate acid. This can be due to our small sample. But as in previous studies we also found a significant difference in homocysteine concentrations between the 2 genders, with higher homocysteine concentrations in the male group.

P506
Flavonoid Intake in Vegetarians and Non-Vegetarians
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Background: The health advantages of sufficient flavonoid intake are well documented. It was our aim to compare the flavonoid intake in vegetarian and non-vegetarian subjects. Materials and methods: Vegetarians (n=90) were matched with non-vegetarians according to sex and age. All volunteers completed a 3 days food diary. Flavonoid containing food items (25 items) were selected and analyzed for their specific flavonoid content (USDA nutrient tables). Results: Mean flavonoid intake was higher in the vegetarians (103 ± 102 mg) compared to the non-vegetarians (46 ± 44 mg). Catechins contributed for 42% of the total flavonoids intake in vegetarians and 39% in the non vegetarians. The main catechin source for both populations were green teas, apples and red wine. Orange juices and oranges were the main sources for hesperitin. Only 17% of the non-vegetarians consumed soy products compared to 60% of the vegetarians. This resulted in a significantly (p<0.05) different isoflavone intake of 2.7 ± 7.5 mg for the non-vegetarians compared to 15 ± 21 mg for the vegetarians. Conclusions: Our findings indicate a rather low intake of flavonoids as assessed in the subjects under investigation. Especially, the values in the non-vegetarians were extremely low. However, results should be interpreted cautiously since a 3-days diary may not be totally representative for a dietary pattern, especially if less common food items are assessed. Simple recommendations concerning fruit and vegetable consumption may increase flavonoid content of the diet in vegetarians and non-vegetarians.

P507
Similar Vitamin B12 Estimates and Other Intake Trends Between Diet Recalls and a Vegan Questionnaire
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Objective: Our study sought to compare intake estimates of an originally developed food frequency questionnaire (FFQ) with 24-hour diet recalls, and Dietary Reference Intakes (DRI) for seven selected nutrients of potential concern for vegans. Methods: Diet histories from a sample of vegans and a modified Block Method were used to generate the food list for the questionnaire. Vegans were selected from 19 different U.S. states. One hundred vegans (76 females, 24 males) completed the questionnaire and repeated 24-hour diet recalls over a nine-month period. Nutritional intake values were measured using Pearson's correlations, paired and one-sample t-tests, reported intakes from both methods and relevant DRI values for comparison. Results: A quantitative food item frequency questionnaire was developed. Nutrient intake estimates from the questionnaire and the diet recalls produced Pearson's correlations for protein, vitamin B12, vitamin D, zinc, iron, and n-3 fatty acids, which ranged from 0.38 to 0.61. Paired t-tests produced similar intake values for vitamin B12 between the FFQ (3.2 mg) and the diet recalls (3.2 mg). When compared to relevant Dietary Reference Intake values, one-sample t-tests produced parallel intake trends (higher vs lower) by both methods for all the nutrients under study, except calcium and zinc. Conclusions: When compared to repeated diet recalls, the original FFQ for vegans demonstrated favorable correlations for six of the seven nutrients. Both methods estimated similar intakes of vitamin B12 among this group of vegans. When estimated intakes were compared to relevant DRI, both assessment methods demonstrated similar intake trends for five of the nutrients of interest.
P508
Eating Habits and Lifestyle Characteristics of Austrian Vegans, Vegetarians, and Omnivores
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Background: Numerous studies in the past decades documented the benefits of well-planned vegetarian diets. Essential components of a vegetarian diet include a wide variety of vegetables, legumes, fruits, whole grain foods, nuts, seeds, and soy bean products. Some studies point out that the beneficial effects could partially be due to a healthy lifestyle which includes regular physical activity, stress management/techniques and abstinence from smoking and alcohol. The present study mainly aimed at evaluating the differences in eating habits and lifestyle characteristics of Austrian vegetarians and vegans in comparison to omnivores. Subjects and Methods: 235 healthy adults participated in the present cross-sectional survey (55 vegans, 57 vegetarians, 123 omnivores). Vegetarians were classified as persons who avoided meat, fish, poultry, the criterion for inclusion as a vegan was the denial of all food products of animal origin (except honey). Over 60% of both, the vegetarians and the vegans, followed their diets for more than five years. A semi-quantitative frequency questionnaire (FFQ) that also included questions on lifestyle and nutrition facts as well as a 24 h recall was distributed. All statistical analyses were performed with SPSS (version 12). Results: Our vegan participants had a slightly higher mean energy intake than the vegetarians and the omnivores. The vegetarians and the vegans preferred more often whole grain products, fresh fruit, vegetables, legumes, soy products, nuts and seeds than omnivores. The vegetarian group drank less alcohol, encompassed fewer smokers, and was more often involved in stress reduction techniques and physical activity than the vegan and omnivore group. Conclusion: The dietary habits of the vegetarian group were more often complemented with exercise, stress reduction techniques, abstinence from smoking and alcohol compared to the vegans and the omnivores.

P509
Comparison of Soy Protein Estimates from FFQ Against 24-Hour Recalls and Isoflavonoid Excretion
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Background: Evidence of the benefits of soy on cancer risk in western populations is inconsistent, in part due to the low intake of soy in these regions. We assessed the validity of soy protein intake estimated from food frequency questionnaires (FFQ) in a sample of healthy individuals with a wide range of soy intake. Materials and Methods: We obtained dietary intake data from 100 healthy men and women in the U.S. (43 blacks, and 57 non-blacks). We compared soy protein from FFQ (Q) against repeated 24-h recalls (R) and urinary excretion (M) of daidzein, and genistein (measured by HPLC/PDA/MS) as reference criteria. We calculated Pearson correlation coefficients (with 95% CI) for Q-R, R-M, and Q-M pairs. Results: Among soy users (N=79), mean (SD) soy protein was 8.94 g/d (6.45) from 24-h recalls and 6.73 g/d from FFQ. The crude (unattenuated) correlation (with 95%CI) between soy protein from 24-h recalls and FFQ was 0.57 (0.32, 0.75). Correlation coefficients between soy protein from 24-h recalls and urinary isoflavonoids were 0.72 (0.43, 0.96) for daidzein, and 0.67 (0.43, 0.91) for genistein. Between FFQ and urinary excretion, these were 0.50 (0.32, 0.65) for daidzein, and 0.48 (0.29, 0.61) for genistein. Conclusions: Soy protein estimates from questionnaire are highly correlated with soy protein from 24-h recalls and urinary excretion of daidzein and genistein. The FFQ used in the Adventist Health Study-2 cohort is a valid instrument for assessing soy protein in a population with a wide range of soy intake.

P510
Nutrition and Body Composition of Buddhist Vegetarians and Omnivores in South Korea
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Compared to studies on Western vegetarian diet, few studies have been performed on vegetarian nutrition in East Asia, especially in Korea. The typical "Asian diet" is based on mostly rice and plant foods similar to vegetarian diet. This study compared dietary intake and body composition of Korean Buddhist vegetarians and omnivores. The study population comprises of 54 Buddhist nuns adhering to vegetarian diets for more than three years and 62 omnivore females. They recorded their dietary intakes for three consecutive days. Body composition was measured by BIA. As expected, omnivores showed higher intakes of all nutrients from animal origin than did vegetarians. Vegetarians consumed significantly higher intakes of plant protein, crude fiber, total Ca and plant Ca, plant Fe and p.s. ratio than omnivores. But intakes of plant-derived fat, carbohydrate and PUFAs did not differ between the diet groups. Whilst in Westerners vegetarians tend to have a lower body weight the vegetarian nuns in this study were found with higher BMI and body fat than omnivores. Body fat in percent of body mass was not different between the groups. Within the same BMI groups, omnivores had higher absolute and relative body fat values than did vegetarians. Length of the period of vegetarianism in the vegetarian group and protein intakes (g/kg bodyweight) of both groups were inversely associated to body fat. Buddhist vegetarians consumed mostly plant foods and modest amounts of dairy product, they had more favorable dietary profile compared with Korean omnivores. Buddhist vegetarian diet did not result in lower BMI and body weight compared to omnivore diet in general, but with longer time on vegetarian diet body fat was lowered. Given the health benefits from Western vegetarian diets it could be shown that also Asian vegetarian diets provide for a healthy nutritional status.
**P601**

**Fermentation of Calcium Fortified Soy Milk with Probiotics: Effects on Calcium Bioavailability**

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**Background.** A high intake of dietary calcium through out life helps reduce the risk of osteoporosis. Calcium-fortified soymilk is commonly consumed by vegetarians. However, soybeans, like other legumes contain myo-inositol hexaphosphate (IP6), also known as phytate, which can chelate calcium inhibiting its absorption. Fermenting fortified soymilk can reduce the amount of IP6 by phytase activity which hydrolyses IP6 to its lower IP4. Furthermore, the body’s ability to absorb calcium is dependent on the form in which it is consumed. Fermenting soymilk increases the conversion of isoflavones to the biologically active aglycone form. These biologically active isoflavones have important actions in bone health. **Materials and Methods.** Calcium-fortified soymilk was fermented with 6 strains of Lactobacillus namely L. acidophilus ATCC 4962, ATCC 35200, ATCC 4356, ATCC 4451, L. casei ATCC 290, and L. plantarum ASCC 270 to measure calcium solubility, phytase activity and isoflavone content. Calcium-fortified soymilk, made from soy protein isolate, was inoculated and incubated for 24 h at 37°C then stored for 14 d at 4°C. Soluble calcium was measured using atomic absorption spectrophotometry (AA). IP6 and isoflavone were measured using HPLC. **Results.** Viability of the strains in the fermented calcium-fortified soymilk was > 8.5 log 10 CFU/g after 24 h fermentation and this was maintained for 14 d storage at 4°C. After 24 h, there was a significant increase (P<0.05) in soluble calcium. L. acidophilus ATCC 4962 and L. casei ASCC 290 demonstrated the highest increase with 89.3 % and 87.0 % respectively. The productions of the enzyme phytase during fermentation led to the degradation of IP6. Fermentation significantly increased (P<0.05) the level of conversion of isoflavones into biologically active aglycones by β-glucosidase activity. **Conclusion.** Fermenting calcium-fortified soymilk with probiotics can potentially enhance the calcium bioavailability of calcium fortified soymilk due to increased calcium solubility, bioactive isoflavone aglycone enrichment and IP6 degradation.

**P602**

**Potential Negative Effects of Trans Fats on DHA and ARA in Maternal and Child Health**

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**Introduction.** Countries with high trans fat (TFA) intakes have instituted TFA food labeling (>0.5 g/serving). Several countries continue to show high intakes compared to recommendations (<1% of calories). Most TFA literature focuses on negative cardiovascular effects. Research on TFA and its relationship to maternal and child essential fatty acid status (specifically docosahexaenoic (DHA) and arachidonic acids (ARA)) are isolated with a paucity of summation and guidance. **Aim:** To identify studies on TFA and DHA status in mothers and children. **Results:** Search results yielded fifteen studies on human milk content, children, pregnancy, and infants. Fifty percent of U.S. human milk content would require TFA labeling due to high TFA content. Cord blood TFA levels had inverse correlation with human milk levels of LCPUFA and higher TFA. Lower infant growth was correlated with higher maternal blood TFA levels. One study found a negative association between cord blood ARA status and TFA and increases in minor neurological dysfunction compared to controls at 18-month (P<0.002, P<0.03, respectively). Canadian and U.S. toddlers are consuming >1% of calories as unsaturated fatty acids from the TFA food supply. **Conclusion:** Data suggest that perinatal TFA intake may interfere with the elongation of n-3 and n-6, shorter chain polyunsaturated fatty acids, in DHA and ARA. Until TFA are reduced or eliminated from the food supply, DHA supplementation for mothers and children seems prudent.

**P603**

**Evaluating the Antioxidant Capacity of California Dates and Asian Vegetables**

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**Background.** Coronary heart disease is the leading cause of death among Americans and the oxidation of low density lipoproteins (LDL) plays a key role in the development of coronary heart disease. The purpose of this research was to evaluate the capacity of polyphenolic antioxidants in California dates and certain Asian vegetables to inhibit LDL oxidation and potentially reduce heart disease risk. **Materials and Methods.** Samples of California dates, cilantro, bok choy, and Kradon bok, a vegetable grown and consumed primarily in Thailand, were obtained. All samples were dried, then ground into a fine powder. Polyphenols were extracted from each sample by methanol extraction. The total polyphenol content, and the ability of polyphenols from each sample to inhibit LDL oxidation were then measured. **Results:** California dates had the lowest polyphenolic content, but the date polyphenols were among the most potent antioxidants, and were able to inhibit LDL oxidation at relatively low concentrations. In contrast, the Kradon bok had the highest total polyphenol content, but Kradon bok polyphenols were less potent as antioxidants. **Conclusions.** When evaluating the antioxidant capacity of plant foods, it is useful to look at both the total polyphenol content and the relative activity of the polyphenols present. Some foods may have high polyphenol content, but those polyphenols may be relatively inactive while the opposite may be true in other foods.
Nutritional Status of Leaf Proteins Extracted from Terrestrial Weeds
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Background: Biochemical studies were made to determine nutritional status of some terrestrial weeds (leaves).

Materials & Methods: The leaf protein concentrate (LPC) fractionated from Kans (Saccharum spontaneum Linn), Motha, (Cyperus rotundus Linn.) and Mandusi (Phalalis minor Retz) taken for biochemical composition.

Results and Discussions: It was observed that the crude protein content was much more higher in the LPC of all the three weeds than those observed in the leaves. Similarly the essential amino acid contents were found in adequate quantity except methionine in the LPC of these terrestrial weeds. Similar observations were also recorded for the dry matter, crude fiber, crude fat and ash content in the leaves and LPC of these weeds. The results indicate that these terrestrial weeds may be utilized as a promising source for the extraction of leaf protein concentrate, and thus its utilization as a non-conventional protein rich food, feed and in medicinal pharmaceutical field. It can be an ideal supplementing food for the people whose condition necessitates drastic restrictions on the intake of Na+ & K+ and for the people with gastrointestinal problems. LPC can be added to non-alcoholic beverages to increase their nutritional value and to supplement some cereals.

A Vegan Raw-Food Diet and an Ultra-Endurance Bicycle Race: A Case Study
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Background: Interest in raw-food diets among vegans and the public is increasing. Research is limited on the adequacy of this diet due to the low number of strict adherents. This case study looks at the caloric adequacy of a raw-food diet in the context of an ultra-endurance athletic event: a 508-mile non-stop bicycle race. Our case-study participant has been following a vegan diet for more than five years. During this time he has competed in numerous athletic events including triathlons, marathons and bicycle races. In the four months preceding this event he ate a strictly raw-food vegan diet.

Materials and Methods: The Furnace Creek 508 has been called the 'toughest 48 hours in sports' and is a premiere ultra-endurance bicycle race. Entrants require a support crew to supply food, water and other needs. Our participant's crew was trained by a Registered Dietitian on taking accurate Food Records. All food items were measured and recorded and recipes were supplied for mixed food items. No nutrition consulting was given to the cyclist or the support team.

Results: Our participant finished the bicycle race in thirty-six hours and consumed 15,124 total calories, 98.3% of which was raw food. The sources of his calories were 64.9% from carbohydrate, 25.2% from protein and 9.6% from fat. He averaged 451 calories per hour while cycling (33.5 hours cycling, 2.5 hours sleeping). Amazingly he also consumed 371 grams of fiber in this 36-hour period.

Conclusions: Our results fit within the current recommendations for ultra-endurance athletes. Despite the high caloric needs of a participant in this kind of event, a raw-food diet can supply adequate energy in the recommended ratios. Both raw-foodists and ultra-endurance athletes are understudied populations and further research could yield interesting results.
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