INTERNATIONAL SYMPOSIUM ON THE

9th Role of Soy

in Health Promotion and Chronic Disease Prevention and Treatment

October 16-19, 2010 • Washington, DC

Symposium Program

Innovation through Nature

WE SALUTE THE 9th INTERNATIONAL SYMPOSIUM ON THE ROLE OF SOY

Given the current global economy, growing populations and increasing need for healthy, nutritious foods, Solae is proud to be a Platinum Level Sponsor of the 9th International Symposium on the Role of Soy.

Solae is a global food ingredient company committed to health and nutrition and to the development of innovative soy-based ingredients and technology. We provide solutions that deliver a unique combination of nutritional, health, functional, and economic benefits.

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Please plan on attending the Cardiovascular Disease Session:

Moderated by Solae™ Scientist, Ratna Mukherjea, PhD • 9:55 a.m. • Monday, October 18, 2010.

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INTERNATIONAL SYMPOSIUM ON THE 9th Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment

Welcome!

It is with great pleasure that we welcome you to the **9th International Symposium on the Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment**. This international symposium has become the central meeting of interest to researchers investigating the health effects of soyfoods and soybean components.

Soy continues to attract the attention of investigators throughout the world in a wide range of disciplines. Nearly 2,000 soy-related articles are published annually. Furthermore, new technologies and improved methodology are better allowing the scientific community to learn about the myriad ways that soy and soybean components affect biological systems. By participating in this symposium, you have the opportunity to learn of important research long before publication as well as discuss your latest research results or ideas with worldwide leaders.

Not only will data be presented that confirm the health benefits of soy in a variety of well-researched areas but potential new benefits will also be highlighted. For example, there will be keynote presentations on the ability of soy to improve skin health and for isoflavones to improve the prognosis of children with mucopolysaccharidoses, a fatal genetic disease. There will also be extensive sessions on topics that have been the subject of much recent debate. The session on cardiovascular disease comes to mind in particular because of the recent decision by the European Food Safety Authority to reject the health claim petition for soy protein and cholesterol reduction. Presentations in this session will highlight the value of using soyfoods for reducing cholesterol and risk of coronary heart disease.

The session on breast cancer will provide new data that not only offers reassurance that soyfoods are safe, but may in fact be beneficial for breast cancer patients and high-risk women. And the session on equol will explore in some detail the potential benefits of this daidzein-derived intestinal metabolite. The information discussed should allow attendees to better understand whether equol-producers have greater health advantages from soyfood consumption than non-producers.

Of course, it is during the discussion times that some of the more interesting and important information is exchanged, so we encourage all of you to partake in this important part of the symposium. In addition to the more than 30 speakers presenting original research, this symposium will allow for ample time to view and discuss the poster presentations. Be sure to take the opportunity to talk to investigators firsthand about their research. This is also a good time to discuss with colleagues possible future collaborations.

Finally, this symposium provides an excellent opportunity, during both the scientific and social events, to share ideas and to participate in discussions with leading experts. If you are new to this field it will be an opportunity to match names with faces. There will also be time to visit the sponsoring companies' displays, providing an opportunity to learn about the types of products available for both experimental purposes and public use. Without the generous contributions of the sponsors, this symposium could not take place. We look forward to welcoming you to this outstanding event.

Co-Chairpersons

Mark Messina, PhD
Adjunct Associate Professor, Loma Linda University, and President, Nutrition Matters, Inc., USA

Thomas M. Badger, PhD
Professor, University of Arkansas for Medical Sciences, and Director and Senior Investigator, Arkansas Children's Nutrition Center, USA

Aedin Cassidy, PhD
Professor and Head of Diet & Health Group, School of Medicine, University of East Anglia, UK

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Professor, Department of Pathology and Laboratory Medicine, Cincinnati Children's Hospital Medical Center, USA

Francesco Squadrito, MD
Professor, Department of Clinical and Experimental Medicine and Pharmacology, Section of Pharmacology, University of Messina, Italy

General Information

Registration

Presidential Ballroom Foyer—2nd Floor

Saturday, October 16 . . . . . 11:00 am–6:30 pm
Sunday, October 17 . . . . . 7:30 am–2:00 pm
Monday, October 18 . . . . . 7:00 am–5:30 pm
Tuesday, October 19 . . . . . 7:00 am–12:30 pm

Sponsor Showcase

Congressional/Senate Rooms—2nd Floor

The Sponsor Showcase will feature displays highlighting the latest advances in soy research technologies as well as current soy products available for research and commercial use. This area will host all breaks and the box lunch on Sunday.

Please note that although this area is open at the designated times below, the sponsors are only requested to be present during the box lunch and breaks.

Sponsor Showcase Schedule

Saturday, October 16
2:30–3:00 am . . . . . .Break
5:15–6:30 pm . . . . . .Welcome Reception

Sunday, October 17
7:30–8:30 am . . . . . .Coffee, Tea, Snack
9:50–10:15 am . . . . . .Break
12:00–2:00 pm . . . . . .Box Lunch

Monday, October 18
7:00–8:00 am . . . . . .Coffee, Tea, Snack
9:35–9:55 am . . . . . .Break
2:45–3:30 pm . . . . . .Break

Tuesday, October 19
7:00–8:00 am . . . . . .Coffee, Tea, Snack
9:55–10:25 am . . . . . .Break

Attire

Business or business casual attire is appropriate for all symposium events.

Congratulations, Award Winners!

For Outstanding Contributions in Promoting Awareness of the Nutritional and Health Attributes of Soyfoods

Ms. Linda Funk
Iowa Soybean Association and The Soyfoods Council, Iowa, USA

For Outstanding Contributions to Increasing Scientific Understanding of the Health Effects of Soyfoods and Soybean Constituents

Thomas M. Badger, PhD
University of Arkansas for Medical Sciences and Arkansas Children's Nutrition Center, Arkansas, USA

INTERNATIONAL SYMPOSIUM ON THE 9th Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment

Thank you!

The co-chairs for the 9th International Symposium on the Role of Soy in Health Promotion and Chronic Disease Prevention and Treatment thank the following companies for their generous contributions. Without their assistance, this symposium would not have been possible.

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Program Schedule

All presentations will take place in the Presidential Ballroom. Each presentation will be followed by a short discussion.

Saturday, October 16

1:00 **Welcome.** Mark Messina, Nutrition Matters, USA.

Keynote Presentations

Moderator: Elizabeth Tilak, WhiteWave Foods Company, USA.
Each presentation will be followed by a 10 minute discussion.

1:10 **Gene Expression-targeted Isoflavone Therapy (GET IT) for Mucopolysaccharidoses: The Use of Soy Isoflavone Extract for Treatment of Children Suffering from Severe Genetic Disease.** Grzegorz Wegrzyn, University of Gdansk, Poland.

1:50 **Herbicide Tolerant Genetically Engineered Soybeans: Looking for Risk in All the Wrong Places?** Bruce Chassy, University of Illinois, USA.

2:30 **Break.**

3:00 **Effect of a Novel Supplemented Soy Drink on Skin Ageing of Post-menopausal Women.** Robin van den Berg, Unilever Discover R&D Vlaardingen, The Netherlands.

3:40 **Soymilk Produced Less Fat Accumulation, Decreased Markers of Inflammation and Oxidative Stress and Enhanced Plasma Adiponectin in Overweight Men.** Elvira De Mejia, University of Illinois, USA.

4:10 **Sources and Dietary Intake of Total and Individual Isoflavones in the U.S. Diet.** David Haytowitz, USDA-ARS-Nutrient Data Laboratory, USA.

4:30 **Soy Saponins: Current Research and Future Goals.** Mark Berhow, USDA, ARS, NCAUR, USA.

4:50 **Awards Presentations.**

5:15–6:30 pm • Welcome Reception
Congressional/Senate Rooms

Sunday, October 17

7:30–8:30 am • Coffee, Tea, Snack
Congressional/Senate Rooms

8:30 **Opening Remarks.** Aedin Cassidy, University of East Anglia, UK.

Soy and the Breast Cancer Patient

Moderator: Herman Depypere, Ghent University, Belgium.
Each presentation will be followed by a five minute discussion.

8:40 **The Soy and Breast Cancer Controversy Overview.** Mark Messina, Nutrition Matters, Inc., USA.

8:50 **Differences in Mouse Versus Human Isoflavone Metabolism and the Implications for Breast Cancer Risk.** Kenneth D.R. Setchell, Children's Hospital at Cincinnati, USA.

9:10 **Soy Food Intake Among Breast Cancer Patients: Association with Survival and Menopausal Symptoms.** Xiao-Ou Shu, Vanderbilt University, USA.

9:30 **Association Between Soy Isoflavone Intake and Breast Cancer Recurrence and Survival Among Postoperative Patients Receiving Adjuvant Endocrine Therapy.** Xinmei Kang, Harbin Medical University, China.

9:50 **Break.**

10:15 **Nipple Aspirate Fluid and Estrogen Metabolites During a 6-Month Soyfood Intervention.** Gertraud Maskarinec, Cancer Research Center of Hawaii, USA.

10:35 **A Phase IIb Trial of G-2535 (Unconjugated Isoflavones -100) in Women at High Risk for Breast Cancer.** Seema Khan, Department of Surgery and Robert H. Lurie Medical Research Center, Feinberg School of Medicine at Northwestern University, USA.

10:55 **Soy and the Breast Cancer Patient: A Clinical Perspective.** Mary Hardy, University of California at Los Angeles, USA.

11:10 **Panel Discussion.** Moderator: Herman Depypere, Ghent University, Belgium.

12:00–2:00 pm
Box Lunch • Poster Viewing and Sponsor Showcase
Congressional/Senate Rooms

Monday, October 18

7:00–8:00 am • Coffee, Tea, Snack
Congressional/Senate Rooms

8:00 **Opening Remarks.** Thomas Badger, Arkansas Children's Nutrition Center, USA.

Nonalcoholic Fatty Liver Disease

Moderator: Thomas Badger, Arkansas Children's Nutrition Center, USA.
Each presentation will be followed by a 10 minute discussion.

8:05 **Nonalcoholic Fatty Liver Disease in Children.** Joel E. Lavine, Columbia College of Physicians and Surgeons, USA.

8:45 **Consumption of Soy Protein Protects Against Hepatic Fat Accumulation: Activation of PPAR LXR and Inhibition of SREBP-1C Signaling.** Thomas Badger, Arkansas Children's Nutrition Center, USA.

9:15 **Antagonism of Adipogenic Programming by Soy-based Diet Protects Against Non-alcoholic Steatohepatitis (NASH) in Obese Zucker Rats.** Jeremy E. Davis, Southern Illinois University, USA.

9:35 **Break.**

Cardiovascular Disease

Moderator: Ratna Mukherjea, Solae, USA.
Each presentation will be followed by a five minute discussion.

9:55 **Introduction.** Ratna Mukherjea, Solae, USA.

10:00 **Effects of Genistein Aglycone on Insulin Resistance and Lipid Metabolism in Postmenopausal Women with Metabolic Syndrome: Preliminary Results from a Randomized Clinical Trial.** Alessandra Bitto, Dept. of Clinical and Experimental Medicine and Pharmacology, University of Messina, Italy.

10:15 **Soy Protein Effects on Serum Lipoproteins: An Updated Meta-Analysis.** James Anderson, University of Kentucky, USA.

10:35 **Soy Protein Decreases Low-density Lipoprotein Cholesterol by a Food Displacement Mechanism: An Exercise in Dietary Modeling.** Claire E. Berryman and Li Wang, Pennsylvania State University, USA.

10:50 **Diet Versus Drugs in Chronic Diseases: Other Advantages.** David Jenkins, University of Toronto, Canada.

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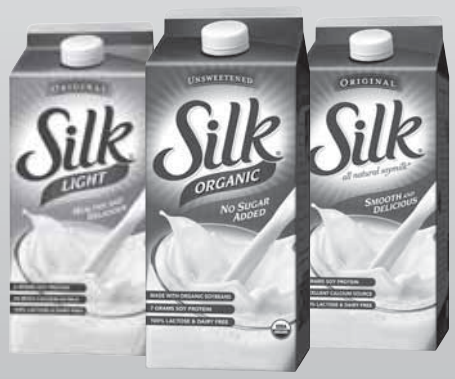

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1. NASS, Acreage, June 2009. USDA

11:10 **Systematic Review and Meta Analysis to Support a Cholesterol-Lowering Claim for Soy Protein in the European Union.** Janice Harland, HarlandHall Associates, UK.

11:25 **The Effect of Isoflavone Soy Protein Supplementation on the Progression of Subclinical Atherosclerosis in Healthy Postmenopausal Women.** Howard Hodis, University of Southern California, Keck School of Medicine, USA.

11:40 **Panel Discussion.**

12:00–1:00 pm • Luncheon
Federal Room and South America Room

Bone Health

Moderator: Francesco Squadrito, University of Messina, Italy.
Each presentation will be followed by a 10 minute discussion.

1:00 **A Randomized, Placebo-controlled, Double-blind Pilot Study to Investigate the Effect of a Combination of Genistein, Polyunsaturated Fatty Acids and Vitamins K1 and D3 on Bone Health and Safety in Postmenopausal Women (PMW).** Iris Kunz, DSM Nutritional Products, R&D Human Nutrition and Health, Switzerland.

1:20 **Soy Isoflavones for Reducing Bone Loss (SIRBL) Study: Three Year Effects on pQCT Bone Density and Strength in Postmenopausal Women.** D. Lee Alekel, FSHN Dept., Iowa State University, USA.

1:40 **Genistein Aglycone Reduces FRAX Rate in Postmenopausal Women.** Francesco Squadrito, University of Messina, Italy.

Hot Flashes

Moderator: Aedin Cassidy, University of East Anglia, UK.
Each presentation will be followed by a 10 minute discussion.

2:00 **The Effect of Genistein on Menopause Symptom Management in Healthy Postmenopausal Women: a Multi-center, Randomized, Placebo-controlled Study.** James Elliott, DSM Nutritional Products, Inc., USA.

2:20 **Isoflavone Extracts and Hot Flash Alleviation: Systematic Review and Meta-Analysis of Clinical Studies.** Mindy Kurzer, University of Minnesota, USA.

2:45 **Break and Poster Viewing.**

3:30 **The Effect of Isoflavone Soy Protein Supplementation on Cognitive Function in Healthy Postmenopausal Women.** Howard Hodis, University of Southern California, Keck School of Medicine, USA.

Sports Nutrition

Moderator: Belinda H. Jenks, Pharmavite LLC, USA.
Each presentation will be followed by a 10 minute discussion.

3:50 **Soy Protein's Role in Exercise and Resistance Exercise Training.** Blake B. Rasmussen, University of Texas Medical Branch, USA.

4:30 **The Effects of Soy and Other Proteins on the Stimulation of Muscle Anabolism in Response to Resistance Exercise.** Catherine M. Jankowski, University of Colorado, USA.

Thyroid Function

4:50 **The Effect of Soy Phytoestrogen Supplementation on Thyroid Status and Cardiovascular Risk Markers in Patients with Subclinical Hypothyroidism: a Randomized Double Blind Crossover Study.** Stephen L. Atkin, University of Hull, UK.

Tuesday, October 19

7:00–8:00 am • Coffee, Tea, Snack
Congressional/Senate Rooms

8:00 **Opening Remarks.**

Equol

Moderator: Kenneth Setchell, Children's Hospital at Cincinnati, USA.
Each presentation will be followed by a five minute discussion.

8:05 **Brief Introduction to Equol.** Stephen Barnes, University of Alabama, USA.

8:15 **Safety Assessment of Natural S-equol.** Belinda H. Jenks, Scientific Affairs and Nutrition Education, Pharmavite LLC, USA.

8:40 **Efficacy and Safety of a Natural S-equol Supplement for Menopausal Healthcare.** Takeshi Aso, Comprehensive Reproductive Medicine, Tokyo Medical and Dental University, Japan.

9:10 **Equol Enantiomers Mimic Genistein in Impacting Mammary Gland Development But Not in Breast Cancer Chemoprevention.** Nadine Brown, Children's Hospital at Cincinnati, USA.

9:25 **Equol Producer Status Changes During Soy Intervention in Women.** Adrian Franke, Research Center of Hawaii, USA.

9:40 **Effects of an Equol Supplement on Bone Mineral Density in Postmenopausal Japanese Women.** Yuko Tousen, National Institute of Health and Nutrition, Japan.

9:55 **Break.**

10:25 **Isoflavones in Aglycon Form are Biologically More Effective than Glycosides—Evidence from a Novel Animal Model Comparing the Effects of Isoflavones on Reproductive Performance and on Cholesterol in Hens.** Kenneth Setchell, Children's Hospital at Cincinnati, USA.

10:45 **The Effect of Equol on Obesity and Metabolic Syndrome in Japanese, from the Standpoint of Gender and Equol Producing Capability.** Takeshi Usui, Clinical Research Institute, National Hospital Organization Kyoto Medical Center, Japan.

10:55 **Panel Discussion.**

New Research Areas

Moderator: Stephen Barnes, University of Alabama, USA.
Each presentation will be followed by a five minute discussion.

11:15 **Genistein-containing Diets Accelerate Lens Opacity in ICR/f Rats.** Kyle Floyd, University of Alabama at Birmingham, USA.

11:30 **Soybean Isoflavones Regulate Dendritic Cell Function and Protect From the Development of Food Allergy.** Madhan Masilamani, Mount Sinai School of Medicine, USA.

11:45 **The Meal as Medicine: Anti-obesity Effects of Soy in Rat Model of Menopause.** Michelle Murphy, Monelle Chemical Senses Center, USA.

12:00 **Closing Remarks.**

Poster Presentations

Poster presentations are located in the Congressional/Senate Rooms.

Posters are available for viewing:

Saturday, October 16. . . . . 2:30–6:30 pm
Sunday, October 17 . . . . . 7:30 am–2:00 pm
Monday, October 18 . . . . . 7:00 am–5:30 pm
Tuesday, October 19 . . . . . 7:00 am–10:25 am

A dedicated poster session will take place on Sunday, 12:00–2:00 pm, with a box lunch being served. This is your chance to talk to the investigators first-hand regarding their research.

Cancer

1. **Lactose Intake Can Be Associated With Increased Risk of Cancers in Korea.** C.W. Chung, Central Research Institute, Dr. Chung's Foods Co., Korea.
2. **Isoflavones in Breast Tissue: Chemopreventive or Cancer Promoting?** S. Bolca[1,2], A. Heyerick[2], P. Blondeel[3], N. Roche[3], M. Bracke[4], C. Manach[5], and H. Depypere[6], [1]Laboratory of Microbial Ecology and Technology (LabMET), Ghent University–UGent, Belgium, [2]Laboratory of Pharmacognosy and Phytochemistry, Ghent University–UGent, Belgium, [3]Dept. of Plastic and Reconstructive Surgery, Ghent University Hospital, Belgium, [4]Laboratory of Experimental Cancer Research, Dept. of Experimental Cancer Research, Radiotherapy and Nuclear Medicine, Ghent University Hospital, Belgium, [5]INRA, UMR 1019, Unité Nutrition Humaine, Centre Clermont–Theix, St. Genès Champanelle, France, [6]Dept. of Uro-Gynaecology, Ghent University Hospital, Belgium.
3. **Genistein (GEN), Resveratrol (RES) and Regulation of HIF-1α in the Mammary Gland.** S. Barnes[1], P. Vayalil[2], A. Piras[1], G.P. Page[1], M. Crowley[1], T. Whitsett[1], C.A. Lamartiniere[1], H. Kim[1]; [1]University of Alabama at Birmingham, USA, [2]University of Cagliari, Italy.

Cardiovascular Health

4. **Exposure to Isoflavone-Containing Soy Products and Endothelial Function: A Bayesian Meta-Analysis of Randomized Controlled Trials.** D.P. Beavers[1], K.M. Beavers*[2], M. Miller[3], J. Stamey[4], and M.J. Messina[5], [1]Wake Forest University School of Medicine, Dept. of Biostatistical Sciences, USA, [2]Wake Forest University School of Medicine, Section on Gerontology, USA, [3]University of Maryland School of Medicine, Dept. of Cardiology, USA, [4]Baylor University, Dept. of Statistics, USA, [5]Loma Linda University, USA.
5. **A Soy-based Medical Food Enhances the Efficacy of a Mediterranean-style Low-glycemic-load Dietary Program for Cardiovascular Risk Reduction in Women with Metabolic Syndrome.** D. Minich[1], M. McIntosh[2], M.-L. Fernandez[3], W. Najm[4], J. Bland[1], M. Tripp[1], and R. Lerman[1], [1]Metagenics Inc, USA, [2]University of Florida, USA, [3]University of Connecticut, USA, [4]University of California at Irvine, USA.

Development

6. **Improving the Nutrient Density of School Meal Programs in Developing Countries by Utilizing Soy Protein.** S.L. Krawczyk, V. Jain, B.C. Owen, K. Weingartner, and M. Nash, National Soybean Research Laboratory, University of Illinois at Urbana-Champaign, USA.

Endocrinology

7. **Epigenetic Modifications in Nonhuman Primates with Dietary Soy.** T.D. Howard[1], S.M. Ho[2], L. Zhang[1], J. Chen[2], R.E. Slager[1], S.B. Gray[1], W. Cui[1], and J.D. Wagner[1], [1]Wake Forest University Health Sciences, USA, [2]Dept. of Environmental Health, University of Cincinnati, USA.

Equol

8. **Natural S-equol Supplement Relieves Menopausal Symptoms in Japanese Postmenopausal Women.** S. Uchiyama[1], T. Ueno[1], B.H. Jenks[2], S. Iwashita[1], H. Ohta[3], and T. Aso[4], [1]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd., Japan, [2]Scientific Affairs, Pharmavite LLC, USA, [3]Obstetrics and Gynecology, International University of Health and Welfare, Japan, [4]Obstetrics and Gynecology, Tokyo Medical and Dental University, Japan.
9. **Effects of Fermented Soy Food Containing Natural S-equol on Tail Skin Temperature in Ovariectomized Rat.** C. Ando[1], T. Yoneda[1], T. Ueno[1], B.H. Jenks[2], S. Iwashita[1], and S. Uchiyama[1], [1]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd., Japan, [2]Scientific Affairs, Pharmavite LLC, USA.
10. **Safety Assessments of Natural S-equol Supplement by Consecutive Ingestion to Japanese Men and Postmenopausal Women.** T. Ueno[1], A. Onoda[1], A. Oyama[1], B.H. Jenks[2], S. Iwashita[1], S. Uchiyama[1], and T. Aso[3], [1]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd., Japan, [2]Scientific Affairs, Pharmavite LLC, USA, [3]Obstetrics and Gynecology, Tokyo Medical and Dental University, Japan.
11. **Endogenous and Dietary Equol Effects in Male and Female Mice.** F.N.A. Dewi[1], C.E. Wood[1], J.M. Cline[1], A.A. Franke[2], D.L. Golden[1], and M.R. Adams[1], [1]Wake Forest University School of Medicine, USA, [2]Cancer Research Center of Hawaii, USA.
12. **Development of AUS-131 (S-equol) as an Oral Agent for Menopausal Symptoms and Benign Prostatic Hyperplasia.** R. Jackson, J. Greiwe, and R. Schwen, Ausio Pharmaceuticals, LLC, USA.
13. **Effect of Soy Isoflavones Intake and Equol Phenotypes on Blood Lipids and IMT in Chinese Adults.** Yun Cai[1], Kaiping Guo[1], Bo Zhang[1], Chaogang Chen[1], Ping Wang[1], Quan Zhou[1], Fang Mei[1], Shigeto Uchiyama[2], and Yixiang Su[1], [1]Sun Yat-Sen University, China, [2]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd., Japan.

Genistein

14. **Enhanced Protection from Radiation Injury by the Combination of Genistein and Captopril.** R.M. Day[1], T.A. Davis[2], and M.R. Landauer[3], [1]Dept. of Pharmacology, Uniformed Services University of the Health Sciences, USA, [2]Dept. of Regenerative Medicine, Naval Medical Research Center, USA, [3]Armed Forces Radiobiology Research Institute, USA.
15. **Drug Interaction Testing of a Genistein Aglycone-Containing Medical Food for Bone and Pharmacokinetic Differences in Humans for Genistein Due to Formulation.** B.P. Burnett[1], A. Bitto[2], L. Pillai[1], D. Altavilla[2], F. Squadrito[2], and R.M. Levy[1], [1]Primus Pharmaceuticals, Inc., USA, [2]University of Messina, Italy.

Liver Disease

16. **Both Dietary Soy Proteins and Isoflavones are Highly Efficient in Prevention of the Formation of Hepatic Lipid Droplets in Rats.** C.W. Xiao[1,2], C.M. Wood[1], K. Cockell[1], and R. Mueller[3], [1]Nutrition Research Division, Bureau of Nutritional Sciences, Food Directorate, Health Canada, Canada, [2]University of Ottawa, Canada, [3]Scientific Services Division, Bureau of Chemical Safety, Food Directorate, Health Canada, Canada.

Miscellaneous

17. **Study of Knowledge and Perception of Soy and Health Among Healthcare Professionals.** P.M. Chan[1] and B.Y. Yeong[2], [1]The Nutrition Place, Singapore, [2]American Soybean Association International Marketing, Singapore.

Soy Formula

18. **Clinical Evaluation of Ready-to-feed Soy based Formula.** C.W. Chung[1], T.S. Hyun[2], H.S. Han[2], K.Y. Kim[2], and R.W. Choue[3], [1]Central Research Institute, Dr. Chung's Foods Co., Korea, [2]ChoongBuk National University, Korea, [3]Institute of Clinical Research, KyungHee University, Korea.
19. **Gastrointestinal (GI) Tolerance and Hydration Status of Newborn Infants Fed Soy-based Infant Formulas with Supplemental Fructooligosaccharides (FOS).** J. Lasekan, S. Acosta, D. Albrecht, and G. Baggs, Abbott Nutrition, Abbott Laboratories, USA.

Soybean Peptides

20. **Screening of the *in vitro* Bioactivities of Soybean (*Glycine max*) Peptide Fractions Separated by Ultrafiltration.** C. Roblet[1,2], J. Amiot[1,2], J. Jean[1,2], C. Lavigne[2,3], A. Marette[2,3], C. Ramassamy[2,4], C. Moresoli[5], M. Lessard[2,6], and L. Bazinet[1,2], [1]Dept. of Food Sciences and Nutrition, and Dairy Research Group (STELA), Université Laval, Canada, [2]Institute of Nutraceuticals and Functional Foods (INAF), Université Laval, Canada, [3]Axe Métabolisme, Santé cardiovasculaire et rénale du Centre de recherche du Centre Hospitalier de l'Université Laval, Canada, [4]INRS-Institut Armand-Frappier 531, Canada, [5]Biotechnology and Health Engineering Centre, University of Waterloo, Canada, [6]Dairy and Swine R&D Centre, Agriculture and Agri-Food Canada, Canada.

Symposium Sponsors*

We extend a special thank you to our symposium sponsors who have contributed to the success of this program.

Visit with the company representatives who will be available during coffee breaks and the Sunday box lunch. See Sponsor Showcase Schedule on page 2.

*As of September 20, 2010

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Gold Level

United Soybean Board
16305 Swingley Ridge Road, Suite 150
Chesterfield, MO 63017
www.soyconnection.com

The United Soybean Board (USB) is a farmer-led organization comprised of 68 farmer-directors. Working with independent academic researchers affiliated with the National Institutes of Health (NIH) and academic institutions, USB has invested millions of dollars into health and nutrition research related to soy. Soybean farmers are united by a commitment to produce wholesome, nutritious foods that can help sustain and nourish an ever-increasing population. And, soybean growers take pride in their role in producing one of the healthiest food crops in the world. Peer-reviewed, fully referenced technical bulletins on a variety of soy and health topics can be accessed through USB's website, SoyConnection.com.

Silver Level

Medifast
11445 Cronhill Drive
Owings Mills, MD 21117 USA
www.choosemedifast.com

Medifast is the leading easy-to-use, clinically proven, portion-controlled weight-management program. Medifast has been recommended by over 20,000 doctors and used by over one million customers since 1980. Medifast is committed to enriching lives by providing innovative choices for lasting health. For more information visit www.choosemedifast.com.

Silk Soymilk
12002 Airport Way
Broomfield, CO 80027
www.silksoymilk.com

Silk Soymilk was launched in 1996 and is the best-selling soymilk brand in the country. Silk was founded on a promise to make the world a healthier place. We began by bringing soymilk mainstream, allowing more people everywhere to enjoy soy's wholesome, natural nutrition. We recently introduced almondmilk as the next step in our proud tradition of good health and great taste. For more information, visit www.silksoymilk.com or www.silkpurealmond.com.

White Wave Foods
12002 Airport Way
Broomfield, CO 80027
www.whitewave.com

WhiteWave Foods, a Colorado-based food company established in 2004, is committed to bringing healthy, responsibly produced foods to consumers. As a subsidiary of Dean Foods, we make recognizable brands like Silk Soymilk, International Delight and Horizon Organic. We believe that a truly successful company delivers exceptional results while simultaneously serving our communities and showing respect for the environment that we all share. For more information about WhiteWave Foods, please visit www.WhiteWaveFoods.com

Bronze Level

DSM Nutritional Products
45 Waterview Blvd.
Parsippany, NJ 07869
www.dsm.com

Oral Presentation Abstracts

Please note: The following abstracts have not been edited for content. They appear as submitted by the authors.

Saturday Afternoon

Keynote Presentations

Gene Expression-targeted Isoflavone Therapy (GET IT) for Mucopolysaccharidoses: The Use of Soy Isoflavone Extract for Treatment of Children Suffering from Severe Genetic Disease. G. Wegrzyn, University of Gdansk, Gdansk, Poland.

Mucopolysaccharidoses (MPS) are inherited metabolic disorders, caused by mutations leading to dysfunction of one of the enzymes involved in degradation of glycosaminoglycans (GAGs) in lysosomes. Recently, genistein was found to reduce the rate of GAG synthesis in cultures of fibroblasts derived from MPS patients. Because of the mechanism of action, potential therapy based on the use of genistein (an isoflavone) in MPS treatment has been named gene expression-targeted isoflavone therapy (GET IT). Experiments with animal models of MPS indicated that genistein can be an efficient agent in decreasing GAG storage and correcting behavior of MPS mice. In an open-label clinical study, 10 MPS patients were treated for 12 months with a genistein-rich soy isoflavone extract at a daily dose corresponding to 5 mg genistein per kg of body weight. This treatment, in which no adverse effects were noted, resulted in a statistically significant reduction in urinary GAG levels. Moreover, hair morphology improved and patients achieved higher cognitive function scores. A two year follow-up study confirmed the efficacy of the treatment. However, evidence suggests an increase in the genistein dose is warranted.

Acknowledgements: This work was operated within the Foundation for Polish Science TEAM Programme co-financed by the EU ERD Fund.

Herbicide Tolerant Genetically Engineered Soybeans: Looking for Risk in All the Wrong Places? B. Chassy, University of Illinois, Urbana, IL, USA.

More than 90% of the soybeans cultivated in the USA are produced from seeds that have been genetically engineered to be resistant to the broad-spectrum herbicide glyphosate. Farmers use this technology because it offers them effective weed control, lower input costs, and fewer trips into the field resulting in less labor and lower fuel costs. In spite of the high rate of cultivation of HT-soybeans over the last 15 years, opponents argue that what they call Genetically Modified (GM) soybeans are bad for the environment, and could be risky to consume due to the inherent danger of the technology of what they claim is flawed regulatory review by governments.

This presentation will: 1) describe the genetic and biochemical changes incorporated into HT-soybeans and how they function to resist glyphosate, 2) the process for regulatory review of transgenic crops, 3) the data collected in a regulatory review, and 4) a comparison of the relative risks presented by conventional and transgenic soybeans. Several lines of evidence will be presented that lead to the conclusion that genetically engineered soybeans are as safe as, or are safer than, any other soybean. The consequence of looking for risks in all the wrong places has distracted attention and resources from assessment and management of real and serious food safety risks.

Effect of a Novel Supplemented Soy Drink on Skin Ageing of Post-menopausal Women. R. van den Berg[1], L. Wainwright[2], K. Barrett[2], J. Casey[2], and G. Jenkins[2], [1]Unilever Discover R&D Vlaardingen, PO Box 114, 3130 AC Vlaardingen, The Netherlands, [2]Unilever Discover R&D Colworth, Colworth Science Park, Sharnbrook, Bedfordshire MK44 1LQ, UK.

Isoflavones are naturally occurring plant components which have weak estrogenic properties. Since it is known that there is a strong correlation between skin collagen loss and estrogen deficiency due to menopause we investigated the effect of a soy based drink on skin ageing. We have conducted a double-blind, placebo-controlled human intervention study for 14 weeks to evaluate the effect of a soy-based drink on skin ageing parameters. 101 healthy, non-smoking Caucasian women (skin type II-III), aged 45–65, were recruited. At the end of the intervention, a statistically significant reduction in wrinkle depth (Rz) in the test group compared to placebo was found. Moreover the treatment had the greatest effect on deepest wrinkles. In addition, skin biopsies were analysed for pro-collagen I synthesis (new collagen) at the beginning and end of the intervention. There was a significant increase in pro-collagen I in biopsies from the test group at the end of the study when compared to the placebo, with an average increase in pro-collagen levels of 25%. This human study has demonstrated that skin anti-ageing effects can be obtained through consumption of a soy isoflavone-rich drink. In particular, we were able to demonstrate a reduction in wrinkle depth in the crow's foot area of the eye and that this change appears to be underpinned by an increase in new collagen synthesis over a 14 week period.

Soymilk Produced Less Fat Accumulation, Decreased Markers of Inflammation and Oxidative Stress and Enhanced Plasma Adiponectin in Overweight Men. Elvira Gonzalez de Mejia,[1] Dina Fernandez,[1] Cristina Martinez-Villaluenga[1] and Neal A. Bringe[2,] [1]Department of Food Science and Human Nutrition, University of Illinois at Urbana Champaign, 228 ERML, 1201 W. Gregory Dr., Urbana, IL 61801, USA, [2]The Monsanto Company, St Louis, MO, USA.

The objective was to compare the effect of consuming low glycinin soymilk (LGS) with conventional soymilk (S) and bovine milk (M) on body fat accumulation and biomarkers of oxidative stress and inflammation in overweight men. In a randomized, double-blind, placebo controlled IRB approved study, 64 healthy overweight men (BMI > 25) were divided into three groups and fed daily for 3 months 500 ml of LGS, S or M. No changes were observed in their caloric intake ($P = 0.40$) and physical activity ($P = 0.49$). Oxidized LDL decreased after LGS consumption (-61%) compared with S (-36%, $P = 0.0007$) and M (-12%, $P = 0.002$). Serum antioxidant capacity increased in LGS (18%, $p = 0.001$) and S (28%, $P < 0.001$) compared with M (-40%). The decrease in plasma interleukin-6 after 3 months of LGS (-22%, $P = 0.025$) and S (-26%, $P = 0.014$) consumption were significantly different to M. LGS caused less total body fat accumulation compared to S ($P = 0.015$) and M ($P = 0.011$), and increased plasma adiponectin (15%) compared with S (2%, $P = 0.039$) and M (-8%, $P = 0.036$). Body weight, waist-hip ratio, BMI, lean mass, serum lipids, plasma leptin, C-reactive protein and fatty acid synthase did not change significantly among groups. LGS reduced oxidized LDL, increased plasma adiponectin and also contributed to body composition maintenance in overweight men. LGS may be a useful product to include in meals designed to improve the health of overweight individuals.

Sources and Dietary Intake of Total and Individual Isoflavones in the U.S. Diet. D.B. Haytowitz and S. Bhagwat, USDA-ARS-Nutrient Data Laboratory, USA.

Soy products are a major source of dietary isoflavones, with weak

estrogenic and other biological properties that may contribute to the lowering of LDL cholesterol and the reduction of the risk for some chronic diseases. Data from Release 2 of the USDA Database for the Isoflavone Content of Selected Foods were matched with food consumption data from the 2007–08 NHANES: What We Eat in America study. Weighted grams consumed for each food item reported by survey respondents were calculated. To calculate the dietary intake of isoflavones contributed by each food item, the isoflavone values for that food item were multiplied by the grams consumed of the food item. Soymilk was the leading source of total isoflavones, followed by tofu and then meatless products, such as veggie burgers. While many participants did not consume soy foods directly, soy-based ingredients are commonly used in food manufacturing. Non-soy products, such as various baked products and frankfurters which may contain soy-based ingredients, provide isoflavones to the diet. The major foods contributing daidzein and genistein were very similar to those contributing total isoflavones. Knowing the relative contributions of total and individual isoflavones to total dietary intake and the quantities consumed in the U.S. diet will assist in assessing the effects of isoflavone intake on human health status.

Soy Saponins: Current Research and Future Goals. M. Berhow, USDA, ARS, NCAUR, USA.

(Abstract not available at press time.)

Sunday Morning

Soy and the Breast Cancer Patient

Differences in Mouse Versus Human Isoflavone Metabolism and the Implications for Breast Cancer Risk. K.D.R. Setchell, Children's Hospital at Cincinnati, USA.

(Abstract not available at press time.)

Soy Food Intake among Breast Cancer Patients: Association with Survival and Menopausal Symptoms. Xiao Ou Shu, Vanderbilt University, USA.

Soy foods are rich in phytoestrogens, mainly in the form of isoflavones, which are natural estrogen receptor modulators that possess both estrogen-like and anti-estrogenic properties. Soy food intake has been hypothesized to reduce the risk of breast cancer and to reduce menopausal symptoms. However, the estrogen-like effect of isoflavones and the potential interaction between isoflavones and tamoxifen have led to concern about soy food consumption among breast cancer patients. We evaluated the associations of soy food intake after diagnosis of breast cancer with total mortality and cancer recurrence, as well as menopausal symptoms in the Shanghai Breast Cancer Survival Study, a large, population-based cohort study of 5,042 female breast cancer survivors. Study participants were recruited between March 2002 and April 2006 and followed through June 2009. Information on cancer diagnosis and treatment, lifestyle exposures after cancer diagnosis, menopausal symptoms, and disease progression was collected at approximately 6 months after cancer diagnosis and was reassessed at three follow-up interviews conducted at 18, 36, and 60 months after diagnosis. Annual record linkage with the Shanghai Vital Statistics Registry database was carried out to obtain survival information for participants who were lost to follow-up. Medical charts were reviewed to verify disease and treatment information. Cox regression analysis was conducted to evaluate the association of soy food intake with total mortality and breast cancer recurrence; unconditional logistic regression analysis was conducted to evaluate associations with menopausal symptoms.

We found that soy food intake, measured either by soy protein or soy isoflavone intake, was inversely associated with mortality and recurrence. The hazard ratio (HR) associated with the highest quartile of soy protein intake was 0.67 (95% confidence interval [CI]=0.51-0.88) HH H for total mortality and 0.66 (95%CI=0.52-0.84) for recurrence compared with the lowest quartile of intake. The multivariate adjusted 5-year mortality rates were 13.1% and 9.2% and 5-year recurrence rates were 13.0% and 8.9%, respectively, for women in the lowest and highest quartiles of soy protein intake. The inverse association was evident among women with either ERpositive or ER-negative breast cancer and was present in both users and non-users of tamoxifen.

The prevalence of menopausal symptoms in our cohort was 56% at 6 months after diagnosis and 63% at 36 months after diagnosis. Hot flashes were the most commonly reported symptom (~44-55%). At 6 months after diagnosis, the prevalence of hot flashes was higher for premenopausal breast cancer patients in the highest quartile of isoflavone intake (OR=1.20, 95% CI: 0.98-1.59) compared with women in the lowest quartile of intake. The association was stronger at 36 months after diagnosis (OR=1.59, 95% CI: 1.02-2.48). Moderate soy food intake was not associated with hot flashes. There was no association between soy food intake and night sweats or vaginal dryness. Neither tamoxifen use nor BMI modified the association between menopausal symptoms and isoflavone intake.

Overall, the results of our study suggest that soy food consumption after breast cancer diagnosis exerts an antagonistic effect on estrogen.

Association Between Soy Isoflavone Intake and Breast Cancer Recurrence and Survival Among Postoperative Patients Receiving Adjuvant Endocrine Therapy. Xinmei Kang[1], Qingyuan Zhang[1], Shuhuai Wang[2] MD, Xu Huang[1], and Shi Jin[1], [1]Department of Medical Oncology, Cancer Hospital of Harbin Medical University, Harbin, 150040 China, [2]Department of Pathology, Cancer Hospital of Harbin Medical University, Harbin, 150040 China.

Background: Intake of soy isoflavones among women with breast cancer has become a public health concern because soy isoflavones have weak estrogenic effects. There is little clinical evidence about the safety of soy isoflavone intake in breast cancer patients receiving adjuvant endocrine therapy.

Methods: We examined associations between dietary soy isoflavone intake and breast cancer recurrence and survival among 524 postoperative breast cancer patients from August 2002 to July 2003 who received adjuvant endocrine therapy. Dietary soy isoflavone intake was measured with a validated food frequency questionnaire at baseline. Hazard ratios and 95% confidence intervals were estimated using multivariable Cox proportional hazards regression models. Analyses were further stratified by the hormonal receptor status and endocrine therapy.

Results: The median follow-up time was 5.1 years. The premenopausal patients had an overall survival rate of 69.4% and it was not related to soy isoflavone intake [HR = 1.05, 95% CI = 0.78-1.71 for the highest quartile (<15.2 mg/d) versus the lowest quartile (>42.3 mg/d), P_{trend} = 0.87]. Compared with postmenopausal patients in the lowest quartile of soy isoflavone intake, postmenopausal patients in the highest quartile had a statistically significant reduced risk of recurrence (HR = 0.67, 95% CI = 0.54-0.85, P_{trend} = 0.02). The inverse associations were observed in patients with ER^+/PR^+ disease and patients receiving anastrozole therapy.

Interpretation: High dietary intake of soy isoflavones is associated with reduced risks of recurrence in postmenopausal breast cancer patients with ER^+/PR^+ disease and receiving anastrozole as endocrine therapy.

Nipple Aspirate Fluid and Estrogen Metabolites During a 6-Month Soyfood Intervention. G. Maskarinec[1], Y. Morimoto[1], S. Conroy[1], F.J. Nordt[2], and A.A. Franke[1], [1]Cancer Research Center of Hawaii, Honolulu, HI, USA, [2]Rhein Consulting Laboratories, Portland, OR, USA.

Based on the hypothesis that isoflavones may protect against breast cancer, we examined the effect of soyfoods on the production of nipple aspirate fluid (NAF), a possible indicator of breast cancer risk, and on urinary estrogen metabolites, in particular the 2/16α-OH estrone ratio. Of 310 women screened, 112 (36%) produced at least 10 μL NAF, the minimum of for study participation. We randomized 96 women to a high or a low soy diet for six months. After a 1-month washout period, the participants crossed-over to the other treatment. During the high soy diet, the women consumed 2 daily servings of soymilk, tofu, or soynuts providing 50 mg of isoflavones per day; during the low soy diet, they maintained their usual diet with <3 weekly soy servings. NAF samples were obtained using a FirstCyte© Aspirator, a manual breast pump, at baseline and after 3 and 6 month of each period. For each woman, 3 overnight urine samples were analyzed for urinary estrogen metabolites by GC-MS. Adherence to the study protocol as evaluated by 24-hour dietary recalls and urinary isoflavone excretion was high. The drop-out rate was 15% (N=14); 82 women completed both diets. The two groups were similar in age, ethnicity, and NAF volume at baseline. We will present findings on changes in NAF volume and urinary estrogen metabolite patterns during the soy trial.

Acknowledgements: Funded by grant R01 CA080843 from the National Cancer Institute.

A Phase IIb Trial of G-2535 (Unconjugated Isoflavones -100) in Women at High Risk for Breast Cancer. S.A. Khan[1], N. Michel[5], B. Michele[1], O. Lee[1], R.T. Chatterton[2], D. Ivancic[1], C. Zalles[6], B. Jovanovic[3], R. Bergan[4]. [1]Department of Surgery, [2]Department of Obstetrics and Gynecology, [3]Department of Preventive Medicine and [4]Department of Medicine, Feinberg School of Medicine at Northwestern University, Chicago IL, USA, [5]Clinical Research Office, Robert H. Lurie Comprehensive Cancer Center of Northwestern University, Chicago, IL, USA, [6]Department of Pathology, Cedar Park Regional Medical Center, Cedar Park, TX, USA.

Background: Consumption of soy isoflavones may confer protection against the development of breast cancer, but the data are conflicting. We conducted a Phase IIB trial of soy isoflavone supplementation, to examine its effect on breast cell proliferation in healthy women at high risk for breast cancer.

Methods: 126 women at high risk for breast cancer underwent a random fine needle aspiration (rFNA) of unaffected breast/s; those with ≥ 4000 epithelial cells were randomized to a six-month intervention of mixed soy isoflavone supplement (PTIG-2535) or placebo, and rFNA was repeated. Cells were immunostained for Ki-67 (primary endpoint), examined for cytomorphology, and by spectral imaging. Expression of 32 genes related to proliferation, apoptosis and estrogenic effect was measured using RT-PCR.

Results: A total of 98 randomized women (49 treated and 49 placebo) were evaluable for the primary endpoint of Ki-67 labeling index (LI). In the treated women, the entry and post-intervention Ki-67 LI was 1.18 and 1.12 respectively, whereas in the placebo group it was 0.97 and 0.92 (between group 2-sided Wilcoxon rank-sum p=0.32). The only subset showing a significant change in median Ki-67 LI post-intervention was premenopausal women, where an increase from 1.87 to 2.33 was seen (p=0.02). Atypical features on spectral imaging showed a significant decrease in postmenopausal women (p=0.04) with a significant increase in premenopausal women (p=0.03). There were no significant changes in gene expression following intervention in either group. Compliance was excellent as measured by plasma genistein values

Conclusions: A six-month intervention of mixed soy isoflavones did not cause a change in breast epithelial cell proliferation in healthy high risk women. These results argue against the efficacy of soy isoflavone supplementation of the adult western diet for purposes of breast cancer prevention, but also do not suggest an adverse effect on the breast.

Soy and the Breast Cancer Patient: A Clinical Perspective. Mary Hardy, University of California at Los Angeles, USA.

(Abstract not available at press time.)

Monday Morning

Nonalcoholic Fatty Liver Disease

Nonalcoholic Fatty Liver Disease in Children. J.E. Lavine, Columbia College of Physicians and Surgeons, NY, USA.

Nonalcoholic fatty liver disease (NAFLD) has emerged as the leading cause of chronic liver disease in children and adolescents in the United States. A two- to three-fold rise in the rates of obesity and overweight in children over the last two decades is probably responsible for the NAFLD epidemic. Emerging data suggest that children with nonalcoholic steatohepatitis (NASH) progress to cirrhosis, which may ultimately increase liver-related mortality. More worrisome is the recognition that cardiovascular risk and morbidity in children and adolescents are associated with fatty liver. Pediatric fatty liver disease often displays a histologic pattern distinct from that found in adults. Liver biopsy remains the gold standard for diagnosis of NASH. Noninvasive biomarkers are needed to identify individuals with progressive liver injury. Targeted therapies to improve liver histology and metabolic abnormalities associated with fatty liver are needed. Currently, randomized-controlled trials are underway in the pediatric population to define pharmacologic therapy for NAFLD. Public health awareness and intervention are needed to promote healthy diet, exercise, and lifestyle modifications to prevent and reduce the burden of disease in the community.

Consumption of Soy Protein Protects Against Hepatic Fat Accumulation: Activation of PPAR LXR and Inhibition of SREBP-1C Signaling. T.M. Badger and M.J.J. Ronis, Arkansas Children's Nutrition Center, Departments of Pediatrics, Physiology/Biophysics and Pharmacology/Toxicology, University of Arkansas for Medical Sciences, Arkansas, USA.

Several environmental and lifestyle changes during the past 30 years (including diet, increased caloric intake and decreased physical activity) have altered metabolism, dramatically transformed body composition and resulted in adverse health effects. Chronic ectopic fat deposition is a major consequence of obesity and the precursor to serious and irreversible liver disease. Non-alcoholic steatohepatitis (NASH) is the major early stage ectopic fat storage disorder. Once the lifestyle issues leading to childhood obesity are established as part of a child's behavior, it is difficult to reverse this disorder. Recent evidence suggests that soyfoods may be important in preventing or treating NASH. We have used several rodent models (rats and Agouti mice) to study the effects of soyfood consumption on: lipid metabolism during developmental (prior to puberty); body composition; and NASH. We have studied soy protein isolate (SPI+), the protein used to make soy infant formula, which contains hundreds of phytochemicals, many of which are bioactive. We also studied SPI+ processed to remove most of the phytochemicals (SPI--) and two isoflavones (purified genistein and daidzein) to determine which components of SPI were responsible for metabolic effects. In weanling Sprague-Dawley (SD) rats, the peroxisome proliferator activated receptor (PPAR) α-regulated hepatic genes involved in fatty acid degradation were up-regulated by SPI+, accompanied by elevated hepatic Acyl Co-A Oxidase (ACO) mRNA levels and increased in vitro binding of PPARα to the ACO gene response element (P<0.05). Similar effects were observed on the PPAR γ pathway. Feeding SPI-- or pure isoflavones did not alter PPARα-regulated gene expression. In contrast, SPI+, SPI-- and isoflavones all increased liver X-receptor (LXR) α-regulated genes involved in cholesterol metabolism and transport (P<0.05). Feeding SPI+ increased promoter binding of LXRα and expression of the transcription factor mRNA and protein (P<0.05).

In another model, male SD rats were fed AIN-93G diets made with casein from PND24 to PND64 or were fed high fat "Western" diets containing 0.5% cholesterol made with casein or SPI+. Insulin resistance, steatosis and hypercholesterolemia in the "Western" diet-fed rats were partially prevented by SPI+ ($P<0.05$). No effects of SPI+ were observed on sterol receptor element binding protein (SREBP)-1c mRNA, but nuclear SREBP-1c protein and mRNA of enzymes involved in fatty acid synthesis were suppressed ($P<0.05$). The Agouti mouse is another widely studied obesity model in which yellow coat color and the obese phenotype is epigenetically modulated. We found that SPI-fed, obese Agouti (A^{vy}/a) offspring had lower hepatosteatosis and increased expression of CYP4A, another PPARα-regulated gene, compared to CAS controls ($P<0.05$) without a shift in coat color phenotype. These results suggest that, 1) consumption of diets made with SPI partially protected against obesity-associated hepatosteatosis in several rodent models, and this may involve induction of PPARα-regulated genes; 2) the effects of purified GEN differ from those of SPI when GEN equivalents are closely matched; 3) SPI does not epigenetically regulate the Agouti locus to shift the coat color phenotype in the same fashion as previously reported for GEN alone; and 4) SPI may be beneficial in management of non-alcoholic fatty liver disease. The data further suggests that activation of PPAR-, LXR- and inhibition of SREBP-1c signaling may contribute to increased insulin sensitivity and improved lipid homeostasis observed in rats fed SPI+ after consumption of diets high in fat and cholesterol.

Acknowledgements: Supported by USDA-ARS CRIS 6251-51000-005-02S.

Antagonism of Adipogenic Programming by Soy-based Diet Protects Against Non-alcoholic Steatohepatitis (NASH) in Obese Zucker Rats. J. Davis[1], J. Cain[1], D. Butteiger[2], and W.J. Banz[1], [1]Southern Illinois University, Carbondale, IL, USA, [2]Solae LLC, St. Louis, MO, USA.

Obesity is associated with hepatic lipid accumulation and development of NASH. Benefits of soy on liver function are well documented, but molecular pathways involved remain unclear. The purpose of this study was to identify these mechanisms, and compare benefits of soy to additional proteins. Lean and obese Zucker rats were assigned to casein-, whey-, or soy-based diets for 17 weeks. At termination, rats fed a soy-based diet had greater body weight and total body fat, irrespective of genotype. This effect was partially attributed to greater hyperphagia. Despite the significant increase in adiposity, insulin sensitivity was improved in obese rats fed a soy-based diet. Furthermore, markers of systemic inflammation, including C-reactive protein and serum amyloid P were reduced in soy-fed animals, regardless of genotype. Alternatively, whey-fed animals had greater serum concentration of acute phase proteins, and greater induction of hepatic inflammatory markers, including tumor necrosis factor-α, monocyte chemotactic protein-1, and NFκB. Consistent with previous findings, a soy-based diet markedly reduced liver weight and total hepatic fat content in obese rats. The anti-adipogenic effect of soy in liver was confirmed by an over 2- and 4-fold reduction in lipoprotein lipase and fatty acid binding protein 4, respectively. To determine the pathway mediating the hepatoprotective effect of soy we examined the expression of adipogenic regulators. Several modulators of the canonical and non-canonical Wnt signaling pathway, known to regulate adipogenesis, were markedly reduced in liver but not adipose tissue (AT) of soy-fed rats. Although there were limited differences in transcript abundance of adipogenic modulators in AT, soy-fed rodents exhibited greater adipocyte size without a reduction in total number indicating that greater AT mass was caused by an increase in both adipocyte number and size. Thus, we confirmed the metabolic and hepatoprotective effects of soy, and identified specific adipogenic pathways that may be responsible.

Cardiovascular Disease

Effects of Genistein Aglycone on Insulin Resistance and Lipid Metabolism in Postmenopausal Women with Metabolic Syndrome: Preliminary Results from a Randomized Clinical Trial. A. Bitto[1], D. Altavilla[1], H. Marini[2], F. Polito[2,1], L. Minutoli[1], and F. Squadrito[1], [1]Dept. of Clinical and Experimental Medicine and Pharmacology, University of Messina, Italy, [2]Dept. of Biochemical, Physiological and Nutritional Sciences, University of Messina, Italy.

The metabolic syndrome refers to the clustering of cardiovascular risk factors that include diabetes, obesity, dyslipidaemia and hypertension. Postmenopausal women potentially develop metabolic syndrome because of decreased serum estrogen levels. Insulin resistance and visceral obesity have been recognized as the most important pathogenic factors. The clinical heterogeneity of the syndrome can be explained by its significant impact on glucose, fat and protein metabolism, cellular growth and differentiation, and endothelial function. While leptin increases with body fat, low adiponectin levels are strongly associated with insulin resistance. We measured glucose, insulin, HOMA-IR, total cholesterol, triglycerides, leptin and adiponectin in 120 postmenopausal women with metabolic syndrome who were randomized to receive 54 mg/day of genistein aglycone or placebo, in addition to their usual therapy, for one year. At 6 months genistein treatment significantly reduced ($p<0.05$ vs placebo recipents) HOMA-IR, total cholesterol, triglycerides and leptin. Moreover a marked increase ($p<0.01$ vs. placebo recipients) in serum levels of adiponectin was also observed. These promising preliminary results suggest a role for genistein aglycone in the treatment of metabolic disorders associated with menopause.

Soy Protein Effects on Serum Lipoproteins: An Updated Meta-Analysis. J. Anderson, University of Kentucky, Lexington, KY, USA.

Soy protein intake is associated with significant decreases in LDL-cholesterol(c). FDA affirmed these observations and approved health claim indicating that soy protein, 25 g/d, may reduce risk for coronary heart disease. Recent observers have questioned the efficacy of soy protein effects, perhaps related to clinical studies with suboptimal designs. We performed an updated meta-analysis and study-quality analysis of 42 randomized clinical trials published since 1995. Quality of study was rated with maximum possible score of 24. 20 parallel trials had significantly higher mean quality scores (15.8) than the 22 cross-over trials (10.1, $P<0.001$). Parallel interventions had net LDL-c reduction of 5.5%; higher quality studies had LDL-c reductions of 6.2%. Crossover interventions had net LDL-c reductions of 3.9%; higher quality studies had LDL-c reductions of 4.7%. Meta-analyses of all groups showed significant LDL-c reductions but parallel studies had significantly greater reductions than cross-over studies ($P<0.0001$). In parallel studies these changes were noted: triglycerides,-9.8%, ($P<0.008$) and HDL-c, +3.2%, $P<0.007$. These analyses affirm the beneficial effects of soy protein intake on serum lipoproteins and suggest that soy protein intake of 15 to 25 g/d may, independent of other dietary and lifestyle alterations, reduce risk for coronary heart disease by approximately 15%.

Soy Protein Decreases Low-density Lipoprotein Cholesterol by a Food Displacement Mechanism: An Exercise in Dietary Modeling. C.E. Berryman and L. Wang, Pennsylvania State University, USA.

The low density lipoprotein cholesterol (LDL-C) lowering effect of soy foods has been attributed to many properties in soy, including its favorable fatty acid profile. Using a dietary modeling approach, menus were developed to reflect the 50th percentile total fat and saturated fat intake (NHANES 01-04) and 75th percentile cholesterol intake (Continu-

ing Survey of Food Intakes by Individuals 94-96, 98) for the U.S. population. Extensive evidence has shown that replacing saturated fat with unsaturated fat and decreasing dietary cholesterol results in decreased serum LDL-C cholesterol levels; our purpose was to quantify this effect. Incremental isocaloric substitution of foods containing 13-50 g soy protein (e.g. soy milk) for similar foods containing animal protein (e.g. cow's milk) in a typical American diet (2050 kcal) resulted in a decrease in saturated fat (12.1 g), cholesterol (113 mg), and monounsaturated fat (3.0 g) and an increase in polyunsaturated fat (4.9 g). Use of these dietary modeling data in an online predictive equation calculator (http://www.katancalculator.nl/) resulted in a dose dependent decrease in LDL-C (5.8-9.7 mg/dL). Each 1 g substitution of soy protein for a calorie-matched amount of animal protein resulted in a 0.11 mg/dL decrease in LDL-C. After all possible animal protein substitutions had been made, substituting soy protein for other sources of plant protein did not provide additional benefits. Literature on whole soy food substitution, although limited, validates the combined displacement and intrinsic effect of soy on LDL-C. Assessment of the review by Anderson et al. (N Engl J Med 1995; 333:276-282) indicated it was not the displacement value of soy protein, but use of the textured soy protein, Cholsoy, that explained part of the large overall LDL-C reduction.

Diet Versus Drugs in Chronic Diseases: Other Advantages. D. Jenkins, K. Srichaikul, A. Mirrahimi, and C. Kendall, University of Toronto, Toronto, Ontario, Canada.

Hope that intensive glycemic control in type II diabetes would automatically translate into reduced coronary heart disease was overturned by publication of three studies (ADVANCE, ACCORD and VADT) just over a year ago. Most recently the pre-eminent effect of saturated fat in increasing heart disease (CHD) risk has also been challenged. These recent publications have therefore challenged some of the most fundamental beliefs on the prevention and treatment of chronic disease.

We therefore explore the following hypotheses: changing the nature of the dietary carbohydrate from high to low glycemic index foods or the use of pharmacological agents which achieve the same effect may allow improved glycemic control in type II diabetes to be achieved. This change in turn will reduce CHD risk. Furthermore slowing carbohydrate absorption by any means may also reduce CHD risk in non diabetic populations and explain the apparent lack of effect of saturated fatty acids on CHD risk. This is particularly true, as has been suggested previously, when the comparison is between saturated fatty acids versus high glycemic index carbohydrates in highly insulin resistant sedentary middle aged Western populations.

Systematic Review and Meta Analyses to Support a Cholesterol-lowering Claim for Soy Protein in the European Union. J. Harland, HarlandHall Associates, UK.

Health claims in the EU, are subject to scientific scrutiny by the European Food Safety Authority. Human data are central to the substantiation of claims. The evidence relating soy protein consumption to an effect on blood lipids or reduction in heart disease has been systematically reviewed using strict inclusion criteria. Only studies conducted in healthy adults with normal of mildly elevated hypercholesterolemia consuming 12 to 25g soy protein were considered. From 34 treatment arms the standard mean difference in LDL cholesterol was calculated at 0.22mmol/L; equivalent to a 5.5% reduction. Meta regressions were conducted to identify if dose response relationships existed between intake of soy protein or isoflavone content/g soy protein (0.06 to 6.33mg/g) and reduction in LDL; no such relationships existed. Relevant epidemiology relating to CHD mortality, or morbidly was also subject to meta analyses. The rate ratio of cardiac death was calculated from four studies representing 202362 person years in the lowest compared to the highest soy intake group. It was significantly lower (P=0.001) at 0.748 (95%CI, 0.631 to 0.888), indicating 25% lower risk of cardiac death in those consuming a higher intake of soy protein, typically 6 to12g/day. Further details of the evidence reviewed are presented.

The Effect of Isoflavone Soy Protein Supplementation on the Progression of Subclinical Atherosclerosis in Healthy Postmenopausal Women. H.N. Hodis[1], W.J. Mack[1], N. Kono[1], S.P. Azen[1], Y. Li[1], D. Shoupe[1], J. Hwang[1], and A.A. Franke[2], [1]University of Southern California, Keck School of Medicine, Los Angeles, CA, USA, [2]Cancer Research Center of Hawaii, University of Hawaii, Honolulu, HI, USA.

The Women's Isoflavone Soy Health Study is a single center, randomized, double blind, placebo controlled trial designed to determine the impact of high dose isoflavone soy protein supplementation (ISPS) on health outcomes in healthy postmenopausal women (PMW). 350 PMW without CVD or diabetes were randomized to 25 g soy protein containing 91 mg aglycone weight isoflavones (154 mg total weight) or to milk protein placebo. Treatments were taken in two evenly divided doses daily delivered in powder food packs or food bars. Median compliance with product consumption was >94%. The primary trial endpoint is rate of change in CIMT measured every six months over the three year trial period. Treatment groups did not differ at baseline on any variables. Average age was 61 years and 36% of the participants represented an ethnic minority. 90% of participants experienced natural menopause and the average time-since-menopause when randomized was 11 years; 50% of the subjects were randomized within 10 years-since-menopause. Average systolic/diastolic blood pressure was 118/75 mmHg, LDL-C 135 mg/dL, triglycerides 111 mg/dL and HDL-C 63 mg/dL. Total plasma isoflavone levels were 181 nM. Average baseline CIMT was 0.811 mm. Effect of ISPS on atherosclerosis progression will be presented.

Acknowledgements: Funded by the National Institutes of Health. Solae LLC provided the study products.

Monday Afternoon

Bone Health

A Randomized, Placebo-controlled, Double-blind Pilot Study to Investigate the Effect of a Combination of Genistein, Polyunsaturated Fatty Acids and Vitamins K1 and D3 on Bone Health and Safety in Postmenopausal Women (PMW). I. Kunz[1], J. Lappe[2], R. Recker[2], C. Riegger[1], P. Weber[1], and R.P. Heaney[2], [1]DSM Nutritional Products, R&D Human Nutrition and Health, Basel, Switzerland, [2]Osteoporosis Research Center, Creighton University Medical Center, Omaha, Nebraska, USA.

Objectives: Investigate efficacy and safety in PMW receiving a combination of 30 mg gen, 1 g n-3 PUFAs, 800 IU vit D3 and 150 ug K1 suppl and 500 mg calcium compared to placebo and 500 mg calc for six months.

Outcome: Primary endpoints were Bone Mineral Density (BMD) at the lumbar spine (LS) and femoral neck (FN). Sec eps were BMD at other bone sites and bone markers. Additional parameters, safety parameters, and tolerability were assessed.

Results: 58, early PMW with an average age of 55y and BMI of 25 kg/m2 were investigated. At the FN and Wards Triangle, there were significant increases in BMD (delta 1.3% and 3.4%, respectively, comp to calc alone, both $p<0.05$). There were no significant differences in change in LS and other hip sites comp to calc alone. After six months supplementation, NTX and BALP were significantly increased ($p<0.05$). Nutrition and physical activity were similar and there were no differences in body composition, and any safety parameters including endometrial thickness. Tolerability was very good with fewer adverse events in the supplementation group and no major affected organ system.

Conclusions: The combined supplementation for six months appeared to protect against bone loss better than calcium alone and was safe and well tolerated.

Soy Isoflavones for Reducing Bone Loss (SIRBL) Study: Three Year Effects on pQCT Bone Density and Strength in Postmenopausal Women. K.M. Shedd-Wise[1], D.L. Alekel*[2], H. Hofmann[3], K.B. Hanson[2], D.J. Schiferl[4], L.N. Hanson[2], and M.D. Van Loan[5], [1]Nutrition Dept., University of California–Davis, Davis, CA, USA, [2]FSHN Dept., Iowa State University, Ames, IA, USA, [3]Dept. Statistics, Iowa State University, Ames, IA, USA, [4]Bone Diagnostics, Inc., Fort Atkinson, WI, USA, [5]USDA/ARS, Western Human Nutrition Research Center, Davis, CA, USA.

Soy isoflavones exert inconsistent bone-preserving effects, but bone strength-preserving effects in humans are unknown. Our double-blind randomized controlled trial examined two soy isoflavone (Novasoy) doses (80 or 120 mg/d) vs placebo tablets on bone mineral density (BMD) and strength (via peripheral quantitative computed tomography) in healthy postmenopausal women (46–63 y). We measured three year change in cortical (Ct) BMD, cortical thickness (CtThk), periosteal circumference (PC), endosteal circumference (EC), and strength-strain index (SSI) at 1/3 midshaft femur (N=171) and trabecular (Tb) BMD, PC, and SSI at 4% distal tibia (N=162). We found no treatment effect on femur CtThk, PC, or EC, or tibia TbBMD or PC. Strongest predictors (negative) of tibia TbBMD and SSI and femur CtBMD were timepoint and bone resorption; whole body fat mass was protective of SSI. As time since last menstrual period (TLMP) increased (p=0.012), 120 mg/d was protective of CtBMD. Strongest predictors of femur SSI were timepoint, bone resorption, and TLMP (protective). Isoflavone tablets were negative predictors of SSI, but 80 mg/d became protective as bone turnover increased (p=0.011). Soy isoflavone treatments for three year were modestly beneficial for midshaft femur volumetric BMD as TLMP increased, and for midshaft femur SSI as bone turnover increased.

Acknowledgements: NIAMS/NIH (RO1 AR046922).

Genistein Aglycone Reduces FRAX Rate in Postmenopausal Women. F. Squadrito[1], D. Altavilla[1], A. Bitto[1], F. Polito[2,1], L. Minutoli[1], and Herbert Marini[2], [1]Department of Clinical and Experimental Medicine and Pharmacology, University of Messina, Italy, [2]Department of Biochemical, Physiological and Nutritional Sciences, University of Messina, Italy.

The Fracture Risk Assessment Tool (FRAX) calculates the ten-year probability of a major osteoporotic fracture and/or of a hip fracture. Genistein might play a preventive role against bone mass loss without the harmful estrogenic activity on reproductive tissues in postmenopausal women.

The aim of the study was to evaluate the ten-year fracture probability in a cohort of osteopenic, postmenopausal women treated for two years.

The study was a randomized, double-blind, placebo-controlled trial involving 389 osteopenic, postmenopausal women. Participants received 54 mg of genistein aglycone (n=191) or placebo (n=198), daily. Both treatments contained calcium and vitamin D3.

Fracture probability measured by FRAX showed a significant reduction in the genistein group compared with placebo after 2 years (major osteoporotic fracture probability: mean difference -0.75, 95% CI -1.009 to -0.4908, p<0.001; hip fracture probability: mean difference -0.41, 95% CI -0.5425 to -0.2775, p<0.001). BMD values at femoral neck negatively correlated with fracture probability assessed by FRAX in genistein group (major osteoporotic fracture r= -0.77, 95% CI -0.8130 to -0.7203, p<0.0001; hip fracture r= -0.7518, 95% CI -0.7972 to -0.6980, p<0.0001).

After two years, genistein aglycone significantly reduced the risk of fractures calculated by FRAX in osteopenic, postmenopausal women thus representing an effective therapeutic option for menopausal bone loss.

Hot Flashes

The Effect of Genistein on Menopause Symptom Management in Healthy Postmenopausal Women: a Multi-center, Randomized, Placebo-controlled Study. J. Elliott[1], M. Evans[2], P. Sharma[2], R. Berman[1], and N. Guthrie[2], [1]DSM Nutritional Products, Inc., Parsippany, NJ, USA, [2]KGK Synergize Inc., London, ON, Canada.

Objective: To evaluate the efficacy of synthetic genistein (aglycone form) for reducing the frequency and severity of hot flashes.

Study design: A 12 week randomized double-blind, placebo-controlled study in which 84 postmenopausal women reporting at least 40 hot flashes/week received either placebo or a single 30 mg dose of genistein.

Outcome measures**:** Primary: percentage change in the number of daily hot flashes from pre-treatment to week 12. Secondary: duration and severity of daily hot flashes, Greene Climacteric Scale score, FSH, 17β-estradiol and endometrial thickness.

Results: Subjects on genistein completing the 12 week study reported a significant decrease in the avg number of hot flashes at wks 8 (p=0.045) and 12 (p=0.015) compared to completers on placebo. Also subjects on genistein demonstrated a greater percent reduction in the avg number of hot flashes from baseline to weeks 4, 8 and 12 of the study compared to placebo (31% vs. 16% (p=0.066), 40% vs. 24% (p=0.062) and 44% vs. 22% (p=0.027), respectively. There were no differences between groups in FSH, 17β-estradiol and endometrial thickness or adverse events.

Conclusions: The current study provides the first evidence that a single daily dose of 30 mg of synthetic genistein reduces hot flash frequency and duration.

Acknowledgements: Supported by DSM Nutritional Products, Inc.

Isoflavone Extracts and Hot Flash Alleviation: Systematic Review and Meta-Analysis of Clinical Studies. M. Kurzer, University of Minnesota, USA.

(Abstract not available at press time.)

The Effect of Isoflavone Soy Protein Supplementation on Cognitive Function in Healthy Postmenopausal Women. W.J. Mack[1], V.W. Henderson[2], J.A. St. John[1], N. Kono[1], C.A. McCleary[1], A.A. Franke[3], and H.N. Hodis*[1], [1]University of Southern California, Keck School of Medicine, Los Angeles, CA, USA, [2]Stanford University, Stanford, CA, USA, [3]Cancer Research Center of Hawaii, University of Hawaii, Honolulu, HI, USA.

The Women's Isoflavone Soy Health (WISH) Study is a single center, randomized, double blind, placebo controlled trial designed to determine the impact of high dose isoflavone soy protein supplementation (ISPS) on health outcomes in a healthy population of postmenopausal women (PMW). 350 PMW without CVD or diabetes were randomized to 25 g soy protein containing 91 mg aglycone weight isoflavones (154 mg total weight) or to milk protein placebo. Treatments were taken in two evenly divided doses daily delivered in powder food packs or food bars. Median compliance with product consumption was >94%. Primary cognitive endpoint is change in global cognition (a weighted cognitive composite from 14 neuropsychological test scores) between the two treatment groups evaluated at baseline and after 2.5 years of intervention. Secondary analyses included comparisons on individual neuropsychological tests and cognitive factors scores reflecting executive function and verbal and visual episodic memory. Treatment groups did not differ at baseline on any variables including an intelligence quotient and the CES Depression score. Average age was 61 years and 36% of participants represented an ethnic minority; 90% of participants were educated beyond high school. The effect of ISPS on cognition will be presented.

Acknowledgements: Funded by the National Institutes of Health. Solae LLC provided the study products.

Sports Nutrition

Soy Protein's Role in Exercise and Resistance Exercise Training. B.B Rasmussen, University of Texas Medical Branch, Galveston, TX, USA.

Resistance exercise and physical activity can reduce the risk of chronic health problems. Well-balanced diet with adequate protein is important for a person to maintain and gain lean muscle mass. Consumption of a high quality protein immediately following resistance training maximizes recovery and muscle protein synthesis (MPS). Leucine appears to be the primary nutrient signal to stimulate MPS. Recent work has confirmed that 1.8 g of leucine is sufficient for MPS. Soy protein is a high quality, plant-based protein that is comparable to milk, meat and eggs. Leucine content in soy protein is slightly less than in dairy proteins (but with adequate amounts of soy intake the proposed threshold of leucine can easily be achieved). Soy protein has an intermediate digestion rate which may allow it to extend the window of MPS. While most of the sports nutrition recovery products are dairy-based blends, soy protein offers additional benefits. Soy protein contains approximately 300% more arginine and 30% more glutamine than whey protein. These two amino acids may bring additional benefits to athletes. Scientific data show that soy protein does not have negative effects on hormone levels in men consuming it during exercise training programs. A "blend" of high-quality proteins (soy and dairy) may be the optimal sports nutrition product for athletes to consume following training.

The Effects of Soy and Other Proteins on the Stimulation of Muscle Anabolism in Response to Resistance Exercise. C. Jankowski, University of Colorado Anschutz Medical Campus, Aurora, CO, USA.

Dietary protein consumed after resistance exercise is thought to augment the anabolic responses in skeletal muscle induced by mechanical strain. Whether the anabolic effects on muscle differ by protein source is a current topic in sports nutrition. A comparison of muscle anabolic responses to resistance exercise with dietary soy and milk protein supplementation was made in three studies of young men. Two studies employed an acute bout of resistance exercise stimulus[1,2] and one study[3] included a 12-week progressive resistance exercise training (PRT) intervention. These three studies all suggested that some aspect of milk protein (~80% casein, 20% whey) generated greater effects on skeletal muscle anabolic response to exercise when compared with soy. These effects included muscle protein fractional synthesis rate (MILK > SOY; WHEY > SOY>CASEIN) and accrual of lean tissue mass (MILK > SOY or carbohydrate). However, these studies do not consistently support the hypotheses put forth regarding the mechanism that could explain the results of each study. The hypotheses that the rates of protein digestion and leucine concentration explain the anabolic responses in soy versus milk proteins were not supported by the studies. It remains possible that other mechanisms could explain the results of these studies or that subtle deficiencies in the experimental approaches caused chance findings and inconsistencies across studies.

1. Wilkinson SB et al. Consumption of fluid skim milk promotes greater muscle protein accretion after resistance exercise than does consumption of an isonitrogenous and isoenergetic soy-protein beverage. Am J Clin Nutr 85: 1031–1040, 2007.
2. Tang et al. Ingestion of whey hydrolysate, casein, or soy protein isolate: effects on mixed muscle protein synthesis at rest and following resistance exercise. J Appl Physiol 107: 987–992, 2009.
3. Hartman et al. Consumption of fat-free fluid milk after resistance exercise promotes greater lean mass accretion than does consumption of soy or carbohydrate in young, novice, male weightlifters. Am J Clin Nutr 86: 373–381, 2007.

Thyroid Function

The Effect of Soy Phytoestrogen Supplementation on Thyroid Status and Cardiovascular Risk Markers in Patients with Subclinical Hypothyroidism: a Randomized Double Blind Crossover Study. S.L. Atkin[1], T. Sathyapalan[1], and N.J. Thatcher[2], [1]Hull York Medical School, University of Hull, Cottingham Road, Hull, UK, [2]Food Standards Agency, Aviation House, Kingsway, London, UK.

Context: There is concern whether soy may affect thyroid function. Intuitively if this is true then soy is likely to have a greater impact in subjects with subclinical hypothyroidism, a condition that has been associated with an increased risk of cardiovascular disease. Conversely, beneficial effects of soy phytoestrogens have been reported on insulin resistance and lipids.

Objective: The primary aim was to determine the effect of soy phytoestrogen supplementation on thyroid function, with a secondary aim of assessing the effects on cardiovascular risk indices in patients with subclinical hypothyroidism.

Design, Setting and Patients: A randomized, double-blind cross over study involving 60 patients with subclinical hypothyroidism.

Intervention: Patients were randomly assigned to either a low dose phytoestrogen (30g soy protein with 2mg phytoestrogens representative of Western diet) or a high dose phytoestrogen (30g soy protein with 16mg phytoestrogens representative of vegetarian diet) supplementation for 8 weeks, then crossed over after an 8 week wash out period.

Main Outcome Measures: The primary outcome was progression to overt hypothyroidism, with secondary outcome measures of blood pressure, insulin resistance measured by HOMA-IR and C-reactive protein.

Results: Six female patients in the study progressed into overt hypothyroidism during the 6 month period with a standardised rate ratio of 3.6(95%CI-1.9,6.2) with 16mg phytoestrogen, though no deterioration in thyroid function were seen in the remainder of the study population. Systolic blood pressure [140.7±2.4 vs.133.6±2.8mmHg*p<0.01*] and diastolic blood pressure [76.7±1.8 vs.72.1±1.4mmHg *p<0.02*] decreased with 16 mg phytoestrogens, whilst systolic pressure alone decreased with 2 mg phytoestrogens. Insulin resistance [HOMA-IR3.5±0.09vs.2.6±0.08 *p<0.02*] and hsCRP[4.9±0.04vs.3.9±0.03, p<0.01] decreased with 16mg phytoestrogens. The lipid profile remained unchanged.

Conclusion: There is a threefold increased risk of developing overt hypothyroidism with dietary supplementation of 16mg soy phytoestrogens especially in females with subclinical hypothyroidism. However, 16mg soy phytoestrogen supplementation, equivalent to that seen in a vegetarian diet, significantly reduces the insulin resistance, hsCRP and blood pressure in these patients. These data are in accord with as second study comparing 30g isoflavone free soy protein with 66mg of isoflavones in 30g of soy protein that will be discussed.

Tuesday Morning

Equol

Safety Assessment of Natural S-equol. B. Jenks, Scientific Affairs and Nutrition Education, Pharmavite, LLC, USA.

Natural S-equol administered as SE5-OH tablets has been studied for benefits and safety for the management of menopausal symptoms in Japanese and U.S. women. SE5-OH with natural S-equol has been developed by the Otsuka Pharmaceutical Co, Ltd. (Saga/Pharmavite), and is a non-GMO, whole soy germ based ingredient produced via fermentation with the patented *Lactococcus* 20-92 bacteria. Fermentation with this lactic acid bacterium converts most of the natural isoflavone daidzein, to its microbiological metabolite S-equol. SE5-OH has self-affirmed GRAS (Generally Recognized As Safe) status. S-equol can be formed via

intestinal bacterial metabolism of daidzein and is therefore considered a "metabolite" in accordance with the Dietary Supplement Health and Education Act (DSHEA). Approximately 22 to 35% of the Western adult population and about 50% of adults living in Asian countries harbor the GI bacteria that have the ability to metabolize daidzein to S-equol confirmed by measuring urinary excretion of equol. Natural S-equol administered as SE5-OH tablets has been examined in human controlled trials. Studies have demonstrated that natural S-equol is safe and well tolerated in post-menopausal women fed the supplement for 12 weeks and in pre-menopausal women fed the supplement for one month. Animal data relevant to S-equol and breast health will be discussed. Currently, it is indicated that consumption of S-equol at doses evaluated in studies does not promote the initiation or progression of breast cancer and is considered safe for breast health. Included in the presentation will be discussion of the SE5-OH self affirmed GRAS dossier that includes a 91-day toxicity study in rats, a series of *in vitro* and *in vivo* genotoxicity studies, a teratology study in rats and a two generation reproduction study in rats.

Efficacy and Safety of a Natural S-equol Supplement for Menopausal Healthcare. T. Aso, Comprehensive Reproductive Medicine, Tokyo Medical and Dental University, Tokyo, Japan.

The accumulating evidence has been indicated that equol has beneficial effects on menopausal symptoms, bone, lipid metabolism and others. For clinical use of equal, the efficacy and safety of a standardized supplement containing natural S-equol need to be confirmed extensively.

The efficacy of a natural S-equol supplement developed by fermentation of a soy germ solution with *Lactococcus 20-92* on menopausal symptoms has been studied in a series of clinical trial. The ingestion of the supplement of 10mg per day for 12 weeks was indicated to improve menopausal symptoms including hot flashes and neck and shoulder stiffness significantly in Japanese postmenopausal women. As a part of the evaluation for the safety of the supplement, the influence of continuous ingestion of supplement on uterus and breasts were investigated. In the equol non-producing Japanese menopausal women, 10 to 30mg per day of the supplement ingestion for three months did not show any significant changes in vagina and cervix cytology, endometrium thickness measured by transvaginal ultrasonography and breasts radiological finding examined by mammography.

Thus, the results obtained so far indicated the standardized supplement containing natural S-equol is effective for improvement of menopausal symptoms of Japanese women without any adverse effects. The supplement seems to be a promising remedy in menopausal hearth.

Equol Enantiomers Mimic Genistein in Impacting Mammary Gland Development but not in Breast Cancer Chemoprevention. N.M. Brown*[1,2], S.L. Lindley[1,2], K.D.R. Setchell[1,2]; [1]Division of Pathology and Laboratory Medicine, Cincinnati Children's Hospital Medical Center, Cincinnati, OH, USA, [2]Department of Pediatrics, University of Cincinnati College of Medicine, Cincinnati, OH, USA.

The role of soy in reducing breast cancer risk has been suggested to be associated with early exposure to isoflavones, which alter mammary gland morphology. The objective of the study was to determine the effect of dietary exposure to the enantiomers of a key soy isoflavone metabolite, equol, on mammary gland development and later chemoprotection using the DMBA-induced animal model of breast cancer. Animals were exposed to *S*-(-)equol or *R*-(+)equol (250 mg/kg diet) during the neonatal (0-21 days) or prepubertal (21-35 days) periods only. Histological evaluation of the mammary glands showed that both enantiomers fed neonatally via the dam led to significant precocial mammary gland differentiation. By day 50 this early exposure to *S*-(-)equol or *R*-(+) equol resulted in a decrease in immature terminal end structures and an increase in mature lobules, suggesting an early 'imprinting' effect. Despite these morphological changes to the mammary gland, brief exposure to equol in the neonatal and prepubertal periods only, failed to have a later chemopreventive effect against mammary tumors induced by DMBA, but neither did it increase tumor formation in response to DMBA.

Equol Producer Status Changes During Soy Intervention in Women. A.A. Franke[1], S.M. Hebshi[1], I. Pagano[1], N. Kono[2], W.J. Mack[2], and H.N. Hodis[2], [1]Cancer Research Center of Hawaii, Honolulu, HI, USA, [2]Keck School of Medicine, Los Angeles, CA, USA.

In a randomized, double-blind, placebo-controlled soy intervention trial with 350 postmenopausal women (the 'WISH' study), 7 isoflavonoids (IFLs) including daidzein (DE) and equol (EQ) were analyzed by LCMS at baseline and every 6 months over 2.5 years in overnight urine (OU), spot urine (SU), and plasma (PL). EQ producer status was assessed in all 3 matrices using a ratio of EQ/DE with a cutoff of 0.018. When the absolute DE value (DV) was limited to at least 0.2 nmol/mg creatinine in urine or 100 nM in plasma 85 of 186, 91 of 186 and 85 of 185, or approximately half of the subjects, crossed the cutoff on average 1.6, 1.8, and 2.0 times during the study using OU, SU, and PL, respectively. Intraclass correlations of equol production over time within individuals were low with OU=0.64, SU=0.64, and PL=0.46. Results did not change significantly by increasing the DV limit to at least 1.0 nmol/mg (urine) and 500 nM (plasma) or by not considering any DV limit. Overall, half the subjects changed their EQ status during the 2.5 year period of this soy intervention, and did that on average two times. Plasma-urine correlations were very high. We found that noninvasively-collected urine can reliably determine systemic IFL exposure and soy intake compliance.

Acknowledgements: NCRR (RR020890), NCAM +ODA +ORWH (U01AT001653), Solae LLC supported this study.

Effects of an Equol Supplement on Bone Mineral Density in Postmenopausal Japanese Women. Y. Tousen[1], J. Ezaki[1], Y. Fujii[2], T. Ueno[2], S. Uchiyama[2], M. Nishimuta[3], and Y. Ishimi[1], [1]Food Function and Labeling Program, National Institute of Health and Nutrition, Tokyo, Japan, [2]Saga Nutraceutricals Research Institute, Otsuka Pharmaceutical Co., Ltd., Saga, Japan, [3]Division of Human Nutrition and Applied Physiology, Chiba Prefecture University of Health Science, Chiba, Japan.

Equol, a metabolite of isoflavone daidzein, obtained from soy isoflavones may play a critical role in the prevention of bone loss in postmenopausal women. Here we studied the effects of equol on bone metabolism in a mouse model of osteoporosis and in postmenopausal women. Initially, we examined that administration of equol (0.5 mg/d subcutaneously) or 17β- estradiol (0.03 μg/d subcutaneously) in ovariectomized (OVX) mice for 4 weeks. The administration of equol inhibited bone loss of the whole body and femur in OVX mice without uterine hypertrophy. Moreover, we performed a 1-year double-blind, randomized placebo-controlled trial using natural S-equol supplementation in 93 equol non-producing early postmenopausal Japanese women. Subjects were randomly assigned to the following 4 groups: placebo, 2 mg (EQ-2), 6 mg (EQ-6), and 10 mg (EQ-10) of S-equol per day. After 12 months of the intervention, % change in decrease in urinary deoxypyridinoline level and whole body bone mineral density (BMD) significantly lower in EQ-10 group compared with that in placebo group. On the other hand, serum sex and thyroid hormone concentrations were not influenced by the equol intervention. Our data suggest that equol may contribute to bone health in postmenopausal women without unfavorable effects.

Isoflavones in Aglycon Form are Biologically More Effective than Glycosides—Evidence from a Novel Animal Model Comparing the Effects of Isoflavones on Reproductive Performance and on Cholesterol in Hens. K.D.R. Setchell, Children's Hospital at Cincinnati, USA.

(Abstract not available at press time.)

The Effect of Equol on Obesity and Metabolic Syndrome in Japanese, from the Standpoint of Gender and Equol Producing Capability. T. Usui[1], N. Satoh-Asahara[1], A. Inagura[2], T. Ueno[2], and S. Uchiyama[2], [1]Clinical Research Institute, National Hospital Organization Kyoto Medical Center, Kyoto, Japan, [2]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd, Saga, Japan.

Objective: Recently, it has been suggested that soy isoflavones may have favorable effects on metabolic disorders. Daidzein is one of the principal isoflavone contained in soy and converted to equol by intestinal bacteria. Approximately one-half of Japanese possess a microflora capable of producing equol. We conducted a trial with equol to confirm its beneficial potential effect on various metabolic parameters.

Design: The study was randomized, placebo-controlled, crossover design. All subjects were considered as obesity, regardless of gender and equol producing capability. Placebo or Natural S-equol tablets containing 10 mg (S)-equol were orally ingested per day for 3 months.

Results: About 70% of the individuals were classified as equol nonproducer (ENP). Compared with the previous reported ratio of ENP in general population, the ratio of ENP in this obesity subject is higher. Equol intervention significantly lowered serum low density lipoprotein (LDL) levels and CAVI score. Furthermore this effect was more prominent in female ENP. The differences in LDL level before and after intake of equol were significantly correlated positively with that of CAVI score.

Conclusion: The ratio of ENP in obesity population was higher than generally reported. Equol may have a role in the prevention of cardiovascular disease to lower LDL levels and CAVI scores in obesity.

New Research Areas

Genistein-containing Diets Accelerate Lens Opacity in ICR/f Rats. K.A. Floyd[1], S. Barnes[1], D. Stella[1], G. Squadrito[1], C.C. Wang[1], S. Laurentz[2], G.P. McCabe[2], and O.P. Srivastava[1], [1]University of Alabama at Birmingham, Birmingham, AL, USA, [2]Purdue University, West Lafayette, IN, USA.

ICR/f rats develop lens cataracts at 10–12 weeks of age. In this study they were bred and weaned onto an isoflavone-free AIN76A diet. After weaning they were placed on either AIN76A (control diet), or AIN76A diets containing 0.018% genistein in the form of unconjugated genistein or its glucoside equivalents. Lenses were filmed by a slit-lamp procedure to assess the development of opacity. Plasma isoflavones were measured by LC-MS and antioxidant levels in plasma, aqueous humor (AH) and lens tissue by LC-electrochemical detection. Results were statistically analyzed by a 1-way ANOVA. While there were no significant differences in the times to full cataracts between the diet groups, all the genistein-containing diets caused more rapid development of water clefts at earlier stages than the control, AIN76A diet. LC-MS analysis of plasma confirmed the absence of genistein in the control diet and its presence in each of the genistein supplemented diets. Ascorbic acid levels in AH and the plasma were twice as high in the soy isolate group than in the other groups. Lens glutathione levels were lower in the genistein diet groups than the control group.

Conclusions: In the ICR/f rat, genistein-containing diets accelerated the early stages of lens opacity. Although soy protein isolate increased plasma and AH ascorbic acid levels, it did not translate to protection of the lens in this model.

Acknowledgements: Supported by NIH grant P50 AT00477.

Soybean Isoflavones Regulate Dendritic Cell Function and Protect From the Development of Food Allergy. M. Masilamani, J. Wei, S. Bhatt, M. Paul, and H. Sampson, Mount Sinai School of Medicine, New York, NY, USA.

Soybeans are rich in anti-inflammatory isoflavones and are the most common source of isoflavones in the human food supply. We hypothesize that the active isoflavones in the gut milieu are capable of modulating immune responses to dietary antigens by regulating dendritic cell (DC) function. We tested this hypothesis in a murine model of peanut allergy and in human monocyte derived DCs (MDDC). C3H/HeJ mice were fed a diet containing 1500 ppm genistein and daidzein. The anaphylactic symptoms in these mice were compared to those fed a soy-free diet. Dietary isoflavones in mice reduced the anaphylactic symptoms and decreased the number of degranulated mast cells (by 30–40%) in the ear specimens, when compared to mice fed the soy-free diet. Human MDDCs were activated with lipopolysaccharide (LPS) or cholera toxin (CT) in the presence of isoflavones. The surface expression levels of DC activation markers were analyzed by flow cytometry. We observed a significant reduction (>50%) in the activation-induced cell-surface expression of CD83, CD80 and CD86 but not MHC class II molecules in human MDDC in the presence of isoflavones in vitro. These changes in DCs regulate NK cell and CD4+ T cell function through cell-cell interactions. These data indicate that soybean isoflavones may modulate DC function and protect against the development of food allergy.

Acknowledgements: The Jaffe Food Allergy Institute.

The Meal as Medicine: Anti-obesity Effects of Soy in Rat Model of Menopause. M.C. Murphy, M.R. Rosazza, D.R. Reed, and M.G. Tordoff, Monelle Chemical Senses Center, Philadelphia, PA, USA.

Estrogen deficiency may be responsible for the gain in body weight and visceral fat experienced by postmenopausal women because, in rodent models of menopause, estradiol administration counteracts these effects. Soy contains phytoestrogens which have a chemical structure similar to estradiol; it may thus be a natural alternative to reduce menopausal symptoms. We tested whether phytoestrogens have anti-obesity effects, similar to estradiol, by monitoring daily food intake and body weight of female Long-Evans rats that were either bilaterally ovariectomized or sham operated and fed either phytoestrogen-free control diet (CTRL) or phytoestrogen-rich (SOY) diets. SOY diet significantly reduced body weight compared to CTRL diet in both OVX and SHAM. We also examined whether there was a taste preference for the SOY diet. OVX animals did appear to prefer the SOY diet over the CTRL diet. To determine the cause of the change in body weight, intact rats fed either CTRL or SOY diet had food intake, activity, oxygen consumption and carbon dioxide production measured for four days. We found no differences between the groups in food intake or respiratory exchange rate; however, relative to rats fed CTRL diet, rats fed SOY diet had significantly higher heat production and activity. These findings suggest that soy inhibits obesity-related symptoms of menopause by increasing physical activity and energy expenditure.

Poster Presentation Abstracts

Please note: The following abstracts have not been edited for content. They appear as submitted by the authors.

Cancer

1. **Lactose Intake Can Be Associated With Increased Risk of Cancers in Korea.** Chai Won Chung, Central Research Institute, Dr. Chung's Foods Co., CheongJu, ChoongBuk, Korea.

Prevalence of lactose intolerance in Korean adults is more than 75%, and many of them show symptoms such as diarrhea, abdominal pain, or bloating after ingestion of dairy products. Milk consumption per capita still has increased for the past 20 years. Relationships between milk consumption and incidence rate of cancers, lactose intolerance and oxidative stress were investigated. Electronic databases were systematically searched for last 24 years (1985–2008) to compare the milk consumption per capita to the incidence rate of some cancers in Korea. To explore the relationship between lactose intolerance and oxidative stress, 70 subjects aged 22–74 years were tested. Milk consumption was correlated to the mortality of cancers during the period. That of breast cancer increased from 438 to 1731, and from 39 to 1,168 in prostate cancers, along with the increased milk consumption, from 24.3L to 61.3L. Association of the degree of lactose intolerance and active oxygen scores was not clear. More than a half of those people who were lactose intolerance have been taking cow milk against risks of osteoporosis and menopausal disorder. Therefore, healthcare agencies should help people know whether they are lactose intolerant by including the examination in general comprehensive medical checkup list, and suggest them to improve diet, if necessary, such as replacing dairy products with soy products.

2. **Isoflavones in Breast Tissue: Chemopreventive or Cancer Promoting?** S. Bolca[1,2], A. Heyerick[2], P. Blondeel[3], N. Roche[3], M. Bracke[4], C. Manach[5], and H. Depypere[6], [1]Laboratory of Microbial Ecology and Technology (LabMET), Faculty of Bioscience Engineering, Ghent University–UGent, Ghent, Belgium, [2]Laboratory of Pharmacognosy and Phytochemistry, Faculty of Pharmaceutical Sciences, Ghent University–UGent, Ghent, Belgium, [3]Department of Plastic and Reconstructive Surgery, Ghent University Hospital, Ghent, Belgium, [4]Laboratory of Experimental Cancer Research, Department of Experimental Cancer Research, Radiotherapy and Nuclear Medicine, Ghent University Hospital, Belgium, Ghent, Belgium, [5]INRA, UMR 1019, Unité Nutrition Humaine, Centre Clermont–Theix, St. Genès Champanelle, France, [6]Department of Uro-Gynaecology, Ghent University Hospital, Ghent, Belgium.

Responding to the presumed SERM-like activities of phytoestrogens, ideally acting as ER agonists in bone and cardiovascular tissue without stimulating proliferation in breast, uterus, and endometrial tissue, the food supplement market targeting menopause expanded substantially. Most of these supplements are based on isoflavone-rich extracts. Although the preferential binding of isoflavones (IF) to ERβ implies rather cancer chemopreventive than promoting effects, their estrogen-like activities concomitantly evoke safety concerns. Therefore, we measured the levels of IF that actually reach breast tissue in a bioactive form and found that, upon a 5d-supplementation, human breast adipocytes and epithelial cells were exposed to ≤20–25 pmol/g total IF-aglycones and 900–1150 pmol/g total IF-glucuronides. The E2β-equivalents exceeded 21±4 and 40±10 times the endogenous E2 concentrations in adipose and glandular biopsies, respectively, whereas the E2α/E2 ratios were 0.4 and 0.8, respectively. These findings suggest that soy consumption may elicit ERβ agonistic effects in breast tissue. Yet, further investigations are required. Therefore, our next step is to explore whether E2-responsive genes are differentially expressed by dietary IF and the SERMs tamoxifen and raloxifene. Integration of exposure and transcriptomic profiles will help understand the mechanisms of action of these xenoestrogens.

3. **Genistein (GEN), Resveratrol (RES) and Regulation of HIF-1α in the Mammary Gland.** S. Barnes[1], P. Vayalil[2], A. Piras[1], G.P. Page[1], M. Crowley[1], T. Whitsett[1], C.A. Lamartiniere[1], H. Kim[1]; [1]University of Alabama at Birmingham, Birmingham, AL, USA, [2]University of Cagliari, Cagliari, Italy.

Gene expression changes that occur in the mammary gland prior to (at weaning) and after puberty (50 days of age) were examined by microarray analysis on rats on an isoflavone-free diet. Gene-ontology analysis revealed a 2-fold reduction on the Krebs cycle pathway at 50 days. Western blot analysis revealed that the levels of isocitrate dehydrogenase (IDH) and succinate dehydrogenase B (SDHB) were substantially lower in 50 day vs in 21 day mammary gland. The Krebs cycle not only provides energy in the form of ATP, but also the keto acids for the synthesis of macromolecules. The metabolic product of IDH is α-ketoglutarate, a cofactor with oxygen in the hydroxylation of hypoxia-induced factor 1α (HIF-1α), the so-called oxygen sensor. Immunohistochemical and quantitative immunofluorescence analysis of the mammary gland detected low levels HIF-1α in the mammary gland pre-pubertally; post-pubertally (50 days), it was detected at higher levels and localized to the epithelial cells lining the ducts of the mammary gland. In 50 day glands from rats fed GEN or RES, however, a 50% lower signal for HIF-1α was detected. These data suggest that the chemopreventive activity of GEN and RES is due in part to an impact on HIF-1α signaling resulting from effects on Krebs cycle enzyme gene expression.

Acknowledgments: Supported by U54 CA100949.

Cardiovascular Health

4. **Exposure to Isoflavone-Containing Soy Products and Endothelial Function: A Bayesian Meta-Analysis of Randomized Controlled Trials.** D.P. Beavers[1], K.M. Beavers[2], M. Miller[3], J. Stamey[4], and M.J. Messina[5], [1]Wake Forest University School of Medicine, Department of Biostatistical Sciences, Winston-Salem, NC, USA, [2]Wake Forest University School of Medicine, Section on Gerontology, Winston-Salem, NC, USA, [3]University of Maryland School of Medicine, Department of Cardiology, Baltimore, MD, USA, [4]Baylor University, Department of Statistics, Waco, TX, USA, [5]Loma Linda University, Loma Linda, CA, USA.

Endothelial dysfunction has been identified as an independent coronary heart disease risk factor and a strong predictor of long-term cardiovascular morbidity and mortality. Data on the effects of exposure to isoflavone-containing soy products (ICSP) on endothelial function (EF) are conflicting. A Bayesian meta-analysis was conducted to provide a comprehensive account of the effect of ICSP on EF, as measured by flow-mediated dilation (FMD). PUBMED was searched inclusively through August 21, 2009 on randomized controlled trials (RCTs) using the keywords soy, isoflavone, phytoestrogen, EF, and FMD. A total of 17 RCTs were selected as having sufficient data for study inclusion. The overall mean absolute change in FMD (95% Bayesian CI) for ICSP interventions was 1.15% (-0.52, 2.75). When the effects of separate interventions were considered, the treatment effect for isolated isoflavones was 1.98% (0.07, 3.97) compared to 0.72% (-1.39, 2.90) for isoflavone-containing soy protein. The models were not improved when considering study-specific effects such as cuff measurement location, prescribed dietary modi-

fication, and impaired baseline FMD. Cumulative evidence from the RCTs included in this meta-analysis indicates that exposure to soy isoflavones can modestly, but significantly, improve EF as measured by FMD.

5. **A Soy-based Medical Food Enhances the Efficacy of a Mediterranean-style Low-glycemic-load Dietary Program for Cardiovascular Risk Reduction in Women with Metabolic Syndrome.** J.-L. Chang[1], D. Minich[1], M. McIntosh[2], M.-L. Fernandez[3], W. Najm[4], J. Bland[1], M. Tripp[1], and R. Lerman[1], [1]Metagenics Inc, Gig Harbor, WA, USA, [2]University of Florida, Jacksonville, FL, USA, [3]University of Connecticut, Storrs, CT, USA, [4]University of California at Irvine, Orange, CA, USA.

We investigated the effects of a Mediterranean-style low-glycemic-load diet with or without a soy protein-based medical food (commercially available) in women with metabolic syndrome. Eighty-nine women recruited from three university study sites were instructed to consume the specified diet. Forty-four were randomly assigned to the placebo arm and 45 to the medical food arm. The medical food contained soy protein, soy-derived phytosterols, rho iso-alpha acids from hops, and proanthocyanidins from acacia. No caloric restriction was imposed during the 12-week study and exercise was maintained at baseline levels. At end of study, both arms lost similar amounts of body weight (~ 1 lb/week), and both arms showed significant improvements ($P<0.05$) in total cholesterol, TG, VLDL-C, LDL-C, non-HDL cholesterol, TG/HDL, cholesterol/HDL, apoB, apoB/apoA-1, and LDL particle number. Compared to placebo, the medical food arm resulted in greater improvements in total cholesterol, LDL-C, non-HDL cholesterol, apoB and apoB/apoA-1 ($P<0.05$). Serum homocysteine levels remained unchanged in the medical food arm but were increased in the placebo arm ($P<0.05$). The medical food may enhance benefits of a Mediterranean-style low-glycemic-load diet leading to global improvement in multiple cardiovascular disease risk factors.

Development

6. **Improving the Nutrient Density of School Meal Programs in Developing Countries by Utilizing Soy Protein.** S.L. Krawczyk, V. Jain, B.C. Owen, K. Weingartner, and M. Nash, National Soybean Research Laboratory, University of Illinois at Urbana-Champaign, USA.

Everyday 60 million children attend school hungry, and this expected to rise to over 100 million by 2015. A wholesome lunch at school can help protect children from hunger. By enhancing local staples traditionally low in protein with high protein soy ingredients the overall nutrient density of the meal can be increased. Textured soy protein (TSP) and soy flour are easy to modify in culturally appropriate recipes because they are relatively mild in flavor and can substitute for and/or combine with local foods, and in many cases reduce the costs for the feeding program. Grain-Soy Blend rations can also be used in recipes beyond the standard porridge feeding. The staff at the National Soybean Research Laboratory has developed an International School Meals with Soy project that trains local communities to provide a nutrient dense traditional meal that is also highly acceptable by the students. Data from a recent project in Honduras illustrates that by adding TSP to replace some of the beans in a local rice and beans recipe, protein grams per serving can be increased from 18 to 25 and costs decreased from 14 Lempiras ($0.74USD) to 12 Lempiras per serving ($0.63USD). Acceptability of the TSP enhanced meal also was rated as high as the traditional meal.

Endocrinology

7. **Epigenetic Modifications in Nonhuman Primates with Dietary Soy.** T.D. Howard[1], S.M. Ho[2], L. Zhang[1], J. Chen[2], R.E. Slager[1], S.B. Gray[1], W. Cui[1], and J.D. Wagner[1], [1]Wake Forest University Health Sciences, Winston-Salem, NC USA, [2]Department of Environmental Health, University of Cincinnati, Cincinnati, OH USA.

A cynomolgus macaque primate colony was established, allowing for the study of fetal programming and developmental basis of chronic disease. Adult monkeys were randomized to a diet with a fat content similar to the typical American diet (TAD), containing either protein derived from soy with isoflavones (TAD soy) or casein-lactalbumin (TAD casein). Offspring ate the same diet as their mothers after weaning. The colony has been followed for 3 years to assess body weight, carbohydrate and lipid measures, hormones, and biomarkers. Serum isoflavones were higher with TAD soy than TAD casein, but not as high as with monkey chow. Offspring of TAD soy dams had similar body weights at birth, but over a 2 year period weighed significantly less, and had significantly lower triglycerides and fructosamine levels. Glucose tolerance tests in TAD soy offspring had increased glucose disappearance, with lower glucose and insulin responses. Eight adult males were studied to determine if DNA methylation was related to the dietary differences. Four TAD soy animals were switched to TAD casein, and vice versa. DNA from blood, muscle, fat and liver was analyzed with the Illumina HumanMethylation27 BeadChip after 6 weeks on each diet. Significant changes in DNA methylation were observed after changing diets. These data suggest that soy-mediated variation in weight and glucose regulation is partly regulated by DNA methylation changes.

Equol

8. **Natural S-equol Supplement Relieves Menopausal Symptoms in Japanese Postmenopausal Women.** Shigeto Uchiyama[1], Tomomi Ueno[1], Belinda H. Jenks[2], Soh Iwashita[1], Hiroaki Ohta[3], and Takeshi Aso[4], [1]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd., Tokyo, Japan, [2]Scientific Affairs, Pharmavite LLC, Northridge, CA, USA, [3]Obstetrics and Gynecology, International University of Health and Welfare, Tochigi, Japan, [4]Obstetrics and Gynecology, Tokyo Medical and Dental University, Tokyo, Japan.

The objective of this trial was to confirm the effects of a natural S-equol supplement (10mg of equol) on menopausal symptoms in Japanese postmenopausal equol non-producers.

We conducted randomized, double-blind, placebo-controlled trial using a natural S-equol supplement for 12 weeks on 160 postmenopausal Japanese women who complained hot flushes once per day at least. They were randomly assigned to 2 groups; placebo (n=83) or equol (ingestion equol 10mg/d, n=77) groups. Participants completed a menopausal symptom checklist at baseline, 12 weeks and 6 weeks post-intervention.

At baseline, daily hot flushes frequency was 2.9 ± 2.1 and 3.2 ± 2.4 in the placebo and equol groups, respectively. The equol group showed significant reductions in hot flushes frequency ($P<0.01$) and severity ($P<0.05$) following 12 weeks of ingestion compared to placebo group. The decreases in severity of shoulder or neck stiffness of equol group were greater than those of placebo group significantly ($P<0.05$). No significant change in the results of clinical parameters and serious adverse effect was detected.

Ingestion of a natural S-equol supplement (10mg/d) for 12 weeks significantly improved hot flushes frequency and severity, and shoulder or neck stiffness in Japanese postmenopausal women. It is indicative that a natural S-equol supplement is a promising alternative in the management of menopausal symptoms.

9. **Effects of Fermented Soy Food Containing Natural S-equol on Tail Skin Temperature in Ovariectomized Rat.** Chieko Ando[1], Takeshi Yoneda[1], Tomomi Ueno[1], Belinda H. Jenks[2],

Soh Iwashita[1], and Shigeto Uchiyama[1], [1]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd., Tokyo, Japan, [2]Scientific Affairs, Pharmavite LLC, Northridge, CA, USA.

Equol had been reported to have greater estrogenic activity. We succeeded in production of a fermented soy food containing natural S-equol (SE5-OH) using equol-producing lactic acid bacteria. The concentration of natural S-equol in SE5-OH ranged 0.5–0.8%. Previously, we demonstrated that SE5-OH significantly reduced the frequency and severity of hot flush in Japanese postmenopausal women. Thus, in the present study, we set out to determine whether the S-equol contained within SE5-OH was primarily responsible for the reduction of hot flush using an tail skin temperature(TST) rat model in ovariectormy(OVX) rat.

The study groups were consisted of sham (n=30, vehicle), control (n=30, vehicle), Premarin (n=10, Premarin), SE (n=30, SE5-OH) and S-equol (n=30, natural S-equol) groups. SE and S-equol groups were administered as same dose of natural S-equol 11.7mg/kgBW. TST was measured every week from three to five weeks after the operation. The TST was significantly higher in control group compared with sham group, and significantly lower in Premarin group compared with control group. SE5-OH and natural S-equol equally suppressed TST in OVX rats. Both SE5-OH and natural S-equol differed from Premarin in their lack of estrogenic effects on uterine weight.

These results suggest that natural S-equol is safe and is the primary substance in SE5-OH responsible for reducing hot flush.

10. **Safety Assessments of Natural S-equol Supplement by Consecutive Ingestion to Japanese Men and Postmenopausal Women.** Tomomi Ueno[1], Atsuko Onoda[1], Ayuko Oyama[1], Belinda H. Jenks[2], Soh Iwashita[1], Shigeto Uchiyama[1], and Takeshi Aso[3], [1]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd., Tokyo, Japan, [2]Scientific Affairs, Pharmavite LLC, Northridge, CA, USA, [3]Obstetrics and Gynecology, Tokyo Medical and Dental University, Tokyo, Japan.

We succeeded in industrial production of a fermented soy food containing natural S-equol using equol-producing lactic acid bacteria, *Lactococcus 20-92*. In the present study, we investigated the effects of natural S-equol on the endocrine function and reproductive systems of Japanese men and postmenopausal women.

The study was conducted with a randomized, placebo-controlled design. Healthy men and postmenopausal women were divided into three groups and given either a placebo, natural S-equol 10mg/d or 30mg/d for 12 weeks. The safety of the supplement was assessed by blood endocrinological test. The safety assessment on reproducing function was examined of uterus and breasts.

There were no serious adverse events among the groups in this study. No abnormal changes in serum concentrations of sex hormone and thyroid hormone were observed in each group. The measurement of uterus endometrial thickness and cytological analysis of vaginal epithelium or the mammography examination revealed no biological effect of the supplement on reproductive organs.

The consecutive ingestion of natural S-equol supplement (30mg of equol/d) for 12 weeks caused no safety problems, particularly in relation to the endocrine function and reproductive systems. Thus, these data provided basic information to support the safety of continued use of natural S-equol supplement.

11. **Endogenous and Dietary Equol Effects in Male and Female Mice.** F.N.A. Dewi[1], C.E. Wood[1], J.M. Cline[1], A.A. Franke[2], D.L. Golden[1], and M.R. Adams[1], [1]Wake Forest University School of Medicine, Winston Salem, North Carolina, USA, [2]Cancer Research Center of Hawaii, Honolulu, Hawaii, USA.

Equol producers and non-producers may show different responses to soy foods and cancer risk-related phenotypes. We assessed the effects of endogenously produced equol, dietary equol, and soy isoflavone consumption in a three-way factorial design experiment in mice. Equol-producing flora was introduced at 3–6 weeks of age. Diets contained total isoflavone doses of 0, 209 or 2808 ppm with or without exogenous racemic equol (342.5 ppm), and were given for 16 weeks. Difference in effect on testis and uterine weights were only related to endogenous equol and not to dietary equol or isoflavone diet. Equol producers showed lower testis and uterine weights compared to non-producers ($P<0.05$ for both), with effect to testis weights limited to mice not receiving dietary equol ($P<0.0001$). Flora did not affect plasma daidzein concentrations and resulted in lower plasma equol concentrations only in males ($P<0.01$) with effect limited to mice given dietary equol ($P<0.001$). Dietary equol and isoflavone diet resulted in greater concentrations of plasma equol and genistein, respectively ($P<0.0001$ for both). The results indicate that isoflavone metabolism in mice varies with sex, diet, and gut flora status. Our findings also show that endogenously produced equol may result in lower weights of estrogen-sensitive tissues, suggesting that phenotypic differences in equol producers may be related more to gut flora than direct equol effects.

12. **Development of AUS-131 (S-equol) as an Oral Agent for Menopausal Symptoms and Benign Prostatic Hyperplasia.** R. Jackson, J. Greiwe, and R. Schwen, Ausio Pharmaceuticals, LLC, Cincinnati, Ohio, USA.

S-equol is a potent, non-steroidal, non-hormonal estrogen receptor β agonist. With this property the compound has potential as a pharmaceutical agent for vasomotor symptoms (VMS) in women and benign prostatic hyperplasia (BPH) in men. GMP S-equol was synthesized from daidzein to > 99% enantiomeric purity using a chiral catalyst. IND enabling studies were then carried out. It was shown in 28-day safety studies that the maximum tolerated dose in the rat was 125 mg/kg and in the monkey 250 mg/kg. No genotoxicity was noted in three different models. Single-rising dose (10 to 320 mg) and 14-day multi-rising dose (10 to 160 mg BID) Phase 1 clinical studies were carried out in 100 normal subjects using immediate release capsules. Plasma concentrations of free, unconjugated S-equol were determined using a sensitive LC-MS/MS method (lower limit of quantification, 25 pg/mL). In both studies, Cmax and AUC were dose related for both the free and total S-equol; steady-state drug concentrations were achieved by the second day of twice a day dosing. There were no significant drug-related adverse events in these Phase 1 studies. Based on these results, Phase 2a clinical trials for S-equol in VMS and BPH have been initiated.

13. **Effect of Soy Isoflavones Intake and Equol Phenotypes on Blood Lipids and IMT in Chinese Adults.** Yun Cai[1], Kaiping Guo[1], Bo Zhang[1], Chaogang Chen[1], Ping Wang[1], Quan Zhou[1], Fang Mei[1], Shigeto Uchiyama[2], and Yixiang Su[1], [1]Sun Yat-Sen University, Guangzhou, China, [2]Saga Nutraceuticals Research Institute, Otsuka Pharmaceutical Co., Ltd., Tokyo, Japan.

Background: The soy isoflavones (IF) daidzein is metabolized to equol by intestinal bacteria in 30–50% of persons. Studies suggest beneficial health effects associated with equol phenotypes.

Objective: 1) to assess the proportion of equol excretors in Chinese residents aged 40–65; 2) to compare differences in serum lipids and carotid artery intima-media thickness (IMT) between equol excretors and non-excretors; 3) to evaluate the effect of IF intakes, Equol phenotypes on serum lipids and IMT.

Design: A total of 572 subjects donated overnight urine samples, which were measured for IF by HPLC-UV to determine equol phenotypes on their usual diet. FFQ were used to calculate IF intakes. Fasting serum lipids were examined and IMT in the carotid sinus 2 cm below the back wall of blood vessel was detected by Technos MPX DU8 ultrasound.

Results: 143 subjects excreted equol (>0.34umol/L) on their usual diet. Compared with non-excretors, equol excretors showed significantly

lower serum TG (P=0.011) and IMT (P=0.033). In equol excretors, high IF consumers (8.07mg/d) had significantly lower IMT (P=0.035) and tended to have higher HDL-c (P=0.021) compared with low IF consumers (2.18mg/d).

Conclusion: Equol excretors might have lower serum lipids and lower IMT than non-excretors. A consumption of 8.07mg/d IF showed beneficial health effects on serum lipids and IMT in equol excretors.

Genistein

14. **Enhanced Protection from Radiation Injury by the Combination of Genistein and Captopril.** R.M. Day[1], T.A. Davis[2], and M.R. Landauer[3], [1]Department of Pharmacology, Uniformed Services University of the Health Sciences, Bethesda, MD, USA, [2]Department of Regenerative Medicine, Naval Medical Research Center, Silver Spring, MD, USA, [3]Armed Forces Radiobiology Research Institute, Bethesda, MD, USA.

We previously demonstrated in mice that genistein prevents lethality from gamma irradiation by protecting hematopoietic stem cells. Here we evaluated genistein with the angiotensin converting enzyme (ACE) inhibitor, captopril, for mitigation of radiation-induced hematopoietic injury. We measured the effects of genistein and captopril alone and in combination on survival, blood cell recovery, micronuclei, and repopulation of hematopoietic progenitor cells. In C57BL/6J mice, 8.25 Gy 60Co total body irradiation (TBI) results in 0% survival after 30 days. Oral administration of captopril, given 1 hr - 30 days post-TBI, increased survival to 55%. One s.c. injection of genistein 24 hr before TBI gave 72% survival. Genistein + captopril increased survival to 95%. Enhanced survival was reflected in improved recovery of red blood cells, total bone marrow cells, and splenocytes. The drug combination enhanced early recovery of erythroid progenitors (CFU-E and BFU-E) and myeloid progenitors (CFU-GM). Genistein protected cells from radiation-induced DNA damage, but captopril had no effect. This data suggests that genistein and captopril provide protect the hematopoietic system from radiation injury via different mechanisms. This unique combination of two non-toxic, well tolerated compounds provides a novel approach to radiation protection.

Acknowledgements: DTRA H.10025_07_R (RMD, MRL), ONR 01153N.4508.519. A0508 (TAD).

15. **Drug Interaction Testing of a Genistein Aglycone-Containing Medical Food for Bone and Pharmacokinetic Differences in Humans for Genistein Due to Formulation.** B.P. Burnett[1], A. Bitto[2], L. Pillai[1], D. Altavilla[2], F. Squadrito[2], and R.M. Levy[1], [1]Primus Pharmaceuticals, Inc., Scottsdale, AZ USA, [2]University of Messina, Messina, Sicily, Italy.

Genistein is combined with different molecules in products for bone health. Fosteum®, a genistein-containing medical food for bone loss, was tested for drug interactions in human liver microsome CYP450 assays. Fosteum inhibited 2C8 and 2C9 with IC50s of 2.5 and 2.8μM, respectively. A steady-state pharmacokinetic (PK) study was performed in 10 fasting and 10 fed postmenopausal women for 7 days to rule out drug interactions. Significant differences were found for free genistein (non-conjugated+protein bound) for Tmax (1.8hr), Cmax(0.05μM), T1/2(2.3hr) and AUC (53.8ng.hr/ml) compared to total genistein (free+conjugated); Tmax(2.2hr), Cmax(3μM), T1/2(10.4hr) and AUC(10424ng.hr/ml). Another PK study (n=30) compared Fosteum to the formulation used by Marini et al (2007, 2008) and to Citracal®plus Bone Density Builder all given at 54mg of genistein per day for 8 days. Fosteum and Marini formulations were equivalent for genistein in Tmax (2hrs), Cmax (0.7μM), T1/2(18–21hrs) and AUC (9221–9818ng.hr/ml). The synthetically-derived genistein in the Citracal product had a Tmax of 6hrs, Cmax 0.57μM, T1/2 8.3hrs and AUC 6474ng.hr/ml suggesting delayed absorption and a lower maximum plasma level with significantly reduced total exposure to genistein. Reasons for the different PK profiles are unclear but may be due to each formula composition.

Liver Disease

16. **Both Dietary Soy Proteins and Isoflavones are Highly Efficient in Prevention of the Formation of Hepatic Lipid Droplets in Rats.** C.W. Xiao[1,2], C.M. Wood[1], K. Cockell[1], and R. Mueller[3], [1]Nutrition Research Division, Bureau of Nutritional Sciences, Food Directorate, Health Canada, Ottawa, Ontario, Canada, [2]University of Ottawa, Ottawa, Ontario, Canada, [3]Scientific Services Division, Bureau of Chemical Safety, Food Directorate, Health Canada, Ottawa, Ontario, Canada.

This study aimed to examine the effect of feeding isoflavones (ISF) or increasing amounts of soy protein on blood lipids and formation of hepatic lipid droplets in rats. Weanling Sprague-Dawley rats were fed diets containing either 20% casein with (CAS+ISF) or without (CAS) supplemental ISF (50 mg/kg diet) or 15% CAS+5% alcohol-washed soy protein isolate (SPI), or 10% CAS+10% SPI or 20% SPI for 90 d. Levels of serum lipids including free, total, HDL, LDL cholesterol and triglyceride were unchanged among dietary groups in females. The size and number of hepatic lipid droplets measured from the Hematoxylin and Eosin stained sections of the female rats fed CAS diet were remarkably larger than those of the male rats fed the same diet, and were reduced by about 90% in the rats supplemented with ISF (CAS+ISF). Visible fat droplets in the livers of the female rats fed all SPI-containing diets and male rats fed diets containing 10% and 20% SPI completely disappeared. Overall, this study has shown that dietary soy proteins or ISF can effectively suppress the formation of hepatic fat droplets at very low levels, which suggests that ingestion of soy foods or supplements might be a useful strategy for prevention or treatment of fatty liver diseases.

Acknowledgements: Research supported by Health Canada.

Miscellaneous

17. **Study of Knowledge and Perception of Soy and Health Among Healthcare Professionals.** P.M. Chan[1] and B.Y. Yeong[2], [1]The Nutrition place, 13 Mohamed Sultan Road # 01-01, Singapore 238962, [2]American Soybean Association International Marketing, 541 Orchard Road # 11-03 Liat Towers Singapore 238881.

In recent years, there has been much scientific research that shows the positive health benefits of soy, but there are also reports on negative health impacts of soy consumption that cause confusion even among health professionals.

A self-completed quantitative survey was conducted among 227 pre-recruited health professionals in Singapore, Indonesia, and Thailand to assess their knowledge and perception of soy and health and to identify appropriate channels to disseminate evidence-based soy and health information.

Ninety percent of respondents felt that soy foods are healthy and nutritious. Nutritionists and dietitians rated the most positively about how healthy soy products are. The nutrients in soy that were mentioned most frequently were protein, calcium, dietary fibre, B vitamins and phosphorus. The study also revealed that most felt that soy was good for patients with high cholesterol, heart disease and osteoporosis. However, soy was seen to be associated consistently as a common food allergen. Consumption of soy was also seen to be adversely related to gout.

Singapore respondents were getting most of their information from more formal channels, whereas Indonesia and Thailand respondents preferred less formal sources.

It is recommended that more efforts to inform and clarify these misconceptions would be beneficial for health professionals.

Soy Formula

18. **Clinical Evaluation of Ready-to-feed Soy based Formula.** C.W. Chung[1], T.S. Hyun[2], H.S. Han[2], K.Y. Kim[2], and R.W. Choue[3], [1]Central Research Institute, Dr. Chung's Foods Co., CheongJu, ChoongBuk, Korea, [2]ChoongBuk National University, CheongJu, ChoongBuk, Korea, [3]Institute of Clinical Research, KyungHee University, Seoul, Korea.

Comprehensive efficacy of ready-to-feed soy based formula (RSF) was investigated. Developmental characteristics among three feeding groups—human milk (HF), cow milk-based formula (MF) and RSF—were observed for three years. Comparison of RSF with partially hydrolyzed cow milk-based formula (H-MF) was also studied for the efficiency against atopic symptoms. Anthropometric results and crucial mineral contents in serum were compared for fifty one healthy full-term babies, and also with stool microorganisms. Status changes were compared between RSF and H-MF against 5 to 10 month-infants diagnosed as atopic dermatitis. Serum calcium concentration among three groups after 12 and 36 months were similar. Lactobacillus in RSF and HF were similar at 108cfu/g until 6 months larger than MF at 106cfu/g. However, MF started to increase rapidly after 6 months until it reached to the level of HF. RSF showed the highest level of Bifidobacterium since 6 months until 18 months. The severity scores of atopic dermatitis (SCORAD) ameliorated significantly in both RSF and H-MF after feeding for 12 weeks. There was no significant difference in the concentration of total Ig-E in both groups. In conclusion, long term feedings of RSF and MF resulted in no difference in the growth, development, bone density and the contents of serum minerals. Concentration of Bifidobacterium in RSF was higher than HF during 6 months to 18 months.

19. **Gastrointestinal (GI) Tolerance and Hydration Status of Newborn Infants Fed Soy-based Infant Formulas with Supplemental Fructooligosaccharides (FOS).** J. Lasekan, S. Acosta, D. Albrecht, and G. Baggs, Abbott Nutrition, Abbott Laboratories, Columbus, OH, USA.

GI benefits of oligosaccharides have been clinically documented for human milk and milk-based formulas in infants, but not for soy-based formulas. Thus, GI tolerance and safety of 2 experimental soy formulas with supplemental FOS were assessed at 14 and 35 d of age in 0-8 d old healthy term infants in a randomized, double-blind, parallel prospective trial vs. a commercial soy formula (Isomil Advance with sucrose as 20% of total carbohydrate; CF, n=62 infants) with history of safe use. The 2nd formula (EF1, n=64) was similar to CF but contained supplemental FOS (2.5g/L) and carotenoids (lutein, lycopene, Î²-carotene); and the 3rd formula (EF2, n=62) was similar to EF1 but contained maltodextrin instead of sucrose. Study completion rates were CF=81, EF1=86, and EF2=87%. No differences ($p > 0.05$) were noted in mean rank stool consistency (primary variable), stool frequency, formula intake, spit-up/vomit, growth (weight, length, head circumference), and safety measures (urine specific gravity, hydration status and serious adverse events). Urine specific gravities for the 3 groups were normal (< 1.03). EF1 had higher % yellow stools vs. CF ($p < 0.014$ at age 0-14 d). The study suggested that soy-based infant formulas supplemented with 2.5g FOS/L, and carotenoids, with or without sucrose, are safe and well tolerated by term newborn infants.

Soybean Peptides

20. **Screening of the *in vitro* Bioactivities of Soybean (*Glycine max*) Peptide Fractions Separated by Ultrafiltration.** C. Roblet[1,2], J. Amiot[1,2], J. Jean[1,2], C. Lavigne[2,3], A. Marette[2,3], C. Ramassamy[2,4], C. Moresoli[5], M. Lessard[2,6], and L. Bazinet[1,2], [1]Department of Food Sciences and Nutrition, and Dairy Research Group (STELA), Université Laval, Quebec, Canada, [2]Institute of Nutraceuticals and Functional Foods (INAF) Université Laval, Quebec, Canada, [3]Axe Métabolisme, Santé cardiovasculaire et rénale du Centre de recherche du Centre Hospitalier de l'Université Laval, Quebec, Canada, [4]INRS-Institut Armand-Frappier 531, Laval, Québec, Canada, [5]Biotechnology and Health Engineering Centre, University of Waterloo, Waterloo, Ontario, Canada, [6]Dairy and Swine R & D Centre, Agriculture and Agri-Food Canada, Lennoxville, Québec, Canada.

Many soybean compounds have been identified for their health benefits. Since a few decades, research interests were focused on soy peptides. However, few fractions have already been identified for their anti-viral, anti-neurodegenerative or metabolic activities. In this context, two kinds of UF membranes (10kDa cut-off hollow fiber and spiral-wound membranes) were tested to understand the influence of the membrane configuration on the separation of soy bioactive peptides. After UF separation, the raw hydrolyzate (RH) and the 4 fractions resulting from UF treatments (hollow fiber retentate (HFR), hollow fiber permeate (HFP), spiral-wound retentate (SWR) and spiral-wound permeate (SWP)) were tested for their effects on the destruction of murin norovirus-1 (MNV-1) and of the most common cancer cells (lung A549, colon HCT15, breast BT549 and prostate PC3), for their anti-oxidant and anti-inflammatory activities and for glucose up-take.

In spite of statistical composition differences (amino-acid and molecular mass) between fractions, no effect was observed on cancer cells or as anti-oxidant. However, a cytotoxic effect was measured on RAW 264.7 macrophages, over 10 mg/ml concentration for RH, HFR and SWR. Furthermore, effects on glucose up-take were observed on L6 rat muscle cells, with a dose/effect correlation, indicating a potential anti-diabetic effect of SWR fraction.

Schedule-at-a-Glance

Saturday, October 16

11:00 am–6:30 pm	Registration	Presidential Ballroom Foyer
1:00–4:50 pm	Opening Session	Presidential Ballroom
2:30–3:00 pm	Break	Congressional/Senate Rooms
4:50–5:05 pm	Award Presentations	Presidential Ballroom
5:15–6:30 pm	Welcome Reception	Congressional/Senate Rooms

Sunday, October 17

7:30 am–2:00 pm	Registration	Presidential Ballroom Foyer
7:30–8:30 am	Coffee, Tea, Snack	Congressional/Senate Rooms
8:30 am–12:00 pm	Morning Session	Presidential Ballroom
9:50–10:15 am	Break, Poster Viewing, Sponsors' Showcase	Congressional/Senate Rooms
12:00–2:00 pm	Box Lunch, Poster Viewing, Sponsors' Showcase	Congressional/Senate Rooms

Symposium concludes early to give attendees the afternoon at their leisure.

Monday, October 18

7:00 am–5:30 pm	Registration	Presidential Ballroom Foyer
7:00–8:00 am	Coffee, Tea, Snack	Congressional/Senate Rooms
8:00 am–12:00 pm	Morning Session	Presidential Ballroom
9:35–9:55 am	Break, Sponsors' Showcase, Poster Viewing	Congressional/Senate Rooms
12:00–1:00 pm	Luncheon	Federal Room and South America Room
1:00–5:10 pm	Afternoon Session	Presidential Ballroom
2:45–3:30 pm	Break, Sponsors' Showcase, Poster Viewing	Congressional/Senate Rooms

Tuesday, October 19

7:00 am–12:30 pm	Registration	Presidential Ballroom Foyer
7:00–8:00 am	Coffee, Tea, Snack	Congressional/Senate Rooms
8:00 am–12:00 pm	Morning Session	Presidential Ballroom
12:00–12:05 pm	Closing Remarks	Presidential Ballroom
9:55–10:25 am	Break, Sponsors' Showcase, Poster Viewing	Congressional/Senate Rooms

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and

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together with whole soy. But now it's

delicately baked. So it's

moister. And fruitier. You might even say

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