PROGRAM

DNSG 2015

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June 9 to 12, 2015 - Toronto

Dietary patterns and food based approaches in diabetes

Diabetes and Nutrition Study Group (DNSG)
of the European Association for the Study of Diabetes (EASD)

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Invited Speakers

Wednesday, June 10

Jordi Salas-Salvadó, MD, PhD

Human Nutrition Unit, Department of Biochemistry & Biotechnology, Sant Joan University Hospital, Faculty of Medicine of Reus, Rovira i Virgili University, Spain; Pere Virgili Institute of Health Research; CIBER Physiopathology of Obesity and Nutrition, Institute of Health Carlos III, Spain. Dr Salas Salvadó is Professor of Human Nutrition and Bromatology at the Faculty of Medicine and Health Sciences (Rovira i Virgili University). He is Head of Nutrition of the Internal Medicine Service, Sant Joan University Hospital of Reus and Vice-Dean / Head of Studies of the Degree in Human Nutrition and Dietetics of the Rovira i Virgili University. He is also Distinguished Professor at the Universitat Rovira i Virgili. In recent years, the expertise and research lines of Dr Salas are focused on human clinical trials evaluating the effect of diets and dietary compounds on obesity, type 2 diabetes mellitus, metabolic syndrome and cardiovascular disease. Since 2005, he has been one of the leaders of PREDIMED STUDY, considered the best clinical trial evaluating the effect of the Mediterranean Diet on cardiovascular diseases. He is the coordinator and a member of the Steering Committee of the PREDIMED-PLUS STUDY, a multi-centre, randomised, primary prevention trial on 6000 overweight or obese participants (55-75 years) with metabolic syndrome. The project aim is to determine the effect on adiposity, cardiovascular disease and mortality and quality of life, of an intensive weight loss intervention based on a traditional hypocaloric Mediterranean Diet, physical activity promotion and behavioural therapy compared to a less intensive program using Mediterranean diet (without energy restriction or physical activity). The recruitment started in September 2013 and will finish in June 2016. Final results will be available in 2020. Since 1983 Dr. Salas has directed 18 research projects financed by public bodies and 23 projects in conjunction with the pharmaceutical or food industries. He has published more than 290 original articles in national and international journals, as well as numerous reviews and editorials. Editor of 6 books, he has also co-authored more than 50 books.

The Mediterranean diet in diabetes

Jordi Salas Salvadó[a] for the PREDIMED – Plus study investigators
[a]Human Nutrition Unit, Hospital Universitari de Sant Joan de Reus, Faculty of Medicine and Health Sciences, IISPV (Institut d'Investigació Sanitària Pere Virgili), Department of Biochemistry and Biotechnology, Universitat Rovira i Virgili, Reus, Spain, and b CIBERobn (Centro de Investigación Biomédica en Red Fisiopatología de la Obesidad y Nutrición), Institute of Health Carlos III, Madrid, Spain.

There are no large randomized clinical trials in overweight subjects evaluating the effect of a long-term sustained intentional weight loss using a healthy diet and physical activity promotion on the risk of cardiovascular clinical events. The PREDIMED Plus study is a randomized, multicenter, parallel-group trial for the primary prevention of cardiovascular disease (CVD). Six thousand men and woman without prior CVD, aged between 55 – 75 years, with metabolic syndrome and body mass index between 27- 40 kg/m^2 (<25% of them with diabetes) will be recruited by primary care medical doctors affiliated to 22 centers throughout Spain to evaluate the effect of an intensive energy-restricted Mediterranean diet, physical activity promotion and behavioral treatment, versus a control group receiving low-intensity recommendations to follow a Mediterranean diet. The mail outcomes are: incidence of CVD, weight loss and maintenance, quality of life, incidence of other chronic diseases related to obesity, changes in CVD risk factors, and use of medication. The results of this novel clinical trial will contribute to provide a strong evidence to develop guidelines for overweight management aimed to the primary prevention of CVD.

Learning objectives:

1. Cross-sectional and prospective studies showed negative associations between some traditional Mediterranean foods or adherence to the Mediterranean diet and diabetes incidence.
2. The PREDIMED trial provided strong evidence that a vegetable-based MeDiet rich in unsaturated fat and polyphenols can be a sustainable and ideal model for diabetes prevention.
3. Randomized trials showed beneficial effects of the Mediterranean diet compared to other dietary patterns on glycemic control in patients with diabetes.

Ulf Risérus, PhD

After postdoctoral training at Oxford Centre of Diabetes, Endocrinology and Metabolism, Oxford University, Risérus´ was in 2009 appointed associate professor in clinical nutrition and metabolism at the Medical Faculty, Uppsala University, Sweden. He is leading a research group targeting dietary prevention of obesity and its related diseases. Specific expertise concerns the role of dietary fats and Nordic dietary patterns in cardiometabolic diseases. Risérus is since 2012 the president of the Diabetes and Nutrition Study Group of the European Association for the Study of Diabetes (EASD), a pan European study group that develops evidence-based nutritional guidelines for the treatment of type 2 diabetes.

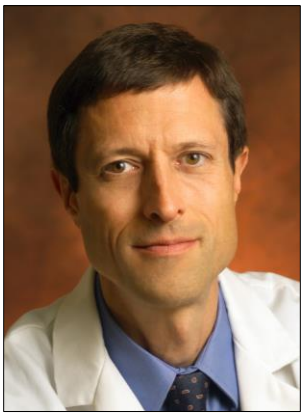
The Nordic diet in diabetes

Dr Ulf Risérus, Clinical Nutrition and Metabolism, Department of Public Health and Caring Sciences, Uppsala University, Sweden

A Healthy Nordic diet consists of a combination of healthy foods occurring in recommended dietary patterns (e.g. Mediterranean diet and DASH-diet), and is mainly a plant-based fibre-rich diet that also includes fish. The Healthy Nordic diet is low in saturated fat, trans fat and red meats with the majority of fat coming from rapeseed oil, sunflower oil, seeds and nuts (e.g. hazelnuts, almonds) and fatty fish. Carbohydrate sources include wholegrain rye, barley and oats, but less from wheat. Fruits (e.g. apples and pears) and berries, as well as legumes, vegetables, root vegetables and cabbages are also key foods. Although no data exist in patients with diabetes, limited available data suggest promising results with regard to prevention of prediabetes, cardiometabolic disorders and reduction of mortality risk. Ongoing and future studies are needed to gain knowledge regarding the role of healthy Nordic foods in type 2 diabetes.

Learning objectives:

1. To know what a Healthy Nordic diet is
2. What is the scientific data on the effects on such diet on prediabetic states (e.g. metabolic syndrome and hyperlipidemia) and on diabetes and CVD risk factors
3. What is the association with CVD and mortality in observational studies
4. What are the key knowledge gaps in this field



Neal Barnard, M.D.

Neal Barnard is an Adjunct Associate Professor of Medicine at the George Washington University School of Medicine in Washington, DC, and President of the Physicians Committee for Responsible Medicine.

Dr. Barnard has led numerous research studies investigating the effects of diet on diabetes, body weight, and chronic pain, including a groundbreaking study of dietary interventions in type 2 diabetes, funded by the National Institutes of Health. Dr. Barnard has authored more than 70 scientific publications as well as 17 books.

As president of the Physicians Committee, Dr. Barnard leads programs advocating for preventive medicine, good nutrition, and higher ethical standards in research. He has hosted three PBS television programs on nutrition and health and is frequently called on by news programs to discuss issues related to nutrition and research.

Originally from Fargo, North Dakota, Dr. Barnard received his M.D. degree at the George Washington University School of Medicine and completed his residency at the same institution. He practiced at St. Vincent's Hospital in New York before returning to Washington to found the Physicians Committee.

Vegetarian diets in diabetes

Type 2 diabetes has become a major epidemic, often leading to serious complications and major costs. Although medications remain a mainstay of treatment, nutritional interventions have shown surprising power in both the prevention and management of type 2 diabetes.

Particular attention has been paid to plant-based diets. As a group, individuals following such diets have a lower diabetes prevalence, compared to others. They also tend to have lower plasma cholesterol levels and are less likely to be overweight.

In clinical trials, plant-based diets have led to dramatic improvements in blood glucose control, plasma lipids, blood pressure, and body weight. The beneficial effect of the diet on glycemic control appears be mediated by (1) weight loss and (2) a reduction in intramyocellular lipid—the intracellular fat that leads to insulin resistance. This presentation will describe the rationale for these trials, their results, and how clinicians can put their findings to use.

Learning objectives:

1. Participants will understand the rationale for the use of plant-based diets in diabetes management.
2. Participants will understand the effect of diet interventions on blood glucose, lipids, and body weight.
3. Participants will learn how to initiate and monitor therapeutic diets for patients with type 2 diabetes.

Ursula Schwab, PhD

Ursula Schwab, PhD, is an associate professor (nutrition therapy) at the University of Eastern Finland (UEF). She works also as a clinical nutritionist at the Kuopio University Hospital. Her expertise is in planning and conducting randomized controlled dietary interventions regarding e.g. the effects of dietary fat, fish, berries and whole grain products, and the healthy Nordic dietary pattern on lipid and glucose metabolism including nutrigenomics, lipidomics and metabolomics approaches. Her research group is partly funded by the Spearhead funding of UEF. She has been involved in the updating of the Nordic and Finnish Nutrition Recommendations, and several national good practice guidelines.

Dietary patterns rich in healthy oils in diabetes

Ursula Schwab, PhD, Associate Professor (nutrition therapy). School of Medicine, Institute of Public Health and Clinical Nutrition, University of Eastern Finland, Kuopio campus. Institute of Clinical Medicine, Kuopio University Hospital

Quality of dietary fat is of significant importance in the recommended diet for diabetics. Current recommendations both in Europe and Northern America are very consistent regarding the quality of dietary fat, i.e. the proportion of saturated fat is recommended to be below 7-10 % of energy intake. Fish is recommended to be part of the supply of unsaturated fat in the diet, but daily use of highly unsaturated vegetable oils is essential in order to meet the recommendations. In diabetes prevention studies the quality of dietary fat has been one of the key aspects along with weight loss / weight maintenance, quality of carbohydrates / amount of dietary fiber, and physical exercise. Furthermore, there is convincing evidence that the quality of dietary fat is of importance for serum lipid profile. There is also evidence to some degree regarding insulin sensitivity, blood pressure, low grade inflammation and fat accumulation in the liver.

Learning objectives:

1. Recommendations of the quality of dietary fat in diabetes
2. Role of unsaturated fat in prevention of type 2 diabetes
3. Metabolic significance of the quality of dietary fat

Anthony Hanley, PhD

Dr. Hanley received his PhD in epidemiology from the University of Toronto in 2000, and was subsequently a post-doctoral fellow in the Division of Clinical Epidemiology, University of Texas Health Sciences Centre at San Antonio. From 2002-2005 he was a research scientist in the Leadership Sinai Centre for Diabetes at Mount Sinai Hospital. Since 2005 he has been a faculty member of the Department of Nutritional Sciences, University of Toronto, where he is currently an associate professor and holds a Tier II Canada Research Chair in Diabetes Epidemiology.

Dr. Hanley's research interests include the metabolic and nutritional epidemiology of obesity, insulin resistance and type 2 diabetes, with a particular focus on diabetes in Aboriginal Canadian communities and other high-risk populations.

Dietary patterns rich in dairy in diabetes prevention

An increasing body of scientific evidence, including several recent meta-analyses of prospective cohort studies, has documented inverse associations of dairy consumption with risk of type 2 diabetes mellitus (T2DM). Further, specific dietary patterns containing higher amounts of dairy (including DASH) have also been reported to be inversely associated with T2DM. While the precise mechanisms through which dairy intake may reduce T2DM risk are not known, dairy products contain a number of components that may impact one or more of the key underling pathophysiological disorders of T2DM. These components include calcium and vitamin D (which have been positively associated with insulin sensitivity and beta cell function), whey protein (which is thought to improve glycemic control), and individual dairy-associated fatty acids, including 15:0, trans 16:1n-7, and c9,t11 conjugated linoleic acid. These fatty acids may simply represent reliable biomarkers of dairy intake, or alternatively, one or more may have bioactivity relevant to diabetes pathogenesis. This presentation will provide an overview of current research on dairy, its components and risk of T2DM.

Learning objectives:

1. Recent epidemiological literature on the association of dairy products with risk of type 2 diabetes;
2. The nutritional components of dairy products and their impact on the underlying pathophysiological disorders of type 2 diabetes;
3. Emerging literature on fatty acids that are specific to dairy, their potential mechanisms in the context of type 2 diabetes, and their possible utility as biomarkers of dairy intake;

Osama Hamdy, M.D., Ph.D

Dr. Hamdy is the Medical Director of the Obesity Clinical Program, Director of Inpatinet Diabetes Management, clinical investigator and senior endocrinologist at Joslin Diabetes Center in Boston and Assistant Professor of Medicine at Harvard Medical School. Dr. Hamdy completed his fellowship in Endocrinology, Diabetes and Metabolism at University of Missouri and Harvard University.

Dr. Hamdy and colleagues' research led to the first discovery that obese adults who lost 7% of their initial weight had significant improvement in their vascular endothelial function. This improvement may eventually prevent progression of atherosclerosis and coronary artery disease. Dr. Hamdy was a co-investigator of several landmark studies; including the NIH-funded "Diabetes Prevention Program" and "the Look AHEAD Study". Dr. Hamdy founded the "Weight Achievement and Intensive Treatment-Why WAIT?" program at the Joslin Diabetes Center in 2005, which is currently implemented Nationally and Internationally. He is the author of the Haravard Health Publication "The Diabetes Breakthrough", which outlines his experience with long-term diabetes weight management. Dr. Hamdy chaired the task force that developed the Joslin Nutrition Guidelines. He is also member of the Nutrition Committee of the American Association of Clinical Endocrinologist (AACE) that developed many of the current guidelines for nutrition and obesity management. Dr. Hamdy co-chairs the global task force that developed the Transcultural Diabetes Nutrition Alogrithm (tDNA) and is currently leading the effort to improve the quality of diabates care across the globe through implementing an effective transcultural lifestyle intervention.
Dr. Hamdy was nominated by the Harvard Medical School for best mentor award of 2013 and was given the Compassionate Caregiver Award of the Kenneth Scwartz Center and the prestigous Michaela Modan awrd of the American Diabetes Association. Dr. Hamdy has more than 150 peer-reviewed original articles, reviews, chapters, conference abstracts and proceedings. He is on the editorial board of several medical journals including US Eendocrinology, Journal of Nutritional Disorders & Therapy and 2-times section editor of the Current Diabetes Report. He is a member of the editorial review board of many scentific medical journals including JAMA, Diabetes Care, Lancet, Obesity Research and the Expert Opinions.

Meal replacements in diabetes

Diabetes specific meal replacements (DSMR) are currently considered an integral part of the medical nutrition therapy for patients with diabetes. They are known to enhance weight reduction and improve glycemic control. Most DSMR have lower glycemic load (GL) and their carbohydrates content is of low glycemic index (GI). Reduction in both GL and GI reduce glucose area under the curve, A1C, visceral fat, serum triglycerides and increase HDL-cholesterol. Look AHEAD study showed that frequent use of DSMR together with lifestyle intervention induced better weight loss. Other studies showed that their use reduces glucose variability and need for higher insulin doses. DSMR also have higher amount of protein. Recently, it was found that many the amino acids content within the DSMR increase insulin and GLP-1 secretions. These changes explain the benefit of DSMR in patients with diabetes. Addition of DSMR to diabetes diet is recommended for obese patients with poor diabetes control.

Learning objectives:

1. Explain the role of diabetes specific meal replacements as an integral part of medical nutrition therapy
2. Review the role of meal replacements in enhancing weight reduction in patients with type 2 diabetes
3. Demonstrate the role meal replacements in improving glucose control, reducing glucose variability and reducing insulin dose
4. Identify the role of meal replacements in stimulating insulin secretion
5. Explain the effect of meal replacement on GLP-1 production

Prof. Livio Luzi, M.D.

Livio Luzi, M.D., is Professor of Endocrinology at the University of Milan and is the Director of the Center for Research on Metabolism at the IRCCS Policlinico San Donato in Milan. Prof. Luzi was also Adjunct Professor of Surgery at the University of Miami and a Visiting Scientist at the Diabetes Research Institute.

After receiving his medical degrees from the University of Milan, Prof. Luzi completed research fellowships in Endocrinology at Yale University and in Diabetes/Metabolism at the University of Texas Health Science Center. From 1993-1996 he was on the faculty of Brigham and Women's Hospital, Harvard Medical School as an Assistant Professor, before returning to Italy.

Prof. Luzi's work focuses on the study of the physiology and pathophysiology of metabolism in different clinical conditions such as acute and chronic diseases related to the cardiovascular such as, diabetes, obesity, high blood pressure, gout, abnormal homocysteine cycle, insulin resistance, metabolic syndrome, dyslipidemia, rare diseases/genetic metabolism with phenotypic manifestations at cardiovascular level.

High-carbohydrate vs. low-carbohydrate diets in diabetes: effect on metabolic control

Diabetes mellitus is a disease characterized by an alteration of the glucose-insulin system. Life-style interventions (diet and physical activity)are a cornerstone in the management of type 1 and type 2 diabetic patients and are strictly interrelated. High-carb diets carry an higher glucose load, that furnish more ready-to-use energy for physically active patients, but, conversely, induce higher glycemic excursions in sedentary diabetics. Low-carb diets have a lower glycemic index and an higher percent of protein and fats, both relevant for endurance exercise.

Herein we will outline the metabolic effect of high-carb and low-carb diets in diabetic patients both with a sedentary life-style as well as with a physically active life (via aerobic and anaerobic sports), also in relation with specific pharmacological treatment.

General guide-lines on dietary and physical exercise recommendations in diabetes mellitus will be summarized and clinical implications of high- vs low-carb diets will be finally discussed.

Learning objectives*:*

1. Concepts of glycemic index, glycemic load, insulinemic index, insulin sensitivity, insulin secretion;
2. Metabolic effects of aerobic vs anaerobic exercise in type 1 and type 2 diabetes
3. Life-style interventions in diabetes: guidelines and novel strategies

Ying Bao, ScD, MD

Dr. Bao is Associate Epidemiologist at Brigham and Women's Hospital and Instructor in Harvard Medical School. She has conducted extensive research in determining the role of insulin resistance and dysregulated energy metabolism in the pathogenesis of gastrointestinal cancer and other chronic diseases, through a comprehensive and integrative application of nutrition, biomarkers, genetics, and metabolomics.

Dr. Bao has also led large studies exploring the health benefits of nuts on chronic diseases, including a landmark study demonstrating that regular nut consumption is associated with reduced overall mortality as well as mortality due to cardiovascular disease, cancer, and other chronic diseases. In the past decade, Dr. Bao has led or contributed generously to important national and international collaborative endeavors, and has contributed high quality first- and senior-authored publications in such journals as *The New England Journal of Medicine*, *Journal of the National Cancer Institute*, and *American Journal of Clinical Nutrition*.

Tree nuts and cardiovascular mortality

Accumulating evidence indicates that nut consumption may have various health benefits. In a recent large cohort study, we found that people who ate nuts on a daily basis lived longer than those who did not. The greatest benefit was seen for cardiovascular mortality. People who ate nuts five or more times a week had a 29% reduction in deaths from heart disease. These findings are consistent with a wealth of observational and clinical trial data to support health benefits of nuts on cardiovascular disease. Possible mechanisms include antiatherogenic, antiinflammatory, and antioxidant properties of nutrients in nuts, such as unsaturated fatty acids, tocopherols, and phytochemicals. Indeed, studies show that nut consumption has beneficial effects on intermediate markers of cardiovascular disease, including lowering LDL cholesterol and ameliorating endothelial function. Overall, the existing data strongly suggest that frequent nut consumption protect against cardiovascular disease.

Learning objectives:

1. Evaluate current literature on tree nut consumption and cardiovascular mortality
2. Understand different epidemiologic methods used in this research area
3. Discuss potential biological mechanisms underlying this association

Mònica Bulló, PhD

Mònica Bulló obtained a degree in Biology from the University of Barcelona (UB) and a Ph.D. by the Rovira i Virgili University with the award of Honours Thesis Ph.D. She occupied research positions, first in the Municipal Medical Research Institute (IMIM) in Barcelona, and in the Biomedical Research Center at the Hospital Sant Joan de Reus. Until now she has occupied various teaching and research positions at the University Rovira i Virgili (URV). Since 2005, she has been a Lecturer Professor in the Department of Biochemistry and Biotechnology-URV (Human Nutrition Unit).

Her main lines of research include: 1) Mechanisms involved in pathophysiology of obesity, 2) Expression of adipokines and their relationship to metabolism, obesity and metabolic syndrome, 3) Effect of Mediterranean diet on cardiovascular risk factors, diabetes prevention and bone metabolism, 4) Effect nutrients on body weight, glucose tolerance and lipid metabolism, 5) Effect of nuts on inflammatory and oxidative parameters, 6) Effect of glycemic index and glycemic load on body weight, inflammation and endothelial function, 7) Satiety control through food structures made by novel processing; 8)Effect of pistachio intake on insulin resistance and T2D; 9) Dietary modulation of gut microbiota and its implication on health. Throughout her scientific career as research staff she has participated in the design and conduction of various research projects, being principal investigator on several national and international projects. In 2005 she obtained a scholarship in the program "State of Research outside Catalonia (2004BE 00018) "of the Generalitat de Catalunya which allowed her a stay of 7 months and starting a line of collaborative research in the Neuroendocrine & Obesity Biology Unit (Professor P. Trayhurn - University of Liverpool, UK). Mònica Bulló has published more than 110 original papers in national and international journals with a cumulative impact factor, according to the SCI, greater than 480, with more than 95 publications in the top quartile of their specific area.
Mònica Bulló, PhD [a,b,c]

Tree nuts as part of a Mediterranean diet in diabetes

[a]*Human Nutrition Unit, Department of Biochemistry and Biotechnology, Faculty of Medicine and Health Sciences, Universitat Rovira i Virgili, Spain,* [b]*IISPV (Institut d'Investigació Sanitària Pere Virgili) Universitat Rovira i Virgili, Spain,* [c]*CIBERobn (Centro de Investigación Biomédica en Red Fisiopatología de la Obesidad y Nutrición), Institute of Health Carlos III, Spain.*

Background. The role of nuts on lipid profile and cardiovascular disease is well-recognized, however their potential role on glucose and insulin metabolism and the risk of type 2 diabetes (T2D) is less conclusive. **Description**. In the PREDIMED study, we analyzed the effect of a Mediterranean Diet supplemented with nuts in the prevention of T2D. In a randomized crossover clinical trial on pre-diabetic subjects, we analyzed the effect of pistachio intake on glucose and insulin metabolism, both at peripheral and cellular levels. **Outcomes**. A significant lower risk to develop T2D was observed in subjects following a Mediterranean Diet supplemented with nuts compared to a low-fat diet. Additionally, a significant improvement in fasting glucose and insulin circulating levels, and also an amelioration of other biochemical markers related with glucose metabolism and inflammation, was observed after pistachio consumption. **Conclusions**. Nut consumption in a context of a healthy diet, is emerging as a useful nutritional strategy for the prevention of T2D.

Learning objectives:

1. Cross-sectional and prospective studies showed controversial results according to the relation of nuts with insulin resistance or type 2 diabetes
2. The PREDIMED trial provided evidence that nut consumption can be a nutritional strategy for diabetes prevention.
3. The EPIRDEM trial showed beneficial effects of pistachio consumption on insulin and glucose metabolism in pre-diabetic subjects, both at peripheral and cellular levels.

Joan Sabaté, MD, DrPH

Joan Sabaté is Professor of Nutrition and Epidemiology at Loma Linda University's School of Public Health. From Spain, Dr. Sabaté is a board certified physician in internal medicine. In 1989 he obtained the degree of Doctor of Public Health in Nutrition from Loma Linda University and became a faculty in the Department of Nutrition. From 1997 to 2013 he served as Chair of the Department.

Dr. Sabaté was principal investigator in the study that directly linked the consumption of walnuts to significant reductions in blood serum cholesterol. His landmark findings were published in the *New England Journal of Medicine* and received the attention of nearly 400 media sources, both national and international. Bringing the research full circle *Archives of Internal Medicine* has recently published the findings of his pooled analysis of 25 intervention trials establishing the benefits of nut consumption on blood lipid levels and lowering the risk of heart disease. He is currently the co-principal investigator on the Walnuts and Healthy Aging Study (the WAHA Study), a dual-center clinical trial with Hospital Clinco in Barcelona that includes 700 subjects.

Dr. Sabaté is frequently asked to speak at scientific symposia as well as health and nutrition conferences throughout the United States, Europe and Asia. He has been published in many scientific journals both as principal and co-author and is the editor of the book *Vegetarian Nutrition* published in 2001. He also served as chairman for the Sixth International Congress on Vegetarian Nutrition held on the campus of Loma Linda University in February 2013.

Tree nuts in the management of obesity, diabetes, and cardiometabolic risk

A major finding of the Loma Linda University based Adventist Health Study was to link, for the first time, nut consumption to reduced risk of coronary heart disease. Results from ensuing observational studies and randomized intervention trials have confirmed the protective effect of nuts for CHD and beneficial effects on several coronary risk factors. This session will focus on the most current research conducted on nut intake, diabetes and cardiometabolic risk factors. Results from published and unpublished work from the Adventist Health Study-2, a large longitudinal study of 96,500 participants, which have examined this relationships will be reported. In this presentation we also will explore certain underlying mechanisms through which nuts can positively modify these cardiovascular disease risks. Finally, evidence regarding the recommendation of incorporating nuts into the usual diet and the concerns of their unwanted effect on body weight over time will be discussed.

Learning objectives:

1. To review most current research on the relationship between nut intake, diabetes and cardio-metabolic risk factors.
2. To describe mechanisms through which nuts can positively modify cardiovascular risk factors.
3. To summarize the evidence regarding recommendation of incorporating nuts into the usual diet and the concerns of their unwanted effect on body weight over time.

Sheila G. West, PhD

Sheila West is Professor of Biobehavioral Health and Director of the Vascular Health Interventions Laboratory at the Pennsylvania State University. Trained at the University of North Carolina at Chapel Hill and the Ohio State University, she joined the faculty at Penn State in 1999. Dr. West leads an interdisciplinary research team that conducts randomized clinical trials examining effects of nutrition and psychological stress on blood pressure and vascular function. The goal of her research program is to identify foods and nutrients that enhance vascular function and reduce blood pressure responses to stress. Dr. West's work has been published in *Hypertension*, *Current Atherosclerosis Reports*, *Annals of Behavioral Medicine*, *The American Journal of Clinical Nutrition* and other biomedical and psychological journals. Her recent studies have examined the effects of omega-3 fatty acids, pistachios, walnuts, dairy foods, and soy on vascular endothelial function and blood pressure responses to acute stress.

Katherine A. Sauder, PhD

Katherine Sauder earned her doctorate at The Pennsylvania State University in 2014 under the mentorship of Dr. Sheila West. Her graduate research focused on understanding the effects of pistachios on cardiovascular risk factors in adults with type 2 diabetes, and examining the association between overall diet quality and vascular function in older adults. She has experience in both epidemiology and clinical trials, and has used a variety of techniques to assess vascular function including flow-mediated dilation, peripheral arterial tonometry (EndoPAT), and pulse wave velocity. She is currently a post-doctoral fellow at the University of Colorado School of Medicine, where she is extending her work in nutrition and diabetes to dietary prevention of gestational diabetes in pregnancy

Tree nuts and cardiovascular risk factors in diabetes

Cardiovascular disease continues to be the leading cause of death among individuals with type 2 diabetes, and management of vascular health is vital to reducing risk even after blood sugar control is achieved. Relatively few studies have examined the benefits of nut consumption on vascular health in type 2 diabetes, particularly in regard to systemic hemodynamics, endothelial function, and arterial stiffness. This presentation will provide an overview of these vascular measures, including relation to cardiovascular risk and techniques for assessment. We will review recent work demonstrating the effects of nut consumption on vascular function, including a 10-week controlled-feeding study for adults with type 2 diabetes that tested a low-fat diet and a moderate-fat diet containing pistachios. Last, we will highlight current gaps in the literature and discuss opportunities for future research.

Learning objectives:

1. Understand the role of systemic hemodynamics, endothelial function, and arterial stiffness in cardiovascular risk
2. Understand techniques for assessing these vascular health markers
3. Learn how nut consumption may affect vascular health in diabetes

Steven N. Blair, P.E.D.

Steven N. Blair is Professor in the Departments of Exercise Science and Epidemiology and Biostatistics at the Arnold School of Public Health, University of South Carolina. Dr. Blair is a Fellow in the American College of Epidemiology, Society for Behavioral Medicine, American College of Sports Medicine, American Heart Association, and American Kinesiology Academy; and was elected to membership in the American Epidemiological Society.

Dr. Blair is a past-president of the American College of Sports Medicine (ACSM), National Coalition for Promoting Physical Activity, and the American Kinesiology Academy. Dr. Blair is the recipient of three honorary doctoral degrees--Doctor *Honoris Causa* degree from the Free University of Brussels, Belgium; Doctor of Health Science degree from Lander University, U.S.; and Doctor of Science *Honoris Causa*, University of Bristol, UK. He has received awards from many professional associations, including a MERIT Award from the National Institutes of Health, ACSM Honor Award, Population Science Award from the American Heart Association, and is one of the few individuals outside the U.S. Public Health Service to be awarded the Surgeon General's Medallion. He has delivered lectures to medical, scientific, and lay groups in 48 states and 50 countries. His research focuses on the associations between lifestyle and health, with a specific emphasis on exercise, physical fitness, body composition, and chronic disease. He has published over 550 papers and chapters in the scientific literature, and is one of the most highly cited exercise scientists with over 31,000 citations to his body of work. He was the Senior Scientific Editor for the U.S. Surgeon General's Report on Physical Activity and Health.

Cardiorespiratory Fitness and Diabetes: A Review of the Epidemiology

Sedentary habits are highly prevalent around the world, and a WHO report indicates that physical inactivity is the fourth leading risk factor for deaths, following high blood pressure, tobacco use, and high blood glucose. Low cardiorespiratory fitness, which is caused by physical inactivity, is a major predictor of incident type 2 diabetes. This benefit occurs in normal weight, overweight, and obese individuals. Moderate to high cardiorespiratory fitness, which can be developed by 150 minutes of moderate intensity physical activity per week, is associated with lower mortality rates in persons with type 2 diabetes. This benefit is seen in all weight categories. Obese individuals with diabetes who are at least moderately fit have much lower death rates during follow-up than do normal weight individuals who are unfit. Regular physical activity is a key factor in preventing diabetes, and has major benefits for those who have diabetes.

Learning objectives:

1. Participants will be able to describe the extent of physical inactivity world-wide.
2. Participants will understand the role of physical inactivity and low cardiorespiratory fitness in the prevention of diabetes.
3. Participants will understand the value of maintaining cardiorespiratory fitness in individuals with diabetes.

Tim Church, M.D., M.P.H., Ph.D.
Tim Church is one of the country's leading physicians in exercise and obesity research. As Chief Medical Officer of ACAP Health Consulting, Dr. Church seeks to reduce the production of and destruction from disease by guiding the company in the creation of clinical strategies and disease specific battle plans. He brings to ACAP Health, dynamic expertise in preventative health, nutrition and the power of physical activity.

After receiving a Bachelor of Science in Animal Physiology from UC-Davis, Church received his Medical Doctorate and Ph.D. from Tulane University School of Medicine in new Orleans, LA. During his preventive medicine residency training, he also obtained a master's degree in Public Health.

Church is a professor and director of the Preventive Medicine Research Laboratory at Pennington Biomedical Research Center at Louisiana State University where he promotes healthy living through research and education in nutrition and exercise biology. As the former vice president of medical and laboratory research at The Cooper Institute in Dallas, he established himself as an international leader in some of the most comprehensive studies on human performance and disease prevention.

Church has received numerous awards for his research in preventative health and is frequently used as an expert source for preventative health stories with major national media outlets. As a consultant to the U.S. Department of Health and Human Services' Physical Activity Guidelines Advisory Committee, Church contributed to their national report published in 2008. He has also authored more than 150 research articles and co-authored, "Move Yourself, The Cooper Clinic Medical Director's Guide to All Healing Benefits of Exercise (Even at Little!)".

Learning objective:

1. Among patients with type 2 diabetes mellitus, a combination of aerobic and resistance training compared with non-exercise control improves HbA1c levels.

Carl (Chip) Lavie, Jr., M.D., FACC, FACP, FCCP

Dr. Lavie graduated from Louisiana State University Medical School in 1983 and completed internal medicine residency at Ochsner and fellowship in cardiovascular diseases at Mayo, where he joined the faculty in 1989. Dr. Lavie is Professor of Medicine and Medical Director, Cardiac Rehabilitation and Preventive Cardiology; Director, Exercise Testing Laboratory; and Staff Cardiologist, Echocardiographic Laboratory at the John Ochsner Heart and Vascular Institute in New Orleans, Ochsner Clinical School-The University of Queensland School of Medicine and he previously served for 10 years as Associate Director of the Internal Medicine Training program. He served as a Consultant in the Department of Preventive Medicine at the Pennington Biomedical Research Center in Baton Rouge, Louisiana from January 2012-October 2014.

Dr. Lavie's research interests include cardiac rehabilitation and prevention, lipids, hypertension, obesity, and exercise, as well as noninvasive testing, encompassing echocardiography, exercise testing, and nuclear cardiology. He is the author of over 800 medical publications including two cardiology textbooks, and 40 book chapters. Dr. Lavie serves as a frequent lecturer, reviewer for several medical journals, and is Associate Editor and Cardiovascular Section Editor of the Mayo Clinic Proceedings and is Editor in Chief of Progress in Cardiovascular Diseases and serves on the Editorial Boards of the Journal of the American College of Cardiology, American Journal of Cardiology, Journal of Cardiopulmonary Rehabilitation Prevention, and over 20 other Journals. From 2011 till now, he has served as Chairman of the Document Oversights Committee for AACVPR. For the years 2003 and 2004 he served as Chairman of Vascular, Hypertension and Prevention for the American College of Cardiology and he has been an elite reviewer for JACC for 7 of the last 8 years, also receiving the Simon Dack Award as a life-time, hall of fame, reviewer. In 2013, he gave Key-Note lectures for both the American College of Sports Medicine and the Cardiac Rehabilitation one for the AACVPR, where he received the 2013 Research Award. From a personal stand-point, he is an avid sports fan and competitive runner, with personal records in the 5K, 10K, Half-Marathon and Marathon of 18:30,38:30,1:24:30, and 3:10, respectively. He is the author of "The Obesity Paradox",released April,2014.

Fitness is More Important than Fatness in Diabetes

Type 2 diabetes mellitus (T2DM) has reached epidemic proportions worldwide and is associated with increased risk for cardiovascular diseases (CVD) and premature mortality. Nonpharmacologic therapy with diet and physical activity (PA) has been shown to prevent progression to T2DM in patients at high risk. Regular PA substantially reduces the risk of T2DM and a high level of PA associated with substantial reduction in T2DM risk. In addition, there is strong evidence suggesting a steep inverse relationship between both PA and cardiorespiratory fitness (CRF) and mortality in patients with T2DM. Of particular concern is the dramatic steep increase in mortality among patients with low CRF. An important point is that obese individuals who are at least moderately fit have a lower mortality than those who are normal weight but unfit. Importantly, substantial data suggests that CRF is more important than weight in patients with T2DM. A primary goal of public health strategies is to promote PA and to move patients out of the least fit, high-risk cohort by increasing PA among the least active. Increasing PA is important throughout the entire healthcare system, particularly in patients with T2DM.

Learning objectives:

1. Review the importance of physical activity (PA) and, especially, cardiorespiratory fitness (CRF), in the pathogenesis and prognosis in type 2 diabetes mellitus (T2DM);
2. Review data suggesting that CRF is more important than weight in patients with T2DM;
3. Discuss the importance of promoting PA throughout the healthcare system as a way to improve CRF and reduce cardiovascular risk, which is particularly important in patients with T2DM.

Thursday, June 11

Michael Keenan, PhD

Michael Keenan earned his PhD from the University of Illinois-Urbana in Nutritional Sciences in 1984. He remained at University of Illinois for two years as a post-doc before moving to Louisiana State University in 1986. After ten years of investigation of the interaction between vitamin D and the ultratrace mineral boron, Michael Keenan changed to obesity research. In 2001 Michael Keenan teamed up with Roy Martin who had recently moved to LSU from Georgia and began doing mechanistic, proof-of-concept rodent studies with resistant starch. This partnership has been very fruitful as far as publications and grant funding. Initially their research focused on the mechanism of body fat reduction in rodents with diets with resistant starch using isocaloric control diets. In recent years their focus has moved into the effects of resistant starch on the microbiota.

"Review of Dietary Resistant Starch Mechanisms - Findings from Animal Models"

Roy J Martin[1], Christine Pelkman[2], and Michael J. Keenan[3]
1.Western USDA Research Center, 2. Ingredion Incorporated, 3. Louisiana State University AgCenter

Animal models of diabetes and obesity of different etiologies have been used to demonstrate that dietary resistant starch has powerful effects on multiple mechanisms important in improving “metabolic health.” For example, dietary resistant starch improves maternal glycemic control in Goto-Kakizaki rat, a model of diabetic pregnancy. Resistant starch from high amylose maize (HAM-RS2) reduces body fat and increases gut bacteria in ovariectomized (OVX) rats, an animal model of menopausal weight gain. A Caenorhabditis elegans model of obesity was used to demonstrate that aqueous extract of cecal contents of rats fed resistant starch reduced body lipid staining in worms. Proposed mechanisms include the following: 1. enhanced gut microbial fermentation, 2. increased plasma levels of gut peptides, 3. elevated detoxification pathways, 4. improved bioavailabity of dietary polyphenols. The ability of dietary resistant starch to improve “metabolic health” consistently in different animal models provides strong support for positive outcomes in clinical studies. Two obese models that did not respond to resistant starch with reduced body fat and improved insulin sensitivity were GLP-1 receptor knockout mice and Zucker Diabetic fatty (ZDF) rats. Thus, it appears that functional GLP-1 and leptin receptors are necessary for beneficial health effects of resistant starch. Funding sources: Ingredion Incorporated and Louisiana State University AgCenter.

Learning objectives:

1. Several animal models of obesity and/or diabetes have fermented resistant starch and have had reduced body fat and improved glycemic control.
2. Two animal models of obesity and diabetes have fermented resistant starch and have not responded with reduced body fat (Zucker Diabetic Fatty rats and GLP-1 receptor knockout mice) and improved glycemic control (Zucker Diabetic Fatty rats).
3. Rodent studies demonstrate that functional GLP-1 and leptin receptors are necessary for responding to fermentation of resistant starch.
4. Human studies demonstrate that production of GLP-1 is not required for improved glycemic control when fed resistant starch, thus, other mechanisms exist for the benefits of consumption of resistant starch.

Denise Robertson, PhD, RNutr.

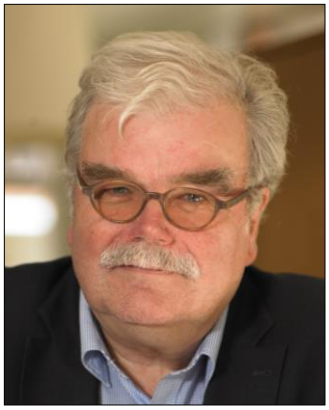
Denise Robertson has a PhD in Clinical Nutrition from the University of Newcastle and is a registered Nutritionist. Her interest has always been in the complex interplay between the gastrointestinal tract and whole-body physiology; nutrition is implicated now as both the “cause” and “treatment” for many conditions such as obesity and type 2 diabetes. After working in Oxford for 7 years she now forms part of the Metabolic Research Team at Surrey University, working entirely in human models of human disease. In addition to nutritional research, she has active links with chronobiology researchers looking at the effects of sleep and clock genes on diabetes risk in addition to the role of gut microbiota in diabetes. She has won awards for her translational work; The Nutrition Society David Cuthbertson Medal (2006), the Association for the Study of Obesity Young Achiever Award (2008) and the University of Surrey researcher of the year (2011).

Clinical evidence – Findings from human trials

Before the positive results from animal models can be fully utilised in terms of a public health strategy to reduce the incidence of obesity and/or type 2 diabetes, robust translational clinical evidence is required. Clinical studies in healthy individuals, those at increased risk of type 2 diabetes (T2D) and finally those with T2D have been undertaken using various doses of RS, and for variable supplementation periods. Accepting the caveat of increased heterogeneity within any human population, several key and important consistencies have been demonstrated with important ramifications for human health. RS intake in humans improves insulin sensitivity using gold-standard methodology, an effect which appears to be tissue specific; beneficial effects are noted on skeletal muscle, adipose tissue and pancreatic function, however there is limited evidence for an effect on hepatic metabolism in humans. Many mechanisms have been proposed following successful pre-clinical work, with evidence suggesting a metabolic link between the gut and periphery, originating from the fermentation of resistant starch by the microbial population.

Learning objectives:

1. To understand the evidence for a clinical benefit of RS intake in humans
2. To appreciate which effects noted in animals have not been translated into human
3. What mechanisms can we provide empirical evidence for?



W.H.M. Saris, MD, PhD.
Wim H.M. Saris MD, PhD, Professor of Human Nutrition at the Faculty of Health, Medicine and Life Science of the Maastricht University, The Netherlands. In 1992 he initiated the Nutrition and Toxicology Research Institute NUTRIM and was the scientific director till 2005. From 2005 till 2014 he was part-time Corporate Scientist Human Nutrition at DSM, Nutritional Ingredients division.

He is author or co-author of 7 books and over 450 scientifically refereed articles dealing with topics like nutrition, obesity, type 2 diabetes, exercise physiology, cancer cachexia, functional foods and nutrigenomics. He coordinated a number of EU funded projects among others CARMEN and DIOGENES and served many national and international committees among others the Dutch Health and Nutrition Council and the Scientific Committee on Food (SCF now EFSA) of the European Commission in Brussels and the European Technology Platform (ETP) initiative “Food for Life” and chairmen of the EU Joint Programming Initiative (JPI) “ Healthy diet for a healthy life”.

Glycemic response/index/load for weight management

Weight gain and in particular weight regain is a common physiological response to increase consumption of palatable food and/or a reduction in physical activity. All macronutrients contribute to the risk of overfeeding. In particular En% fat is a powerful driver for passive overfeeding. For carbohydrate and in particular on the effects of high vs. low Glycemic Index, the number of RCT’s is limited. Prospective studies showed a positive relation of 0.42 kg body weight per 50 units of Glycemic load over a 4-year period. However we should consider this type of data with great caution since food intake data nowadays is very much biased.

The only available Cochrane analysis (Elliott and Bauer 2007) with 4 RCT’s showed a 1.1 kg weight loss in the low GI diet vs. high GI or other diet. The recent Diogenes trial showed a positive weight maintenance effect with a low GI/high protein diet over 6 months. In contrast to the protein effect after one year the GI effect disappeared.

Learning objectives:

1. Fat compare to Carbohydrates has a greater impact on long-term body weight control.
2. Food intake data are more and more an unreliable source of actual intake of macronutrients.
3. Low glycemic vs. high glycemic foods has a moderate positive effect on long-term body weight control

Simin Liu, MD, PhD.

Dr. Liu's work unites molecular genetics, nutrition, physiology and clinical medicine. His research focus include: 1) investigation of genetic, nutritional, and environmental influences and their interactions as potential determinants for health and chronic diseases; 2) critical and systematic assessment of relative mediating effects of these potential determinants for cardiometabolic disorders and their distributions in diverse populations; 3) application of knowledge to improve understanding of health and diseases for individuals and populations. Currently, Dr. Liu is Professor of Epidemiology at Brown School of Public Health and Professor of Medicine at the Alpert School of Medicine, director for both the laboratory of Molecular Epidemiology and Nutrition and Brown Center for Global Cardiometabolic Health. Dr. Liu has served on committees/study sections for the NIH, the CDC, the WHO and FAO of the United Nations addressing policy issues related to public health and nutrition.

Nutritional strategies to modifying glycemic response for diabetes and cardiovascular risk prevention

Few randomized trials have examined the possible beneficial effects of Magnesium during pregnancy, a unique high-risk period of metabolic derangements for both mother and fetus. To determine metabolic and clinical effects of Magnesium supplementation vs. placebo vs. dietary counseling on overweight and obese (OW/OB) pregnant women, 28 OW/OB pregnant women were randomized into one of three groups: a 300 mg magnesium citrate supplement, an identical appearing placebo, or nutritional counseling on how to increase magnesium intake. Hemoglobin A1C levels at the 2nd trimester (adjusting for the baseline value) were statistically significantly different among groups with lowest HgbA1C levels observed in the dietary counseling group (p=0.03). Subjects enrolled in the dietary counseling arm had a statistically significant increased Magnesium intake (p=0.04). Dietary counseling could be a cost effective way to improve blood sugar levels for these women. However, validation for these findings requires a larger scale trial.

Learning objectives:

1. To reduce the burden of this diabetes and cardiovascular disease, prevention programs must target not only the affected individuals but also families, workplaces, schools, and communities.
2. By incorporating GI values of foods into dietary assessment of GL, significant insights can be gained beyond simply investigating the relation of carbohydrates (compared with fats) with diabetes risk prevention.
3. Despite the growing awareness of the deleterious long-term effects of overweight and obesity and the recognition that optimal nutrition is required for proper weight management to prevent increased cardiovascular risk during pregnancy, little data are currently available on the effects of magnesium-rich low glycemic index food.

Thomas MS Wolever, MD, PhD, DM

Thomas Wolever obtained a Bachelor of Medicine and Bachelor of Surgery from Oxford University, UK in 1980, a PhD in Nutritional Sciences from the University of Toronto in 1986 and a Doctorate in Medicine from Oxford University in 1993. His current position is Professor and Graduate Coordinator in the Department of Nutritional Sciences, University of Toronto. He has the following cross appointments: Professor, Department of Medicine, University of Toronto; Scientist, Keenan Research Centre of the Li Ka Shing Knowledge Institute, St. Michael's Hospital, Toronto; Member, Active Medical Staff, Division of Endocrinology and Metabolism, St. Michael's Hospital, Toronto; and Member, Consulting Medical Staff, Centre for Addiction and Mental Health, University of Toronto.

Thomas Wolever's research interests are the effects of dietary carbohydrates on human physiology and metabolism. He is, perhaps, most well-known for work on the glycaemic index which was as first developed by Dr. David Jenkins and Dr. Wolever, along with other collaborators, while he was a medical student. He has written or co-authored over 300 papers in peer-reviewed scientific journals, and also authored a book entitled: *The Glycaemic Index: A Physiological Classification of Dietary Carbohydrate* published in 2006 by CABI (www.cabi.org). In 1997 he founded GI Testing, Inc. to provide confidential GI testing services to industry. To cope with the high demand for GI testing and to enable a wider range of clinical research services to be provided, Glycemic Index Laboratories, Inc. (www.gilabs.com) was formed in 2004; a corporation of which Dr. Wolever is President. More important than anything else, Dr. Wolever is married with 3 children aged 26, 24 and 17 years. He enjoys orienteering, cycling and recorder playing.

Glycemic response/index/load: Methodological issues

Controlling post-prandial blood glucose is recognized as being beneficial for health. However, since glycemic responses can be quantified in numerous ways, it is important for scientific and regulatory purposes to understand the meaning and analytical performance of different methods. I will review the definitions of glycemic response (GR), glycemic index (GI) and glycemic load (GL) and the methods used to determine them. When comparing the GR of foods, the results obtained, and their precision, depends both quantitatively and qualitatively on the methods used. The 2010 ISO method for measuring the GI of foods includes several new features compared to the original (1981) method. The between-laboratory CV of the original GI method is 30% more precise than comparing GR; recent data suggest the ISO method is 25-30% more precise than the original method. The 2010 ISO method for GI is recommended as a marker of carbohydrate quality precise enough for regulatory purposes.

Learning objectives:

1. Be able to define the meaning of GI.
2. Be able to state the difference between GR, GI and GL.
3. Be able to list 2 of the new features of the 2010 ISO method for determining the GI of foods

Alan Barclay, APD, PhD, AN

Alan is an Accredited Practicing Dietitian and Nutritionist and completed a PhD at the University of Sydney in the mid 2000's on the association between glycemic carbohydrate and the risk of developing lifestyle-related diseases. Alan is currently the Chief Scientific Officer at Glycemic Index Foundation (part-time). Alan worked for Diabetes Australia in both a full and part-time capacity, from 1998 - 2014, as Head of research. Alan has worked in clinical dietetics and has maintained a private practice in Sydney since 1995. Alan is an official Media Spokesperson for the Dietitians Association of Australia and has appeared frequently in newspapers, magazines, radio and television news. Alan has published ~30 peer reviewed articles in the scientific literature and is a co-author of the New Glucose Revolution: Diabetes & Pre-diabetes handbook, Low GI Diet Managing Type 2 Diabetes and The Ultimate Guide to Sugars and Sweeteners.

Glycemic index labeling: The Australian Experience

Dr. Alan W. Barclay (PhD), Glycemic Index Foundation, Sydney, Australia.

Healthy low GI foods can be incorporated into diabetes prevention/management plans.
The GI Symbol is a front-of-pack labelling scheme that requires foods to be low GI, and meet nutrient criteria for kilojoules, carbohydrate, saturated fat, sodium, fibre and calcium.

Market research was conducted in 2002 - 2007, and 2012. Participants were 490-1,502 main grocery buyers representative of the Australian adult population. In 2002, 5 foods carried the Symbol and this increased to over 150 by 2012. In 2002, 28% of respondents were aware of the GI. This increased to 86% by 2005, and has remained the same from that point in time onwards. Awareness of the Symbol was 2% at baseline, and increased to 37% by 2012. Most (94%) consumers who were aware of the GI looked for the Symbol when shopping.

In conclusion, the GI Symbol is a simple front-of-pack labelling tool that helps people identify healthy low GI foods when shopping.

Learning objectives:

1. Participants will understand that the GI Symbol is a front-of pack labelling scheme that certifies that a food has had its GI tested according to ISO 26642:2010 and also meets stringent nutrient criteria for kilojoules, carbohydrate, saturated fat, sodium, and in certain foods fibre and calcium in line with international dietary guidelines.
2. Understand that through appropriate public relations activities, the general public can understand that low GI foods are healthier options than high GI equivalents.
3. Recognise that Australian consumers are not unique and that lessons learned in Australia can be translated in to other territories implementing similar programs

Silvia Valtueña Martínez, MD, PhD

Silvia Valtueña Martínez is Senior Scientific Officer at the (human) Nutrition Unit of the European Food Safety Authority (EFSA). The Nutrition Unit deals with the scientific evaluation of health claims made on foods, novel foods, infant formulae/dietetic foods, dietary reference values and upper tolerable intake levels of nutrients, and food allergens for labelling purposes.

After 2.5 years of post-doctoral training at the Harvard Medical School (Boston, MA, USA) and two years of post-doc Marie Curie fellowship at the National Institute of Nutrition in Rome (Italy), she underwent a 5-year training in Internal Medicine at the University of Parma (Italy). She conducted independent research in several branches of human nutrition, including the relationship between diet and the development of chronic diseases, namely obesity, osteoporosis, diabetes and cardiovascular diseases.

Regulation of glycaemic response/index/load: EFSA's perspective

EFSA's role in food safety and nutrition is limited to risk assessment and communication, whereas risk management activities are in the remit of the European Commission and EU Member States. In this context, EFSA has considered the role of GI/GL in two main areas of scientific assessment: the setting of dietary reference values (DRVs) for carbohydrates for the EU population and the evaluation of health claims made on foods. For the first task, EFSA concluded in 2010 that the relationship between dietary GI/GL and the prevention of diet-related diseases was inconsistent. "Low GI/GL claims" are considered nutrition claims not authorized for use in the EU (risk management decision), whereas some function claims on the reduction of post-prandial blood glucose responses have been positively evaluated by EFSA. The scientific background, conditions of use and authorisation status of such claims varies widely.

Learning objectives:

1. To understand the legal framework of EFSA's scientific advice in the area of GI/GL.
2. To understand the basis for positive scientific evaluations of health claims on the reduction of post-prandial blood glucose responses.
3. To understand the gap between scientific assessment and authorisation of health claims on post-prandial blood glucose responses.

Alfred Aziz, PhD

Alfred Aziz is the *Chief, Nutrition Regulations and Standards Division, Bureau of Nutritional Sciences, Food Directorate, Health Canada.*

Dr. Aziz holds a bachelor and master degree in Nutrition from the American University of Beirut, Lebanon, and PhD in Nutritional Sciences from the University of Toronto. In 2005, he received the Health Canada's Office of the Chief Scientist postdoctoral fellowship award and two years later, was appointed as a research scientist in Health Canada's Bureau of Nutritional Sciences. His graduate, post-graduate and independent research programs included food intake regulation, as well as lipid and carbohydrate metabolism. Concurrently, Dr. Aziz became involved in several policy files, such as health claims and the development of a framework to curb childhood obesity. Between 2012 and 2015, he was a participant of the Health Canada Science Management Development Program, and occupied several leadership positions and worked on different files, including paediatric initiatives; medical marihuana regulations; risk assessment and risk management; and recently, nutrition labelling and other food and nutrition regulatory modernization initiatives.

Regulation of glycemic response/index/load claims: Health Canada's perspective

The purpose of this presentation is to provide an overview of the food health claims framework in Canada and Health Canada's perspective on function claims related to the management of postprandial glycemia and glycemic index (GI) claims. The *Food and drugs Acts* prohibits the use of food health claims that are false or misleading. Under this overarching principle, Health Canada uses a risk-based approach to enable health claims through either regulations or policy. With respect to the management of postprandial glycemia, Health Canada consulted on a draft guidance document for the substantiation of function claims related to the reduction of the glycemic response and is currently in the process of completing the review and analysis of the comments received. While some challenges had been identified regarding GI claims, Health Canada is providing support and advice to a Canadian Diabetes Association initiative in exploring options for a GI symbol on foods.

Learning objectives:

1. Provide an overview of the food health claims framework in Canada
2. Provide an overview of Health Canada's perspectives on claims related to the management of postprandial glycemia:
   a) function claims for the reduction of the glycemic response to foods
   b) potential path forward for GI claims

Berna Magnuson, PhD

Berna Magnuson, Ph.D, ATS is an internationally recognized food toxicologist and a Fellow of the Academy of Toxicological Sciences. She holds degrees in food and nutritional sciences and worked in the food industry in quality assurance and product development before undertaking graduate training in food toxicology at Universities of Saskatchewan and Manitoba. Berna worked as a professor for 15 years, at the University of Idaho and University of Maryland, conducting research and teaching food, nutrition and toxicology courses, before returning to Canada. She is currently managing her own consultancy practice and teaches food regulatory courses at the University of Toronto. As a consultant, she provides expertise in food regulations, nutrition and toxicology to food, beverage, and dietary supplement manufacturers and ingredient industries, as well as health professional and consumer associations.

Dr. Magnuson has extensive experience and expertise in low calorie sweetener safety, and serves as an expert advisor and speaker on this topic around the world. She has published numerous peer-reviewed articles, book chapters, and professional articles, is on the editorial board of two journals, and is an active member of various professional associations.

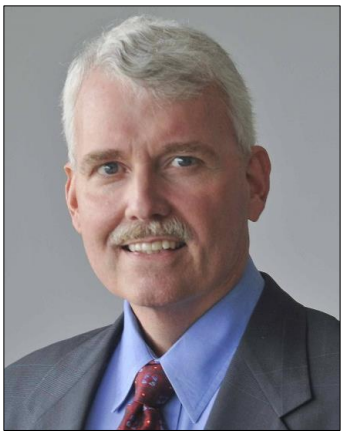
Safety and metabolic effects of low-calorie sweeteners

There is a great deal of misinformation concerning the safety of use of low calorie sweeteners, in the public and among health professionals. As diabetes and obesity continue to be prominent, it is critical that individuals feel confident in the safety of use of these sweeteners that may be beneficial for weight loss and blood sugar control.

The goal of this presentation is to provide an understanding of safety of approved low calorie sweeteners for all members of the population and to provide participants with a better understanding of the source of controversies surrounding low calorie sweeteners. A brief review of the metabolic effects of the different sweeteners will be presented. This will allow participants to be better prepared to assess appropriateness and limitations of study design and conclusions, and to address patient and client concerns.

Learning objectives:

1. Describe the regulatory process for ensuring the safety of low calorie sweeteners approved for use in foods and beverages
2. Understand the differences in the various low calories sweeteners, including differences in metabolism.
3. Recognize the common sources of controversies of safety of low calorie sweeteners.



John C. Peters, PhD

John Peters is Professor of Endocrinology and Metabolism at the University of Colorado, School of Medicine and Chief Strategy Officer of the Anschutz Health and Wellness Center. Dr. Peters is a leading researcher and strategist in nutrition, obesity, diabetes and related diseases.

Prior to joining the Colorado faculty in 2011 he spent 26 years in research and development at the Procter & Gamble Company, where he conducted research, technology and product development programs in areas including nutrition, obesity, diabetes, and metabolism. Dr. Peters has published over 130 scientific articles and book chapters and is co-author of the Step Diet Book. He is co-founder and CEO of the America on the Move Foundation and is past President of the ILSI Center for Health Promotion. He has served on two Institute of Medicine committees on the prevention of childhood obesity.

Low calorie / no calorie sweetener in diabetes

There is uncertainty about the benefit of non-nutritive sweeteners (NNS) in diabetes. Some observational studies have shown a positive association between NNS consumption and increased diabetes risk. There have been no large randomized controlled trials examining NNS in diabetics although there have been studies of NNS effects on weight loss and maintenance in non-diabetics which may provide relevant insight. Meta-analyses of randomized trials in non-diabetics indicate that NNS use leads to modest weight loss and more successful weight maintenance. Recent randomized trials have shown that compared to water, NNS beverage consumption led to greater weight loss. In one trial that reported blood parameters there were no adverse effects of NNS on fasting glucose and subjects reported feeling less hungry during the trial compared to water. NNS may be a useful tool for diabetic individuals trying to lose and maintain weight although more direct clinical evidence is needed.

Learning objectives:

1. To understand the evidence from longitudinal observational cohort studies relating the use of non-nutritive sweeteners (NNS), body weight and diabetes risk.
2. To understand the evidence from randomized controlled trials examining the effects of NNS on body weight and implications for diabetes risk.
3. To understand the potential role for NNS as a tool for prevention and management of diabetes.

Fred Brouns, PhD

Prof Dr. Fred Brouns obtained his PhD at Maastricht University, Netherlands, entitled “Food and Fluid Related Aspects in Highly Trained athletes”, For work this he was awarded the Dutch Sports Medicine Award. Fred headed international Nutrition and Health R&D functions at Wander Dietetics, Sandoz Nutrition, Novartis Nutrition, Eridania Beghin Say, Cerestar and Cargill Inc. At the International Life Sciences Institute (ILSI) Europe he chaired the Carbohydrates Committee and in various expert panels (glycemic index, postprandial glycemia, satiety regulation). Fred became invited member of the British Nutrition Society and is a registered Biomedical Researcher as well as board member (2008-2012) of the Dutch Academy of Nutritional Sciences. Since 2008 he holds a chair in Health Food Innovation at the Faculty of Health, Medicine and Life and Sciences within the research school NUTRIM School of Nutrition and Translational Research in Metabolism of Maastricht University. Fred has > 200 publications, citations according to WoS: sum 5372, average 30.18 /item ; H-index:43

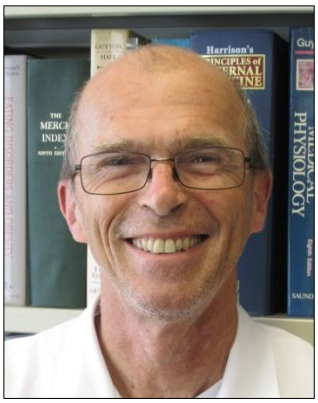
Fruit juice- impact on nutrient quality, obesity and diabetes

Prof Dr Fred Brouns, Chair "Health Food Innovation", Faculty of Health, Medicine and Life Sciences, NUTRIM, Maastricht University, Netherlands

Fruit and vegetable juices provide a wide range of nutrients that fit well in a healthy diet. However, juices also contain relatively high amounts of natural fruit sugars. In recent years, consumers and media alike have therefore questioned the health aspects of juices when consumed in large quantities. It has been suggested that in general juices, like sugar-sweetened soft drinks, contribute to obesity and diabetes through the supply of undesirable high levels of sugar. However, at present, available scientific evidence shows that consumption of 100% fruit juice is associated with a healthier life style and no impact on diabetes in children and adults. In contrast fruit drinks containing also added sugars may be associated with increased disease risks. Similar to other food and drink products, juices should be consumed in moderation to ensure appropriate variety and balance in the diet.

Learning objectives:

1. 100% Juice differs significantly from Sugar Sweetened Beverages (SSB's)
2. In contrast to SSB's 100% juice consumption is NOT related to increased diabetes risks
3. 100% juice contains bioactive fruit components with beneficial effects on diabetes risk factors
4. Fruit sugars as present in fruit or in beverage are equally metabolized
5. The GI of apple and orange does not differ from the GI of their juice.
6. 100 % juice should be consumed in small quantities (equivalent to 1-2 fruits)



Luc Tappy, MD

Luc Tappy was born in Lausanne in 1957. He graduated from medical school and obtained his MD degree at Lausanne University in 1981. He was then trained in the Department of internal medicine, Centre Hospitalier Universitaire Vaudois, and in the Diabetes section, Temple University Hospital, Philadelphia, PA.

Since 1988, he has been a senior researcher at the Institute of Physiology, Lausanne University School of Medicine. His studies focused on nutrition, physical exercise and metabolism in healthy individuals and in various clinical conditions, such as diabetes, obesity, organ transplant patients and critically ill patients. In 2002, he was appointed full professor of physiology at the Department of Physiology of the University of Lausanne, and associate physician at the Division of Endocrinology and Metabolism of the CHUV. He has also been invited professor at the Centre Hospitalier Sart Tilman in Liège, Belgium (1998-2001), and in the Department of Nutrition,at the University of California at Berkeley (1995).

His present research is essentially focused on the environmental factors involved in the present epidemics of obesity and type2 diabetes. Several studies are thus conducted to evaluate the role of dietary sugars (more specifically fructose in carbonated beverages) in the development of obesity and insulin resistance. Several other studies are aimed at assessing and evaluating the role of sport and physical activity in the prevention of metabolic disorders.

Fructose in diabetes: friend or foe?

Fructose is a natural sugar with high sweetening power, which can be metabolized in liver cells without requiring insulin, and which does not increase glycemia to any great extent. It was initially proposed as a sweetener of choice in type 2 diabetes mellitus in the 1980', but this recommendation was rapidly withdrawn due to potential insulin resistance and dyslipidemia.

Insulin resistance plays an important role in the development of cardiovascular and metabolic diseases associated with obesity. More than total body fat, ectopic fat depots in the omentum, liver, muscle, and skeletal/muscle/epicardium are closely associated with insulin resistance and/or cardiac dysfunction. Omental fat volume and intrahepatic fat concentrations are closely interrelated, and constitute the most powerful predictors of insulin resistance.

Whether specific nutrients, such as saturated fat, trans-fat, and sugars are involved in the development of ectopic fat depots independently of excess energy intake remains an important, unsolved question. In healthy humans, intrahepatic fat concentrations increase to a similar extent with excess fat, fructose or glucose, while increasing dietary protein intake partially prevents this effect. Intrahepatic fat concentrations observed in healthy subjects after overfeeding remain largely lower that those observed in obese, insulin resistant subjects with non-alcoholic fatty liver disease. In obese subjects, deposition of ectopic fat in the liver is mainly related to plasma non-esterfied fatty acid concentration. Recent observations further indicate that, in subjects consuming large amounts of sugar-sweetened beverages, intrahepatic fat concentration is related to body fat and omental fat masses, but not to sugar intake. These observations suggest that dysregulation of adipose lipolysis, more than fructose intake, may be a major pathogenic factor in the development of ectopic fat depots and insulin resistance.

Learning objectives:

1. Identify the key steps for metabolism of fructose in humans
2. Understand that fructosae is initially metabolized without insulin and whithout increasing glycemia
3. get acquainted by the characteristics of type-2 diabetes: insulin resistance, ectopic fat deport
4. get acquainted with tracer methodology for measurement of whole body metabolism
5. critically assess the effects of fructose on ectopic lipid deposition and on diabetes control

Jennie Brand-Miller, PhD

Prof. Brand-Miller has a BSc (Food Science and Technology), PhD, AM, Fellow of Nutrition Society of Australia, Fellow of Australian Institute of Food Science and Technology, Personal Chair in Human Nutrition in the School of Molecular Bioscience and Charles Perkins Centre at the University of Sydney.

Brand-Miller is an academic and researcher with 30 years' experience in a variety of research techniques including dietary intervention studies in pregnancy and animal models, observational cohorts, randomised controlled trials, systematic reviews and meta-analysis. Her research has focused on all aspects of carbohydrates—diet and diabetes, diet and pregnancy, insulin resistance, lactose intolerance and oligosaccharides in infant nutrition, with more than 250 scientific publications. She currently leads the Australian arm of the world's largest diabetes prevention study (the PREVIEW study) with responsibility for its dissemination and exploitation. She plays a major role health promotion in Australia as President of the Glycemic Index Symbol Program (www.gisymbol.com). Her popular books have translated research to practice and made the GI a household word, with over 3.5 million copies sold worldwide in 12 languages. She Chairs the University of Sydney's Disability Action Plan Committee, the Shepherd Centre's Research Advisory Committee, and is a past-President of the Nutrition Society of Australia and immediate-past Chair of the National Committee for Nutrition of the Australian Academy of Science.

GI as a marker of carbohydrate quality

Changes in the quality and quantity of carbohydrate foods may compromise nutrient intake. We hypothesized that glycemic index (GI), glycemic load (GL), carbohydrate intake, grains and cereal products would be associated with nutrient adequacy in pregnancy. Healthy women (n = 566), and women with gestational diabetes (n = 82) completed three-day food records in the third trimester. Nutrient intakes were compared to the national recommendations, and energy-adjusted tertiles of GI, GL, were correlated against nutrient intake. After adjustment for age, ethnicity, pre-pregnancy BMI, and intervention group, energy intake in healthy women was positively related to intake of all micronutrients. GI, GL and starch intake were *inversely* related to micronutrient intake, while higher total sugars predicted improved intake. The majority of women with GDM did not meet recommendations for fiber, folate, sodium, vitamin D, iodine and iron, and exceeded guidelines for saturated fat and sodium. High dietary glycemic load and grain intake predict greater risk of poor nutrition in pregnancy.

Learning objectives:

1. To understand relationship between average GI and glycemic load of whole diets and intake of micronutrients
2. To understand relationship between total sugars & starch content and intake of micronutrients

Jim Mann,CNZM, PhD, DM, FRACP, FFPHM, FRSNZ

Professor in Human Nutrition and Medicine, University of Otago, Dunedin, New Zealand . Jim Mann has been Professor in Human Nutrition and Medicine at the University of Otago and Consultant Physician (Endocrinology) in Dunedin Hospital for the past 28 years. Previously he was a University lecturer at Oxford and a Physician in the Radcliffe Infirmary and John Radcliffe Hospital. He is Director of the World Health Organisation (WHO) Collaborating Centre for Human Nutrition, the Edgar Diabetes and Obesity Research Centre at the University of Otago and principal investigator for the Riddet Institute, a national Centre of Research Excellence at Massey University. His research has been in the fields of lipids and carbohydrates as they relate to diabetes, coronary heart disease and obesity. He has been involved with national and international government and nongovernmental organisations in guideline development relating to diabetes, cardiovascular disease, cancer and nutrition. He has been author and coauthor of over 300 publications in peer-reviewed journals, written and edited textbooks and popular books. In 2004 he received the Sir Charles Hercus Medal of the Royal Society of New Zealand. He was appointed a Companion of the New Zealand Order of Merit for services to Medicine in 2003 and in 2012 the first recipient of the *Himsworth Award* given by the European Association for the Study of Diabetes (EASD/DNSG) for his contribution to nutrition research in diabetes.

Andrew Reynolds

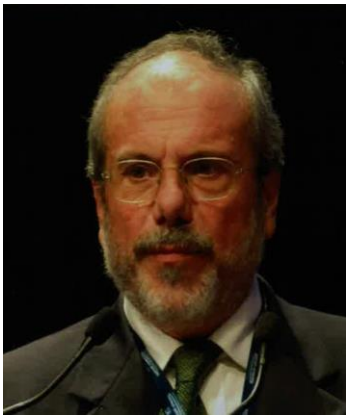
Andrew is a PhD candidate undertaking research on glycaemic regulation in T2 diabetes under the guidance of Professor Jim Mann at the University of Otago. The structural integrity of dietary fiber and resultant physiological effects form part of his research. Andrew views a future role in informing evidence-based policy for non-communicable disease prevention and management

Dietary Fibre as a marker of carbohydrate quality

Dietary fibre has been defined by Codex Alimentarius to include both synthetic and extracted carbohydrate polymers as well as polymers naturally occurring in food, with 10 or more monomeric units which are not hydrolysed by endogenous enzymes in the small intestine of humans. Synthetic and extracted fibres must have a physiological effect and benefit to health that has been accepted by competent authorities. A substantial body of epidemiological evidence demonstrates the benefits of fibres naturally occurring in food in terms of several hard clinical endpoints without any untoward effects. These findings combined with the potential of such fibres to favorably influence gastrointestinal function and a wide range of cardiometabolic measurements have led to the widespread acceptance of dietary fibre naturally occurring in food as an acceptable marker of quality in carbohydrate rich foods. While synthetic and extracted fibres may well have health promoting physiological effects, they are typically added to manufactured foods which may be inappropriately energy dense and or nutrient poor in terms of essential micronutrients. Furthermore, there is currently insufficient evidence that synthetic and extracted fibres are free of long-term side effects. Therefore we conclude that total dietary fibre as currently defined is not necessarily a marker of carbohydrate quality.

Learning objectives:

1. Understand the complexity of defining dietary fibre.
2. Evidence available for linking different dietary fibres with health outcomes.
3. The relevance of the vehicle of delivery for synthetic and extracted fibres.



Gabriele Riccardi, PhD

Gabriele Riccardi is Full Professor of Endocrinology and Metabolic Diseases at the “Federico II” University in Naples, Italy, where he is Director of the Master Course in Human Nutrition and Head of the Diabetes, Nutrition and Metabolism Unit of the University Hospital. He was President of the Società Italiana di Diabetologia (SID) from 2010 to 2012.

Prof. Riccardi is member of the Joint Committee of the European Society of Cardiology and the European Atherosclerosis Society for the Guidelines on Management of Dyslipidaemias and is International Fellow of the American Heart Association. He is in the scientific committee of the Barilla Center for food and nutrition and of the Nutrition Foundation of Italy; he is member of the International advisory Board of the Antidiabetic Food Center, Lund University, Sweden. Author of over 300 in extenso publications in international scientific journals listed in Pub Med (total impact factor > 600). Gabriele Riccardi has held invited lectures at major national and international conferences and in many universities all over the world.

Whole grains as a marker of carbohydrate quality

Cereal foods are the most relevant source of carbohydrates in the human diet; they give a substantial contribution to the energy intake and play an important role in substrate metabolism. Relationships between cereal food consumption and health outcomes indicate that habitual wholegrain intake is associated with a lower risk of cardiovascular diseases, type 2 diabetes and some types of cancer. Mechanisms underlying these associations are linked to carbohydrate digestibility in the small intestine (lowering the postprandial glucose, insulin and lipid rises) and to fermentation of undigested carbohydrates in the colon. Food features able to influence these mechanisms are not yet completely elucidated; however, the role of the amount of fibre, nutrient composition, food structure, glycaemic index and polyphenol content has been clearly established. Cereal species vary for these features and this explains why their impact on disease risk factors may differ according to the cereal types.

Learning objectives:

1. Evaluation of the evidence on the protective role of habitual wholegrain consumption in relation to cardiovascular disease and diabetes
2. Identification of mechanisms potentially responsible for the health benefits of wholegrain
3. What to recommend to the general population and to people with a high cardiometabolic risk in relation to wholegrain consumption.

Furio Brighenti, DrPH

Furio Brighenti, 58, is Full Professor and Chair of Human Nutrition at the Department of Food Science and currently serves as Vice-Rector for Research of the University of Parma, Italy. He's got a MSc in Food Sciences and a DrPH in Public Health Nutrition at the university of Milan.

Prof. Brighenti was Dean of the University Degree in Gastronomic Sciences of the University of Parma (2009-2012); Vice-president of the Italian Nutrition Society (2000-2003) and, since 2009, the current President of the same society; Member of the Expert Commission "Food and School" of the Italian Ministry of Education and Research (2009-2011); Head of the Area of Human Nutrition at the Department of Public Health, University of Parma (2004-2012) and current Head of the Human and Public Health Nutrition Area of the Department of Food Science; Advisor of the Antidiabetic Food Centre of the University of Lund (SWE) (2010-to date); Associate editor of the journal Nutrition, Metabolism and Cardiovascular Disease (2009-2012); Editor-in-Chief of the International Journal of Food Sciences & Nutrition (2012-to date); scientific Co-ordinator of the expert panel for the revision of the Italian DRVs (2010-to date); Member of the Scientific advisory board of the project Giocampus (2008-to date).

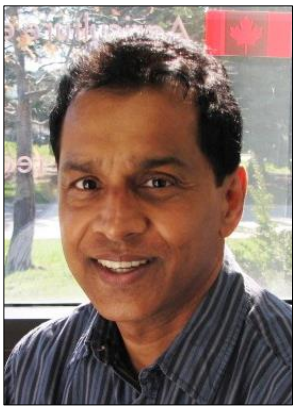
Prof. Brighenti's research work is mainly focused on the metabolic and physiological effects of foods and food components. On these topics he published more than 130 research papers on indexed international journals (see publication details and metrics on Research ID at http://www.researcherid.com/rid/E-4174-2010). Based on citation metrics, he's been included in the 2014 Thomson Reuters list of the Highly Cited Researchers in the field of Agricultural Sciences (http://highlycited.com) .

In vitro digestibility of carbohydrates as a marker of carbohydrate quality

Background and purpose: Postprandial glucose response is influenced not only by the efficiency in glucose disposal but also by the rate of glucose absorption, an effect strongly influenced by food nature and composition. Aim of this talk will be to briefly review the aspects of carbohydrate foods related to starch digestibility and glucose absorption. **Methods:** A review was made on the scientific literature reporting data on starch digestibility and postprandial glycaemia. Factors such as gastric emptying, accessibility to a-amylase, presence of dietary fibre and amylase inhibitors, food structure as affected by processing, cooking, and chewing, were investigated. Published methods aimed to assess the overall carbohydrate digestibility or specifically related aspects were also reviewed, including the EFSA opinions on Resistant and Slowly-Digestible Starch in Starch-containing foods. Food studies that used emerging techniques such as Scanning Electron Microscopy and Differential Scanning Calorimetry were also explored to identify possible mechanisms of action. **Conclusions and implications:** In-vitro starch digestibility and other laboratory techniques may represent useful for exploring mechanisms of action of low-glycaemic index foods, in pre-screening foods to be further submitted to in-vivo testing and in designing novel foods specially aimed to control the postprandial glucose response. However, they do not completely describe the complex nature of the interaction of foods/diets with the human digestive physiology and metabolism of nutrients.

Learning objectives:

1. Postprandial glucose response may be affected by food quality
2. In-vitro Starch digestibility may represent a marker of food quality
3. Industrial and domestic food processing can be used to manipulate starch digestibility, and thus the effect of carbohydrate foods on postprandial glycaemia.
4. Dietary advice on carbohydrate-foods selection may benefit from information on carbohydrate quality data assessed by both in-vitro and in-vivo methods



Dan Ramdath, Phd, FACN

Dr. Dan Ramdath is a Research Scientist in Human Nutrition at the Guelph Food Research Centre, Agriculture and Agri-Food Canada, where his research focuses on validating the health promoting properties of food to support the regulatory framework for health claims substantiation.

Previously, Dr. Ramdath was Chairman, Department of Preclinical Sciences, University of the West Indies, Trinidad, and remains involved in several initiatives that promote the use of credible evidence for health policy formulation. His early work on micronutrient metabolism has contributed significantly to current WHO clinical guidelines for management of malnourished children.

Dr. Ramdath has served on several WHO/PAHO Technical Committees on promoting healthy eating and prevention of childhood obesity.

FRIDAY, JUNE 12

Thomas Linn, MD

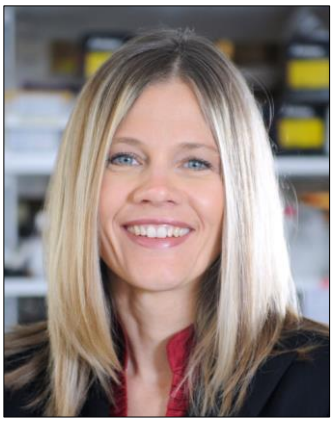
Thomas Linn received his MD degree studying nutritional changes in the lipid composition of red blood cells. He worked as a junior researcher at Rudolf-Buchheim-Institute for Pharmacology, Giessen. Then he started clinical training in internal medicine, endocrinology and metabolism completing with board examination. He chose the field of experimental diabetology for his main thesis working on the biology of pancreatic islets and the role of inflammatory processes in the damage of insulin producing cells. Since 1999 he is Head of Clinical Research Unit at Medical Clinic 3 of University Hospital, Giessen. In 2006 he accepted a call from Justus-Liebig University to become Professor of Internal Medicine with focus on the pathophysiology of metabolism and nutritional medicine. His research is supported from different public and private sponsors; he is founding member of the Committee of Giessen Graduate School for the Life Sciences.

Slowly and rapidly absorbed carbohydrates on postprandial metabolism in type 2 diabetes

Isomaltulose (ISO) attenuates postprandial glucose responses compared to sucrose (SUC) in type 2 diabetes mellitus (T2DM). However, the mechanisms have not been studied. In a randomized crossover study, eleven T2DM subjects underwent a euglycemic clamp combined with labeled oral ISO and SUC load. Glucose kinetics were analyzed for a 4-h postprandial period. Following ISO ingestion glucose absorption was prolonged ($P = 0.005$), mean plasma concentrations of insulin, C-peptide, glucagon, and GIP were ~9-17% lower ($P < 0.05$), by contrast GLP-1 was ~55% higher ($P < 0.001$) compared to SUC. Total amount of systemic glucose appearance was ~35% lower with ISO ($P < 0.001$) due to reduction of both endogenous and exogeneous glucose appearance and augmented splanchnic uptake. Insulin action was increased after ISO compared to SUC ($P = 0.028$). In conclusion, slowly absorbed ISO reduced systemic incorporation of oral glucose by inhibiting glucose production and enhancing splanchnic glucose uptake.

Learning objectives:

1. Isomaltulose bolus is completely absorbed in patients with type 2 diabetes mellitus (T2DM)
2. Slow absorption of sugar reduces blood glucose levels via effects on splanchnic glucose turnover
3. Isomaltulose drink is associated with a favorable gut hormone profile for T2DM patient



Raylene A Reimer, PhD, RD

Dr. Reimer is *Professor, Faculty of Kinesiology and Department of Biochemistry & Molecular Biology, Cumming School of Medicine (University of Calgary).* She is a Professor in the Faculty of Kinesiology and Cumming School of Medicine at the University of Calgary. She is also a Registered Dietitian. She completed her PhD in Nutrition & Metabolism at the University of Alberta and a two year postdoctoral fellowship at the Nestle Research Centre in Switzerland. Dr. Reimer's research focuses on the role of diet in regulating energy intake and gut microbiota in the context of obesity and type 2 diabetes. Dr. Reimer has developed animal models to study how diet during pregnancy and early postnatal life influences obesity risk. Her studies have identified unique dietary fibre sources as potentially valuable nutritional components in managing body weight. Translating findings from animal models to human clinical studies is a key way in which Dr. Reimer spans bench to bedside discovery and application. Her ongoing clinical trials help take evidence-based findings into application. She was honored in 2012 with the Centrum New Scientist Award for Outstanding Research by the Canadian Nutrition Society.

Metabolic benefits of prebiotic fibre intake

Prebiotics are non-digestible food ingredients that selectively stimulate the growth and/or activity of microbiota and thereby confer health benefits to the host. While the ability of prebiotics to enhance satiety has been shown in numerous studies, evidence for the metabolic benefits of prebiotics beyond appetite regulation is starting to emerge. This presentation will briefly review the effects of prebiotics on satiety and energy intake and then present evidence for additional metabolic effects, including glucose and insulin response and inflammatory markers. In addition, the effects of prebiotics on the gut microbiota will be reviewed and implications of prebiotic-induced modulation of the microbiota on obesity and type 2 diabetes discussed. Insights into the mechanisms of action of prebiotics will be gleaned from both animal and human studies.

Learning objectives:

1. Define prebiotics and describe their role in satiety and regulation of energy intake.
2. Understand the emerging evidence for metabolic benefits of prebiotics beyond appetite control.
3. Understand the potential mechanisms, including gut microbiota, through which prebiotics exert metabolic effects.

Geoffrey Livesey, B.Sc, Ph.D

Geoff is a nutritional biochemist now in consultancy worldwide as director of Independent Nutrition Logic Ltd (UK). Formerly he was at the Universities of Surrey (B.Sc 1st. Biochem), Keele (Ph.D. Cell biol.), Oxford (Post-doc clin metab) and East Anglia (lecturer) in the UK. His first post was with Marie Curie MF Cancer Res (Surrey, UK). His research interests has seen associated with several university hospitals, Radcliff (Oxford), Addenbrooks (Cambridge) and Norfolk and Norwich (Norfolk), and he was Principal scientist at the Institute of Food Research (Norwich, UK). Geoff's interest in metabolic research began while at the MRC Metabolic Research Laboratory (Oxford) led by Sir H. A. Krebs. Geoff had grants and commissions from various organisations (EC, FAO, MRC, AFRC/BBSRC, MAFF, ILSI, EPA, CCC) and contributed to the work of several expert groups (BNF,LSRO, ILSI, FAO, WHO, HC). Current memberships include AfN, ASN, NS, Diabetes UK, RSM, ICQC, SENSE, and Acumentia.

Achieving low glycaemic response diets within food-based approaches to healthy eating

Dietary advices on heathy diets from various national authorities are based on food categories and on diet compositions. The simplest advice is generally "eat more fruit and vegetables" through to more complex advice informing on up to ten food categories. Often the advice is considered to result in diets of low glycaemic index (GI), implying there is no need to inform about this property of a food or diet to achieve a healthy diet. But can such food-based advice be optimal for limiting the incidence of T2D or CHD? Meta-analysis of the International GI Tables suggests not. Might another component of diet (e.g. protein content) be important, too? Meta-analysis of prospective cohort studies suggest yes. Is there evidence of effectiveness across the continuum from healthy persons to persons with diabetes? Meta-analysis indicates yes. Is there are role for prebiotics, for example, isomaltulose and inulin? Analyses will be presented.

Learning objectives:

1. Learn why current national food based advices are suboptimal for limiting the incidence and management of T2D and CHD.
2. Learn why dietary protein and GI together appear highly important in dietary risk assessment for T2D and CHD.
3. Learn the extent prebiotics appear to have a role in the management blood glucose.

Jared Carlberg, Ph.D

Jared Carlberg, Ph.D., is Associate Professor of Agribusiness & Agricultural Economics and Associate Dean (Academic) in the Faculty of Agricultural and Food Sciences at the University of Manitoba. His research focuses on the economic costs of food-related chronic diseases, consumer preferences for food products, and the relationships between food intake decisions and self-perceptions of the impacts of food choice on future health states.

Health Economic Impact of Increased Dietary Fibre Intake – A Canadian Example

Jared Carlberg[1], Ph.D; Peter JH Jones[2], PhD; and Mohammad Abdullah[3]

1. Associate Professor & Associate Dean (Academic), Faculty of Agricultural and Food Sciences, University of Manitoba

2. Director, Richardson Centre for Functional Foods and Nutraceuticals, Canada Research Chair (Tier I) in Nutrition and Functional Foods, and Professor, Departments of Food Sciences and Human Nutritional Sciences, University of Manitoba

3. Ph.D. Candidate, Department of Human Nutritional Sciences, University of Manitoba

The interplay between nutrition and lifestyle-related health outcomes has been well-established. More recently, focus has been shifting to the economic costs of nutrition-related disease, with the impact of food choices on health-related costs gaining considerable attention. Not only could tens of thousands of deaths be averted or delayed each year, but also substantial economic savings could be realized if a greater proportion of the population complied with dietary recommendations. Adopting health-conscious nutritional habits that are known to reduce disease risk could thus reduce the economic strain associated with treating nutrition-related chronic disorders. Our research has focused on **the economic valuations of functional foods and certain dietary entities, as well as those of overall dietary improvements.**Through a series of economic framework designs encompassing variations of cost-of-illness analyses, we have provided evidence of non-trivial **savings in costs associated with public health concerns following greater adherence to dietary guidelines and policies.**

Learning objectives:

1. Understanding the steps within a cost-of-illness approach

2. Interpreting the various types of direct and indirect costs and associating them with specific diseases

3. Translating disease reductions into healthcare costs savings

Hertzel C. Gerstein MD MSc FRCPC

Dr. Hertzel C. Gerstein is an Endocrinologist and Professor at McMaster University and Hamilton Health Sciences, where he holds the Population Health Institute Chair in Diabetes Research. He is also Director of the Division of Endocrinology & Metabolism, Director of the Diabetes Care and Research Program and Deputy Director of the Population Health Research Institute. He has received several honors including the Canadian Diabetes Association's Young Scientist Award (1999), Frederick G. Banting award (1999), Charles H. Best award (2007) and Lifetime Achievement Award (2012). Dr. Gerstein has led the application of large simple outcome trials to people with diabetes globally, and developed the concept of dysglycemia as an important risk factor for many of the serious health outcomes that afflict people with an elevated glucose level regardless of diabetes status. His research spans over 50 countries, and has been funded by the Canadian Institutes of Health Research, the National Institutes of Health, the Heart and Stroke Foundation, the Canadian Diabetes Association and Industry. Dr. Gerstein has published more than 300 papers, editorials and commentaries, mainly on diabetes-related issues.

Why do we need large pragmatic outcomes RCT's of nutritional interventions?

Changes in nutrition throughout history have had remarkable effects on clinically important outcomes. Such clinically important outcomes include death, strokes, disability, cognitive decline and other things that are important to both patients as well as healthcare providers. Nutritional interventions that can be proven to have clinically important effects on these health outcomes are likely to be rapidly adopted by people. Conversely interventions that simply affect biochemical or clinical parameters such as serum analytes or blood pressure or glucose level will be subject to controversy. Large clinical outcomes trials that are focused on outcomes that are important to society, patients and providers are clearly the best way to demonstrate the value of new nutritional interventions in the general population and in subgroups such as those with diabetes. Such trials can do this convincingly and effectively because of the very powerful tool of randomization. Epidemiological approaches that analyze databases or even prospectively recruit and follow participants are unable to clearly establish the effect of any intervention. At best they can identify risk factors and stratify people into lower versus higher risk groups. They may also suggest hypotheses regarding the effects of interventions however they are unable to determine whether: (a) any particular therapy is effective at reducing outcomes; (b) any benefits of such therapies outweigh the risks; and (c) whether the measured effect is due to the therapy or to patient characteristics associated with the propensity to get the therapy and the outcome. Conversely the randomized controlled trial is able to make this determination because randomization ensures that: (a) both measured and unmeasured confounders are randomly distributed within the 2 groups; and (if the groups are large enough) the groups are equal on average except for the therapy provider that will not provide it. Once the trial is finished researchers can assume with great confidence that any difference in outcomes between the 2 groups is due to the therapy that was assessed. Such clinical trials are arduous and costly however they are indispensable and have definitively and unequivocally proven the benefits of a wide variety of therapies throughout medicine. This evidence is used by governments and other third party payers to justify adoption of these therapies and have dramatically reduced outcomes in various populations.

Learning objectives:

1. Clarify what is meant when discussing clinical outcomes and outcomes trials
2. Identify the methodologic weaknesses inherent in all non-randomized comparisons and highlight the strengths of randomization
3. Illustrate the limitations of "big data" using examples from the diabetes literature

Edward S. Horton, MD

Edward Horton is Professor of Medicine, Harvard Medical School and Senior Investigator at the Joslin Diabetes Center. He received his medical degree from Harvard Medical School in 1957. Following internship in surgery at Johns Hopkins Hospital and military service in Germany, he received residency/fellowship training in pathology at Dartmouth Medical School and in medicine and endocrineology at Duke University Medical Center. In 1967, he went to the University of Vermont College of Medicine, where he worked for 26 years as Director of Endocrinology and Metabolism and then as Chairman of the Department of Medicine. In 1993, he was appointed Professor of Medicine at Harvard Medical School and Medical Director of the Joslin Diabetes Center. Currently he is a Senior Investigator at the Joslin Diabetes Center. He has over 450 publications and is the recipient of several awards, including the ADA Banting Medal for Distinguished Service, the ASCN Robert H. Herman Award, the Mizuno Award and Lectureship, the IDF John A. Galloway Award, the ADA Outstanding Physician Educator Award, the Endocrine Society Distinguished Physician Award, the ADA Albert Renold Award and the JK Lilly Award. He is past president of the American Diabetes Association and the American Society for Clinical Nutrition and served as Chairman of the National Diabetes Advisory Board.

Lessons Learned from the LookAHEAD Trial

Type 2 diabetes and obesity are increasing rapidly throughout the world. Approaches to the prevention and treatment of this dual epidemic have focused on the use of medications and programs of lifestyle modification (ILS) that include a healthy diet, weight loss and increased physical activity to improve glucose control and other CVD risk factors to reduce the development of long-term complications of diabetes.

The LookAHEAD Trial is comparing the effects of an ILS program with standard care (CON) on CVD events and other complications of diabetes in approximately 5000 overweight subjects with established type 2 diabetes. After one year of treatment, subjects lost and average of 8% of initial body weight and significantly increased their level of physical fitness compared to the CON group. They also achieved better glucose control, lower blood pressure and improved lipids. Despite some regain in weight, these benefits have been sustained over a period of at least 10 years. However, both the control and ILS groups have had relatively low rates of CVD events, with no significant differences between the two groups, although there was greater use of antihypertensive and lipid lowering medications in the CON group than in the ILS group. The ILS group also had marked improvements in obstructive sleep apnea, greater mobility and fewer co-morbidities compared to CON.

This study demonstrates that a program of ILS modification can be sustained for a significant period of time and has long term benefits in reducing several CVD risk factors and improving other co-morbidities.. However, in this study the long-term effects of an ILS program to decrease CVD events has not been demonstrated.

Learning objectives:

1. To understand the rationale, design and principal results of the LookAHEAD Trial
2. To evaluate the effects of an intensive lifestyle modification program on glycemic control in people with established type 2 diabetes mellitus.
3. To evaluate the effects of an intensive lifestyle modification program on cardio-vascular disease risk factors and cardiovascular outcomes in people with type 2 diabetes.
4. To evaluate the effects of an intensive lifestyle modification program on other obesity-related conditions in people with type 2 diabetes.

Jordi Salas-Salvadó, MD, PhD
Institution: Human Nutrition Unit, Department of Biochemistry & Biotechnology, Sant Joan University Hospital, Faculty of Medicine of Reus, Rovira i Virgili University, Spain; Pere Virgili Institute of Health Research; CIBER Physiopathology of Obesity and Nutrition, Institute of Health Carlos III, Spain. Dr Salas Salvadó is Professor of Human Nutrition and Bromatology at the Faculty of Medicine and Health Sciences (Rovira i Virgili University). He is Head of Nutrition of the Internal Medicine Service, Sant Joan University Hospital of Reus and Vice-Dean / Head of Studies of the Degree in Human Nutrition and Dietetics of the Rovira i Virgili University. He is also Distinguished Professor at the Universitat Rovira i Virgili. In recent years, the expertise and research lines of Dr Salas are focused on human clinical trials evaluating the effect of diets and dietary compounds on obesity, type 2 diabetes mellitus, metabolic syndrome and cardiovascular disease. Since 2005, he has been one of the leaders of PREDIMED STUDY, considered the best clinical trial evaluating the effect of the Mediterranean Diet on cardiovascular diseases. He is the coordinator and a member of the Steering Committee of the PREDIMED-PLUS STUDY, a multi-centre, randomised, primary prevention trial on 6000 overweight or obese participants (55-75 years) with metabolic syndrome. The project aim is to determine the effect on adiposity, cardiovascular disease and mortality and quality of life, of an intensive weight loss intervention based on a traditional hypocaloric Mediterranean Diet, physical activity promotion and behavioural therapy compared to a less intensive program using Mediterranean diet (without energy restriction or physical activity). The recruitment started in September 2013 and will finish in June 2016. Final results will be available in 2020. Since 1983 Dr. Salas has directed 18 research projects financed by public bodies and 23 projects in conjunction with the pharmaceutical or food industries. He has published more than 290 original articles in national and international journals, as well as numerous reviews and editorials. Editor of 6 books, he has also co-authored more than 50 books.

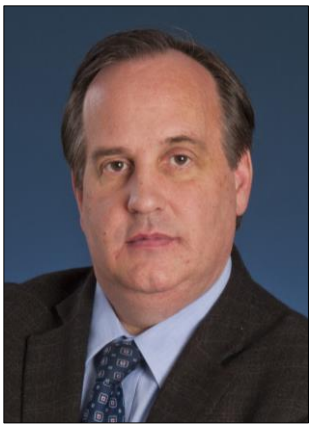
A Mediterranean intensive lifestyle intervention: Predimed Plus

Jordi Salas Salvadó[a] for the PREDIMED – Plus study investigators
[a]Human Nutrition Unit, Hospital Universitari de Sant Joan de Reus, Faculty of Medicine and Health Sciences, IISPV (Institut d'Investigació Sanitària Pere Virgili), Department of Biochemistry and Biotechnology, Universitat Rovira i Virgili, Reus, Spain, and b CIBERobn (Centro de Investigación Biomédica en Red Fisiopatología de la Obesidad y Nutrición), Institute of Health Carlos III, Madrid, Spain.

There are no large randomized clinical trials in overweight subjects evaluating the effect of a long-term sustained intentional weight loss using a healthy diet and physical activity promotion on the risk of cardiovascular clinical events. The PREDIMED Plus study is a randomized, multicenter, parallel-group trial for the primary prevention of cardiovascular disease (CVD). Six thousand men and woman without prior CVD, aged between 55 – 75 years, with metabolic syndrome and body mass index between 27- 40 kg/m^2 (<25% of them with diabetes) will be recruited by primary care medical doctors affiliated to 22 centers throughout Spain to evaluate the effect of an intensive energy-restricted Mediterranean diet, physical activity promotion and behavioral treatment, versus a control group receiving low-intensity recommendations to follow a Mediterranean diet. The mail outcomes are: incidence of CVD, weight loss and maintenance, quality of life, incidence of other chronic diseases related to obesity, changes in CVD risk factors, and use of medication. The results of this novel clinical trial will contribute to provide a strong evidence to develop guidelines for overweight management aimed to the primary prevention of CVD.

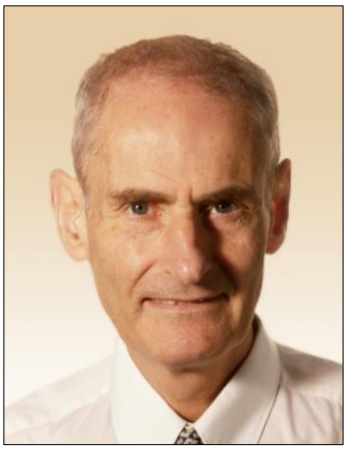
Learning objectives:

1. Any trial has never demonstrated that weight loss and maintenance reduces the risk of cardiovascular events and mortality.
2. The PREDIMED-Plus study is a randomized, multicentre, parallel group trial for the primary prevention of cardiovascular disease.
3. An intensive energy-restricted healthy diet with physical activity promotion and behavioural treatment may have multiple health benefits.



Michael E. Farkouh, MD, FRCPC, MSc, FACC, FAHA
Peter Munk Chair in Multinational Clinical Trials, University Health Network
Director of the Heart and Stroke/ Richard Lewar Centre of Excellence in Cardiovascular Research
Professor of Medicine, University of Toronto

Michael E. Farkouth is the Director of the Heart and Stroke/Richard Lewar Centre of Excellence in Cardiovascular Investigation and the Peter Munk Chair in Multinational Clinical Trials at the Peter Munk Cardiac Centre, both at the University of Toronto, as well as Professor of Medicine at the University of Toronto. He is a graduate of the Schulich School of Medicine at Western University. Dr. Farkouh completed his internal medicine and cardiology training at the Mayo Clinic and the Icahn School of Medicine at Mount Sinai New York respectively and holds an MSc in Clinical Epidemiology from McMaster University. Prior to his current appointments, he served as the founding director of the Mount Sinai Cardiovascular Clinical Trials Unit in New York City. He has published over 140 papers largely on acute coronary syndromes and cardiovascular prevention. He has mentored numerous international residents and fellows and is active in teaching clinical research methodology. Dr. Farkouh is internationally known for his work on the management of acute coronary syndromes in the emergency room. He has a special interest and expertise in the field of cardiovascular disease in diabetic patients. He is currently the project officer for numerous clinical trials on questions related to diabetes and heart disease including the NIH-sponsored FREEDOM trial and coordinates clinical studies in Grenada and Colombia. He chairs the committee on diabetes and heart disease at the Banting and Best Centre and at the University of Toronto. Dr. Farkouh has received the gold medal from John Paul II Hospital in Krakow and was the Teacher of the Year at the Mayo Clinic.



David JA Jenkins, MD, D.Sc, Ph.D

Educated at Oxford University, Dr. Jenkins is currently a professor in both the Departments of Nutritional Sciences and Medicine, Faculty of Medicine, University of Toronto, a staff physician in the Division of Endocrinology and Metabolism, the Director of the Clinical Nutrition and Risk Factor Modification Center, and a Scientist in the Li Ka Shing Knowledge Institute of St. Michael's Hospital. He has served on committees in Canada and the United States that have formulated nutritional guidelines for the treatment of diabetes and recommendations for fibre and macronutrient intake (fat protein and carbohydrates) for the general population (the recommended daily intakes e.g. that you see on food labels) under the joint United States-Canada DRI system (RDAs) of the National Academy of Sciences (Washington, DC). He and his colleagues developed the cholesterol lowering dietary portfolio, that was the only dietary approach referenced in 2004 Guidelines update of the US National Cholesterol Education Program (ATP III) for Americans and is one of three diets recommended by the Canadian Cardiovascular Society (CCS) guidelines for Canadians for 2012. He has received many National and International awards in recognition of his contribution to nutrition research. He believes in the value of plant based diets, and that a major effort is required to mount large studies to determine the extent of their health benefits. He also believes that diets have to be environmentally sustainable.

The "Lifestyle Portfolio Trial" rationale and design

With success of the PREDIMED study interest is renewed in dietary prevention and management of cardiovascular disease. However large intensive trials have been referred to by NHLBI as "Dinosaurs". In this environment we are funded for a pilot study for a diet and exercise large international trial on CVD outcomes. The funding, or lack of, will however determine its future shape.

Ideally we will recruit ~7,500 individuals internationally with known CVD, or three of more major risk factors. Participants will be instructed on the dietary portfolio and physical activity. Key foods will be provided as supplements on the test diet as well as the control. The study will last 8y with MACE as primary outcome.

We believe such studies must be carried out internationally, with sufficient enrolment for conclusions to be reached using the same criteria that established the efficacy and effectiveness of statins.

Learning objectives:

1. Value of Nutritional Trials
2. In determining dietary advice to the needful food supplements to enhanced compliance
3. Issues related to subject selections and recruitments

Livia Augustin, PhD

Dr. Augustin is a nutrition researcher at the Clinical Nutrition and Risk Factor Modification Centre at St. Michael's Hospital in Toronto (Canada). Her major interest is the investigation of dietary carbohydrate quality on chronic diseases. Dr. Augustin hypothesized that the glycemic index may be relevant in carcinogenesis; she started and led the investigations of the glycemic index in cancer risk. Dr. Augustin conceived and co-organized the International Scientific Consensus Summit on the Glycemic Index, Glycemic Load and Glycemic Response (Stresa, 2013). She has been an invited speaker at international scientific meetings and she is a Visiting Professor at the University of Catania (Italy). Dr. Augustin has many scientific publications in peer-reviewed journals and textbook chapters on carbohydrate metabolism. She is a member and coordinator of the ICQC, member of the ASN, CNS and the EFSA expert database. Dr. Augustin serves as review editor and as reviewer for international scientific journals.

International Carbohydrate Quality Consortium (ICQC) update

The International Carbohydrate Quality Consortium (ICQC) is a non-profit, worldwide organization created in 2013 in response to scientific, governmental and public needs for more clarity on the science around dietary carbohydrates quality and health. Scientific world experts joined the two-day meeting in 2013 with the goal of summarizing the evidence on the possible impact of the glycemic index, on chronic disease and release a consensus statement. Our founders envisioned the organization to move the science forward by investigating the gaps and possible solutions, creating new collaborations, encouraging scientific dialogue and harmonizing the carbohydrate discussions within and between academia, industry and governmental bodies. In order to do this we planned to meet every two years. This presentation is a summary of the main points discussed at the ICQC meeting of June 9th 2015 in Toronto.

Learning objectives:

1. What is the ICQC and what is its role?
2. Where are we at with carbohydrate research, labeling and guidelines?
3. Industry perspective

Andreas F. H. Pfeiffer, MD

Dr. Pfeiffer is Full Professor of Internal Medicine and Director of the Department of Endocrinology, Diabetes, and Nutrition at the Charité University Hospital, Berlin, Germany, and Head of the Department of Clinical Nutrition at the German Institute of Human Nutrition in Potsdam. This followed a position as senior consultant and lecturer and Associate Professor of Internal Medicine at the Bergmannsheil University Hospital, Ruhr University, Bochum until 2000.

Dr. Pfeiffer's current honorary positions include Chairman of the Nutrition Board of the German Diabetes Association (DDG). He was President of the German Endocrine Society (DGE) from 2008 until 2011 and Chairman of the Diabetes and Nutrition Study Group (DNSG) of the EASD from 2007 until 2012. In 2012, Dr. Pfeiffer was Chairman of the Local Organising Committee of the 48th EASD Annual Meeting in Berlin.

Dr. Pfeiffer was Co-Editor of Diabetologia from 2003 – 2006, and currently serves on several editorial boards. He has published well over 300 articles. In 1990 he was presented with the prestigious German Association of Internal Medicine's Theodor Frerichs Award. Further awards include a Herman and Lilly Schilling Professorship, 1992-1997, the Hippocrates Prize of the Greek Association of Internal Medicine in 2013 and, most recently, the German Society of Endocrinology's Berthold Medal. His research interests include the pathogenesis of diabetes mellitus type 2, interaction of metabolic and hormonal regulatory circuits with nutrition, genetic background and phenotype in causing disease risks for type 2 diabetes and atherosclerosis, treatment strategies for type 2 diabetes, and neuroendocrinology of energy balance.

Oral Abstracts

Oral Abstract 1 - African Food Pyramid
(**Sara Baer-Sinnott, USA**)

Health Through Heritage: Using Cultural Roots To Empower and Improve Health

Oldways is well known for the Mediterranean Diet Pyramid, developed in 1993 by a scientific committee, and with the Harvard School of Public Health. Oldways also developed four other cultural models for healthy eating – the Asian Diet Pyramid (1995); Latin American Diet Pyramid (1996); Vegetarian and Vegan Diet Pyramid (1997 and 2013); and an African Heritage Diet Pyramid, introduced in 2011.

To put the African Heritage Diet Pyramid into practice, in 2013, Oldways created "A Taste of African Heritage" – an innovative program that combines cultural history, nutrition education, and cooking lessons to empower and improve the well-being of African Americans by connecting them to the whole, plant-based foods of their ancestors. Led by volunteer teachers, "A Taste of African Heritage" has taken place in over 100 communities nationwide, and is growing steadily. Oldways' next series, "A Taste of Latin American Heritage" is set to pilot in 2016.

This presentation will discuss the African Heritage Diet Pyramid and the benefits and successes of a culturally-inspired, grassroots approach to nutrition education. It will demonstrate how culturally-relevant evidence-based nutrition and cooking information can be utilized as an effective tool for improving public health.

Oral Abstract 2 - The effect of a vegetarian vs. conventional hypocaloric diet on serum concentrations of persistent organic pollutants in patients with type 2 diabetes
(Hana Kahleová, Czech Republic)

Hana Kahleová[1], Serena Tonstad[2], Jan Rosmus[3], Fisar P[3], Andrea Mari[4], Martin Hill[5] and Terezie Pelikanova[1]
[1]*Institute for Clinical and Experimental Medicine, Videnska 1958/9, 140 21 Prague, Czech Republic*
[2]*Department of Endocrinology, Morbid Obesity and Preventive Medicine, Oslo University Hospital, Oslo, Norway*
[3]*State Veterinary Institute Prague, Sidlistni 24, 165 03 Prague, Czech Republic*
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[5]*Institute of Endocrinology, Narodni 8, 11394 Prague, Czech Republic*

Objective: Emerging evidence suggests that environmental factors described as persistent organic pollutants (POPs) are involved in the development of type 2 diabetes (T2D). POPs may be present especially in fatty fish, fish and seafood, meat and dairy products. The aim of this study was to explore the effect of a vegetarian vs. conventional diet on serum levels of POPs in T2D patients after 12 weeks of a dietary intervention.
Methods: 74 subjects with T2D were randomly assigned to either follow a vegetarian diet without fish or meat (n=37) or a control group who followed an isocaloric conventional diabetic diet (n=37). Both diets were calorie restricted (-500 kcal/day). To measure insulin sensitivity, the hyperinsulinemic (1 $mU.kg^{-1}.min^{-1}$) isoglycemic clamp was conducted. β-cell function was assessed using a mathematical model after a test meal. Magnetic resonance imaging of the abdomen was performed to measure the amount of visceral fat. We measured serum levels of 44 POPs. Dioxins and dioxin-like POPs were

analyzed by isotope dilution high resolution gas chromatography and mass spectrometry after clean up on silica and carbon columns. Non-dioxin-like POPs were analyzed by gas chromatography with electron capture detector. All measurements were performed at 0 and 12 weeks. For statistical analysis we used repeated measures ANOVA and a multivariate regression model. Correlations were calculated using Pearson's correlations.
Results: We did not observe any difference between the groups in serum levels of most POPs in response to both hypocaloric diets. In the groups combined, changes in serum concentrations of the POPs were correlated to changes in HbA1c ($r=+0.34$; $p<0.01$), fasting plasma glucose ($r=+0.41$; $p<0.01$) and β-cell function measured as insulin secretion at a reference glucose level ($r=-0.37$; $p<0.01$), independent of changes in body weight and volume of visceral fat.
Conclusions: Our findings support the relationship between POPs and diabetes, especially β-cell function.
ClinicalTrials.gov number, NCT00883038
This work was supported by the project grant IGA MZCR NT/14250-3 from Ministry of Health, Prague, Czech Republic and Institutional Support MZCR 00023001 (IKEM, Prague, Czech Republic).

Oral Abstract 3 – Tree nuts improve glycemic control in all-comers: A systematic review and meta-analysis of randomized controlled trials (Effie Viguiliouk, Canada)

Effie Viguiliouk[1, 2], Cyril WC Kendall[1, 2], Sonia Blanco Mejia[1, 2], Vanessa Ha[2, 4], Stephanie Nishi[1, 2], Arash Mirrahimi[2, 3], Adrian I. Cozma[2, 5], Viranda H. Jayalath[2], Livia S. Augustin[1, 2], Laura Chiavaroli[1, 2], Lawrence A. Leiter[1, 2], Russell J. de Souza[2, 4], David JA Jenkins[1, 2], John L. Sievenpiper[1, 2]*
[1]Nutritional Sciences, University of Toronto, Toronto, ON, Canada
[2]Toronto 3D Knowledge Synthesis and Clinical Trials Unit, St. Michael's Hospital, Toronto, ON, Canada
[3]School of Medicine, Queen's University, Kingston, ON, Canada
[4]Clinical Epidemiology & Biostatistics, McMaster University, Hamilton, ON, Canada
[5]Undergraduate Medical Education, University of Toronto, Toronto, ON, Canada
E-mail: effie.viguiliouk@mail.utoronto.ca

Objective: Tree nut consumption is associated with reduced diabetes risk, however, results from randomized controlled trials (RCTs) on glycemic control have been inconsistent. To assess the effect of tree nuts on glycemic control we conducted a systematic review and meta-analysis of RCTs.
Methods: We searched MEDLINE, EMBASE, CINAHL, and Cochrane databases through 8 August 2014 for relevant RCTs ≥3-weeks reporting HbA1c, fasting glucose, fasting insulin, and/or HOMA-IR. Three independent reviewers extracted relevant data. Data were pooled using generic inverse variance random effects models and expressed as mean differences (MD) with 95% confidence intervals (CI). Heterogeneity was assessed (Cochran's Q) and quantified (I^2).
Results: 32 trials (n=1688) met the eligibility criteria. Diets emphasizing tree nuts significantly lowered fasting glucose (MD=-0.11 mmol/L, 95% CI:-0.18, -0.03 mmol/L; P=0.004), fasting insulin (MD=-4.80 pmol/L, 95% CI:-8.15, -1.45 pmol/L; P=0.005) and HOMA-IR (MD=-0.45, 95% CI:-0.81, -0.09; P=0.01) compared with isocaloric control diets. No significant treatment effects were observed for HbA1c, however the direction of effect favoured tree nuts.
Limitations: Majority of trials were of poor quality (MQS<8) and short duration (follow-up<12 weeks).
Conclusion: Pooled analyses show that inclusion of tree nuts into the diet improves glycemic control. Owing to the uncertainties in our analyses there is a need for longer, higher quality trials.
Protocol registration: Clinicaltrials.gov identifier: NCT01630980
Funding: International Tree Nut Council Nutrition Research & Education Foundation

Oral Abstract 4 - Almonds improve glycemic control in Chinese patients with type 2 diabetes mellitus (Oliver Chen, USA)

C-Y. Oliver Chen[1], Chiao-Ming Chen[2], Jen-Fang Liu[3,4]*
[1]Jean Mayer USDA Human Nutrition Research Center on Aging, Tufts University, Boston, MA 02111, USA; [2]Department of Food Science, Nutrition, and Nutraceutical Biotechnology, Shih-Chien University, Taipei, Taiwan; [3]School of Nutrition and Health Science, Taipei Medical University, Taipei, Taiwan; [4]Chang Gung University of Science and Technology, Taiwan
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Objective: Our previous study showed that consumption of ~60 g/d almonds for 4 weeks improved adiposity, glycemic control, lipid profile, oxidative stress, and inflammation in Chinese T2DM patients. To substantiate these health benefits, we conducted a 7-month randomized, cross-over, controlled feeding trial with 2-wk run-in, 2 phases of 3-mo intervention, and 2-wk washout.
Methods: Of 727 eligible patients (aged 40-70 y, >5 y diabetes history, 24-35 kg/m^2 BMI, 6.5-9% HbA1c), 40 patients were enrolled and assigned to consume control diet (CON) prepared based on the NCEP step II guidelines and almond diet (ALM) designed by incorporating ~60 g/d almonds to CON to replace 20% daily calories. All meals were provided during the intervention phases. The daily dose of almonds either was consumed as a snack or was incorporated to foods, e.g., steam bun, bread, pizza, and dumpling. Seven subjects dropped out from the trial because of personal reasons. Blood was collected before and after each intervention phase for analyses for biomarkers of lipid profile, glucoregulation, inflammation, oxidative stress, and endothelial function.
Results: Among 33 patients who completed the trial, ALM didn't improve the studied biomarkers as compared to CON. In a subset data, 27 subjects with HbA1c value <8% had a lower HbA1c value at the end of the ALM phase than CON (7.01 ± 0.60 vs. 7.23 ± 0.63%, P = 0.027). Similarly, their fasting glucose and postprandial insulin release were lower after ALM.
Conclusions: Almonds incorporated to a healthy diet is beneficial to glycemic control in Chinese T2DM patients. While the reduction in HbA1c was modest, bringing its level close to 7% is crucial to preventing or delaying development of complications. Factors underlying the less robust outcomes in this study than the first trial will be discussed.
Protocol registration: clinicaltrials.gov identifier, NCT01656850
Funding Source: Almond Board of California

Oral Abstract 5 - Guidelines and nut consumption in Norway (Lars Johansson, Norway)

Lars Johansson, Norwegian Directorate of Health, lars.johansson@helsedirektoratet.no
Objective: Evaluate trends in nut consumption in relation to dietary guidelines. Norway included "Eat a small handful of unsalted nuts daily" in the dietary guidelines in 2011. This corresponds to 20 gram per day, and includes almonds and peanuts. From 2015 packages of unsalted nuts may be labelled with the Keyhole symbol.
Methods: Nut consumption is described by data for import by Statistics Norway, grocery trade by Nielsen, Household Consumption Surveys, national dietary surveys among adults and the survey Norwegian Eating Facts, Ipsos MMI.
Results: Import of nuts and peanuts increased from 8 to 10 gram per person per day (g/p/d) during 1989-2013. Grocery sales of nuts during 2011-2013 were 6 g/p/d.
The average purchase of nuts, olives and seeds during two weeks reported by households increased from 3 to 8 g/p/d from 1982 to 2012. Hereof were nuts 3.8 g, almonds 1.6 g, peanuts 1.6 g and olives 0.5 g in 2012. The proportion of total intake from nuts, almonds and peanuts was for energy 1.9, protein 1.5, fat 1, PUFA 8, CHO 0.2 and fiber 2%.

The average intake of nut products was 5 g/p/d contributing with 1.4% of energy in the national dietary survey among adults 2010 using 2x24h recall.
The proportion of adults reporting to consume unsalted nuts or nut mixes once a week or more increased from 9 til 12% during 2009-2013 according to Norwegian Eating Facts. In 2013 the proportion consuming unsalted nuts never or rarely was 34% and daily 2%.
The proportion that ate salted peanuts at least weekly increased from 8 to 9% during 2009-2013. In 2013 the proportion consuming salted peanuts never or rarely was 32%.
Conclusions: The consumption of nuts is increasing, but it is far from recommended levels. A large proportion of the population rarely consumes nuts.

Oral Abstract 6 - High intensity interval training improves glycaemic control and pancreatic β cell function of type 2 diabetes patients (Per Bendix Jeppesen, Denmark)

Søren Møller Madsen[1], Anne Cathrine Thorup[1], Kristian Overgaard[2] and Per Bendix Jeppesen[1]
[1]Department of Endocrinology and Internal Medicine, Aarhus Sygehus THG, Aarhus University Hospital, Aarhus C, Denmark. [2]Section of Sport Science, Department of Public Health, Aarhus University, Aarhus C, Denmark

Physical activity improves the regulation of glucose homeostasis in both type 2 diabetes (T2D) patients and healthy individuals, but the effect on pancreatic β cell function is unknown. We investigated glycaemic control, pancreatic function and total fat mass before and after 8 weeks of low volume high intensity interval training (HIIT) on cycle ergometer in T2D patients and matched healthy control individuals. Study design/method: Elderly (56 yrs±2), non-active T2D patients (n=10) and matched (52 yrs±2) healthy controls (CON) (n=13) exercised 3 times (10×60 sec. HIIT) a week over an 8 week period on a cycle ergometer. Participants underwent a 2-hour oral glucose tolerance test (OGTT). On a separate day, resting blood pressure measurement was conducted followed by an incremental maximal oxygen uptake ($\dot{V}O_2max$) cycle ergometer test. Finally, a whole body dual X-ray absorptiometry (DXA) was performed. After 8 weeks of training, the same measurements were performed. Results: glycaemic control as determined by fasting venous glucose concentration, end point 2-hour OGTT and glycosylated haemoglobin was significantly reduced ($p<0.05$). Pancreatic homeostasis as determined by homeostatic model assessment of insulin resistance (HOMA-IR) and HOMA β cell function (HOMA-%β) were both reduced significantly ($p<0.05$). Whole body insulin sensitivity as determined by the disposition index (DI) was significantly increased ($p<0.05$). During OGTT, the glucose continuum was significantly reduced at -15, 15 and 120 min ($p<0.05$) and at -10 and 0 min ($p<0.01$) with an additional improvement ($p<0.05$) of its 1st phase (30 min) AUC. Significant abdominal fat mass losses were seen in both groups (T2D: $p<0.01$ and CON: $p<0.05$) corresponding to a percentage change of -17.84 %±5.02 and -9.66 %±3.07, respectively.
Conclusion: These results demonstrate that HIIT improves overall glycaemic control and pancreatic β cell function in T2D patients. Additionally, both groups experienced abdominal fat mass losses. These findings demonstrate that HIIT is a health beneficial exercise strategy in T2D patients.

Oral Abstract 7 – Responders and non-responders – Baseline metabolic condition affects response to resistant starch (Barbara Gower, USA)

Barbara Gower[1*], Richard Bergman[2], Darko Stefanovski[3], Betty Darnell[4], Fernando Ovalle[5], Gordon Fisher[6], Katherine Sweatt[1], Holly Resuehr[1], Christine Pelkman[7].
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Objective: This study was designed to examine the effect of HAM-RS2 resistant starch on insulin sensitivity in women.
Methods: Participants were 40 healthy pre- and postmenopausal women. The study was conducted using a randomized, placebo-controlled, double-blind cross-over design. HAM-RS2 (HI-MAIZE®260 corn starch, Ingredion Incorporated, Bridgewater, NJ) was formulated into snack foods and tested at two doses, 15 and 30 g resistant starch per day. An isocaloric snack formulated with a highly-digestible waxy corn starch served as a control. Each arm was 4 weeks, with a 4-week wash-out period between. The main outcome was insulin sensitivity (S_I) assessed at the end of each arm by Minimal Model. Data were analyzed by mixed-effects modeling, adjusting for covariates.
Results: Two Gaussian distributions for S_I were identified, an insulin-resistant (IR) group (S_I<7.8), and an insulin-sensitive (IS) group ($S_I \geq 7.8$). Among IR participants, S_I was on average 16% higher after the 30 g supplement when compared to the control (P=0.02). No effect of HAM-RS2 on insulin sensitivity was observed among IS participants.
Conclusions: Among insulin-resistant women, consumption of 30 g/d HAM-RS2 improved insulin sensitivity by 16%. Because insulin resistance is a risk factor for diabetes, HAM-RS2 may be an appropriate dietary ingredient to reduce risk for diabetes in insulin-resistant women.
Protocol registration: NCT0152806
Funding source: Ingredion Incorporated, P30DK56336, P60DK079626, UL1RR025777

Oral Abstract 8 – Linking microbial consumption of resistant starch to functional outcomes (Maria Marco, USA)

Intestinal microorganisms have important beneficial roles in the regulation of energy homeostasis, lipid and glucose metabolism, and the immune system. Conversely, a dysbiotic gut microbiota is associated with obesity, type 2 diabetes mellitus, and metabolic syndrome. Therefore, dietary approaches to modulate the composition and activities of the gut microbiota might be sufficient to protect and alleviate the symptoms against these chronic diseases. This presentation will describe recent highlights in the progress to unravel how dietary fermentable carbohydrates such as type 2 resistant starch (RS) improve metabolic health. Specifically, findings from human and murine studies will presented with regard to the specific bacterial groups enriched with RS consumption and the impact of RS on the intestinal and serum metabolomes and gene expression in the intestine as well as distal sites in the body.

Oral Abstract 9 - Raisin Intake, Glycemic Control and other Cardiovascular Risk factors in Type 2 Diabetes Mellitus (James Painter, USA)

James Painter, Arianna Carughi, Harold Bays

Specific foods and dietary patterns may influence glycaemia and cardiovascular disease risk factors, and thus may have an impact on managing type 2 diabetes mellitus (T2DM) and cardiovascular disease (CVD). Worldwide health agencies recommend individuals increase the intake of fruit for improved health maintenance, including patients with diabetes mellitus. Traditional dried fruit without added sugar, such as raisins, are considered healthful foods and are a preferred snack because of their nutrient profile, which is rich in dietary fiber, potassium and health protective bioactive compounds. Dried fruit, like all commonly consumed fruit, provide sugar (e.g., fructose and glucose) as the only caloric macronutrient. This may raise concern for patients with diabetes mellitus regarding the potential to affect glycemic control. However, raisins have a low glycemic index, resulting in a low potential for insulinemic and glycemic response. While most fruits and vegetables have not undergone the rigors of objective clinical trial evaluation, a 12-week randomized controlled clinical study of 51 participants evaluated routine intake of raisins versus equicaloric, high carbohydrate processed snacks (e.g. crackers, crisps) on cardiometabolic risk factors in patients with T2DM. Those who consumed raisins had a significant ($p<.05$) 23% reduction in postprandial glucose levels, a 19% reduction in fasting blood sugar and a 0.12 % reduction in hemoglobin A1c ($p>.05$) (NS). Also compared to process snacks, raisins produced a significant 8.7mmHg reduction in systolic blood pressure, possibly due to potassium and other vasoactive raisin constituents. Body weight, anthropometric measures, and blood lipid levels did not change. This data was generally consistent with another objective controlled trial of raisins among patients with hyperglycemia, but not diabetes mellitus. Emerging data will be presented supporting the role of raisins and other traditional dried fruits as a healthy component of the daily diet, including patients with T2DM.

Oral Abstract 10 - Systematic Review and Meta-Analysis of Artificially-Sweetened Beverages and Type 2 Diabetes (Douglas Weed, USA)

Douglas L. Weed, M.D., M.P.H., Ph.D. (corresponding author), DLW Consulting Services LLC, Salt Lake City, UT 84103, Dominik D. Alexander, Ph.D., M.S.P.H., Cara L. Frankenfeld, Ph.D.

Objective. Whether an association exists between artificially sweetened beverages (ASB) and type 2 diabetes (T2D) is unclear. We undertook a systematic literature search and meta-analysis of the existing epidemiological studies of ASB-T2DM.

Materials and Methods. We searched PubMed and Scopus to identify prospective observational studies on ASB and T2DM. Data collected from these studies were combined using random effects meta-analysis. We identified possible confounders, assessed the control of confounding in the prospective studies, and calculated summary relative risks (SRREs) and 95% Confidence Intervals (CIs) including dose-response using actual data from the published studies. Publication bias was assessed using funnel plots and Egger's regression.

Results. Seven studies met inclusion criteria. The pooled estimate for extreme categories of ASB intake for models fully adjusted for confounders was (SRRE = 1.12, 95% CI: 1.03 – 1.22; I^2 =36%; N=7). We did not observe evidence of a dose-response pattern. Statistical assessment of publication bias suggested evidence of selective reporting of positive findings; a tally of cohorts that have reported on diet and T2D (N=22) suggests that the ASB-T2D relationship is published in only a subset (N=7).

Conclusions. The observed relationship between ASB and T2DM, although more homogeneous than previous estimates, remains a weak association lacking dose-response. Approximately 15 studies exist with unpublished data on diet and T2DM, providing an argument for the need for further research on this controversial topic to address prominent uncertainties.

Source of Support: Funding was provided by The Coca-Cola Company. By contractual agreement, all decisions regarding the content of the manuscript—including design, analysis, and interpretation—rest solely with the authors.

Oral Abstract 11 - Lowering Glucose and Insulin Responses to a Starchy Staple: From Formulation to Flux (David Mela, The Netherlands)

Hanny M Boers[1], Theo H van Dijk[2], Coby Eelderink[3], Harry Hiemstra[1], Anne-Roos Hoogenraad[1], Katrina MacAulay[4], Peter Murray[4], Harry PF Peters[1], Marion G Priebe[3], Jack WM Seijen ten Hoorn[1], Mirjam AM Vente-Spreeuwenberg[1], David J Mela[1]*
[1]Unilever R&D, Vlaardingen NL; [2]Dept Laboratory Medicine and [3]Center for Medical Biomics, University Medical Center Groningen, Groningen NL; [4]Unilever R&D, Sharnbrook UK
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Objective: There is growing endorsement for the benefits of lowering acute post-prandial glucose (PPG) and insulin (PPI) responses to carbohydrate-rich staples. This work describes the selection and effects of incorporating viscous fibres and an alternative starch source into the wheat-based flour ('atta') used for making flatbreads, a widely-consumed carbohydrate source in South Asia.
Methods: From existing literature, *in vitro* glucose release, and product feasibility, guar gum (GG), konjac mannan (KM) and chickpea flour (CPF) were prioritized for clinical testing in freshly prepared flatbreads. Trial 1 (balanced-order incomplete block design, n=38 UK subjects) compared 10 modified atta formulations (2/4/6% GG; 2/4% KM; 15% CPF, and 10 or 15% CPF plus 2 or 4% GG) to an existing full-fibre commercial product reference. Based on those results, Trial 2 (full crossover design, n=50 Indian subjects) tested 3 formulations (15% CPF + 2/3/4% GG). Trial 3 then measured effects of CPF+GG on glucose fluxes using dual isotope labelling (n=12 Dutch males).
Results: In Trial 1, 6% GG, 4% KM, and 15% CPF plus 2 or 4% GG produced significant ($p<0.01$), ≥30% reductions in PPG 2-hr incremental area under the curve. A model with 3 *in vitro* parameters closely predicted these results ($R^2_{adj}=0.98$). Trial 2 largely confirmed the results for PPG also with marked PPI reductions, both GG dose-related. Trial 3 showed these reductions in PPG and PPI occurred with modest reductions in glucose uptake and clearance, and much more substantial suppression of hepatic glucose production rate.
Conclusions: 1) The combined CPF+GG formulations significantly reduce PPG and PPI; 2) *in vitro* assays can aid in prioritizing formulations for clinical testing; and 3) the dose-related PPG-lowering effects of GG+CPF predominantly reflect post-absorptive effects rather than rates of glucose uptake.
Protocol Registration: ClinicalTrials.gov Identifier: NCT01734590 (Trial 3)
Funding source: Unilever

Short Oral Abstracts

Short Oral Abstract 1 - Diets naturally-rich in different polyphenols improve glucose metabolism: is the effect related to specific subclasses? (Claudia Vetrani, Italy)

Claudia Vetrani[1], Marilena Vitale[1], Lutgarda Bozzetto[1], Giovanni Annuzzi[1], Giuseppina Costabile[1,2], Rosalba Giacco[2], Giuseppe Della Pepa[1], Ettore Griffo[1,2], Anna Mangione[1], Paola Cipriano[1], Gabriele Riccardi[1], Angela A Rivellese[1]*

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Objective: It is known that dietary long chain n-3 polyunsaturated fatty acids (LCn3) and polyphenols (PP) may influence glucose metabolism. However, evidence from clinical trials in humans still gives conflicting results. This randomized controlled study evaluated the effects of diets naturally rich in PP and/or LCn3 on glucose metabolism trying to highlight any specific effect of different PP subclasses.
Methods: Eighty-six individuals with high waist circumference and any other feature of the metabolic syndrome were randomized to one of four isoenergetic diets differing only for LCn3 and PP content: (A) poor in LCn3 and PP; (B) rich in LCn3; (C) rich in PP; (D) rich in LCn3 and PP. Before and after the 8-week intervention, insulin-sensitivity (OGIS) and β-cell function (ΔAUCinsulin/ΔAUCglucose) were derived from plasma glucose and insulin concentrations during 3-h OGTT. Moreover, correlation analyses were performed between dietary changes in PP subclasses and clinical outcomes.
Results: PP-rich diets significantly reduced blood glucose AUC and increased insulin 30min-AUC ($p<0.05$ for PP effect, 2-way ANOVA), improving also OGIS ($p<0.05$ C vs. A, one-way ANOVA). Correlation analyses indicated that changes of dietary flavons triggered the effect on glucose AUC ($p= 0.009$) whereas those of anthocyanidins and flavan-3-ols were mainly related to early insulin secretion ($p= 0.010$ and $p= 0.029$; respectively). LCn3 significantly reduced β-cell function ($p<0.05$ for LCn3 effect).
Conclusions: Diets naturally rich in PP improve glucose tolerance, likely through an improved insulin sensitivity and early insulin secretion. Some subclasses of PP seem to be more effective.
Protocol registration: clinicaltrials.gov identifier, NCT 01154478
Funding Source: European Community (Contract no: FP7-KBBE-222639) and the Italian Ministry of the University (PRIN 2010-2011, No. 2010JCWWKM).

Short Oral Abstract 2 - The Effect of α-linolenic Acid and Fish on Glucose Metabolism, Serum Lipid Profile and Low-grade Inflammation in Subjects with Impaired Glucose Metabolism (Maria Lankinen, Finland)

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Objective: Our aim was to examine whether α-linolenic acid (ALA), fatty fish and lean fish differ in their effects on glucose metabolism, lipid metabolism and inflammatory markers.

Methods: Altogether 79 volunteers with elevated fasting plasma glucose (5.5-6.9 mmol/l), BMI 25-36 kg/m^2 and age 43 to 72 years participated in the 12-week parallel randomized controlled trial with four groups. The fatty fish group consumed 4 meals of fatty fish per week to provide ~ 1 g EPA and DHA per day. The lean fish group consumed 4 meals of lean fish per week. The ALA group ingested camelina sativa oil in order to get 10 g ALA per day. The control group consumed lean meat products. Control and ALA groups were allowed to eat 1 fish meal per week. The study diets were isocaloric. Oral glucose tolerance test (OGTT) and frequently sampled intravenous glucose tolerance test (FSIGT) were performed and blood samples for analyses of serum lipid profile, fatty acids, inflammatory markers and metabolomics and lipidomics profiles were drawn at the beginning and at the end of the intervention. ANCOVA models adjusted for age, gender, use of statins and baseline value was used for comparing changes between the groups.
Results: There were major changes in the fatty acid composition of phospholipids, cholesteryl esters and triglycerides in eicosapentaenoic acid, docosahexaenoic acid in the fatty fish group and ALA in the ALA group, which reflect good compliance to the diets. No significant changes in glucose and insulin metabolism were found based on OGTT or FSIGT. Concentrations of total and LDL cholesterol (C), LDL-C/HDL-C ratio and Apo B/Apo A-I ratio changed significantly differently between the groups. The biggest changes were seen in the ALA group where the total and LDL-C concentrations decreased compared with the fatty fish group and the lean fish group, and LDL-C/HDL-C and Apo B/Apo A-I ratios decreased compared with the lean fish group. Inflammatory markers - high sensitivity C-reactive protein (CRP), Interleukin 1 receptor antagonist (IL-1Ra) and Interleukin 1 beta (IL-1 beta) - did not change during the intervention.
Conclusion: The results suggest that a diet enriched in ALA could improve the serum lipid profile in subjects with impaired glucose metabolism. Changes in lipid metabolism are going to be studied in-depth utilizing metabolomics and lipidomics methods.
Protocol registration: ClinicalTrials.gov NCT01768429
Funding. Finnish Diabetes Research Foundation, Competitive Research Funding of the Northern Savo Hospital District special state subsidy for health research (VTR), Juho Vainio Foundation, Finnish Cultural Foundation, North Savo Regional Fund, Paavo Nurmi Foundation, Yrjö Jahnsson Foundation.

Short Oral Abstract 3 - A High-Protein Diet Reduces Liver Fat Content and Improves Glomerular Filtration Rate in Subjects with Type 2 Diabetes (Mariya Markova, Germany)

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Objective: Previous studies reported both favourable and adverse impacts of high-protein diet in type 2 diabetes. In our study, we evaluated in detail the effects of two isocaloric high-protein diets of animal (AP) and plant (PP) origin in type 2 diabetic patients.
Methods: Individuals with type 2 diabetes were randomized to either high-animal or high-plant protein diet (30% protein, 40% carbohydrates, 30% fat) for 6 weeks. The AP diet was rich in meat and dairy foods, while the PP group received products with high amount of dietary pulses and pea protein. Blood samples were collected every two weeks to measure routine parameters. Magnetic resonance imaging was performed at the beginning and at the end of the study.
Results: The study included 30 subjects (age 65±6 years, BMI 30.5±3.6 kg/m^2, HbA_{1c} 7.0±0.6%). We observed reduction of cholesterol, LDL- and HDL-cholesterol in all participants. Levels of liver parameters (AST, ALT, GGT) in blood improved significantly after diet intervention in both groups.

Furthermore, significant reduction of liver fat was observed in all subjects (AP: -43.6%, p<0.001; PP: -37.1%, p<0.001). In the PP group we observed significant reduction of plasma creatinine (-7.79 µmol/l, p<0.01) and also enhancement of glomerular filtration rate (from 75.95 to 88.15 ml/min/1.73m^2, p<0.001) which was not seen in the AP group. Moreover, significant reduction of the HbA_{1c} was observed in all subjects (AP: - 0.58%, p < 0.05; PP: - 0.41%, p < 0.001).
Conclusions: A 6-week high-protein diet leads to improvement of glucose metabolism and liver health in subjects with type 2 diabetes. Unexpectedly, high-protein diet had no adverse effects on kidney parameters, moreover plant protein showed even favourable impact.
Protocol Registration: clinicaltrials.gov, in process
Funding: Federal Ministry of Food and Agriculture (funding reference number, 313-06.01-28-1-54.071-10)

Short Oral Abstract 4 - A Randomized Crossover Trial Of Walking After Eating And Standard Physical Activity Advice In T2DM: Impact On Glycemia (Andrew Reynolds, New Zealand)

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Objective: To compare the effects of standard physical activity advice and postprandial physical activity on glycemic control in people with T2DM.
Methods: Forty-one T2DM adults ($HbA1_c$ 58.9 mmol/mol) completed interventions of a 30-min walk per day and walking for 10-mins after each main meal for two-weeks, with a four-week washout. Continuous glucose monitors were worn to calculate the incremental area under the curve (iAUC) for each meal and sum of total meals, and blood tests were taken pre- and post interventions.
Results: After adjustment for intervention order iAUC (mmol/L•min) was significantly lower for total meal iAUC (508 vs. 453, P=0.03) when walking after eating, driven by a highly significant difference in iAUC from the evening meal (537 vs. 424, P<0.001). Despite no significant difference between interventions (CI -0.15, 0.82), glycemic control as measured by glycated albumin (%) was reduced after the 30-min walk (CI -1.08, -0.60). Change in fasting plasma glucose (mmol/L) did not reach conventional levels of significance due to the 30-min (CI -1.06, 0.05) or walking after eating interventions (CI -1.06, 0.88).
Conclusions: Walking for 10-mins after each meal improved postprandial glycemic response. Modest improvement in some measures of glycemic control occurred following both walking regimens. The 30-min walk intervention improved glycated albumin, potentially due to a lowered fasting plasma glucose level.
Protocol Registration: Australian New Zealand Clinical Trials Registry: ACTRN12613000832774
Funding: The New Zealand Artificial Limbs Service (NZALS)

Short Oral Abstract 5 - The Effect of Glycemic Index and Glycemic Load on Liver Enzyme Activity (Laura Chiavaroli, Canada)

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Toronto, Ontario, Canada.
Objective: The relationship between non-alcoholic fatty liver disease (NAFL) and insulin resistance, suggests that dietary interventions to reduce postprandial glycemia and insulin demand, i.e. low glycemic index (GI) and low glycemic load (GL) diets, may be relevant to NAFL.
Methods: Liver enzymes (ALT and AST) were measured in two 3-month clinical trials of low GI or GL versus control (high cereal fiber) diets in participants with type 2 diabetes (n=212). Baseline liver enzymes were also measured in three additional studies of type 2 diabetes (n=299).
Results: In study 1, the low GI diet resulted in significant reductions in both liver enzymes with a greater reduction for AST when compared to the control diet (P<0.05). In study 2, the low GL diet demonstrated significant reductions in both liver enzymes, while the control diet significantly reduced AST. However, the reductions in AST were significantly greater on the low GL diet compared to control (P<0.05).
Using baseline data from studies 1 and 2 as well as 3 additional studies, baseline correlations between liver enzymes and markers of metabolic syndrome revealed significant positive correlations for both AST and ALT with diastolic blood pressure and with triglycerides, and for ALT with fasting glucose, HbA1c and systolic blood pressure (P<0.05). Of the dietary factors correlated with liver enzymes, only dietary cholesterol was positively associated with AST and ALT (P<0.05).
Conclusion: Lower GI and GL diets improved liver enzymes and thus may play a role in reducing the risk of NAFL.

Short Oral Abstract 6 - Regular Participation in the phases of an Intervention Program and the Beneficial Effects on the Daily Dietary Habits of Participants- The PERSEAS study (Charilaos Dimosthenopoulos, Greece)

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Objectives: PERSEAS study [**P**rospective **E**valuation of vascular **R**isk **S**urrogates: the **E**lafonissos **A**rea **S**tudy] is a 5-years intervention program of the general "closed" population of Elafonissos island, Greece. The intervention program involves the recording changes of cardiovascular risk factors: obesity, hypertension, hyperlipidemia and diabetes, according to the life habits.
Methods: Throughout first 3 phases, 612 individuals (12-89 years) participated. A diet score was created, based on 11 food items of a questionnaire (whole grains, fruits and juices, vegetables and salads, legumes, fish, red meat, poultry, milk full-fat, olive oil, cheese normal fat and alcohol consumption). A *healthy habits index* was composed of Diet score categories (bad (0-3), moderate (4-7), good (8-11) eating habits), physical activity and smoking. Investigation of changes between initial and final measurements were based on paired t-test or on Wilcoxon signed rank sum test. Statistical significance level was defined on $\alpha = 5\%$.
Results: 291 people was composed [141 men (48.45%),150 women (51.55%) , average age 54 years (SD19,07)]. A statistically significant difference in the change of diet score between the number of entries in the study (p= 0.0059) was found. The dietary score on average (standard deviation) was increased by 0.54 (1.72) points for people who participated in all 3 phases. The *healthy habits index* increased on average by 0.08 (0.9) units for people with full participation in the study, while decreased by 0.17 (0.64) units for people with partial participation.

Conclusions: People who consistently participated in all phases have improved their eating habits, in relation to persons who participated occasionally in the study, which appeared to have worse eating habits. Also individuals with partial participation in the study showed greater weight gain rates. Finally, there was evidence that the constant participation in the study is associated with an increase in healthy daily habits.

Short Oral Abstract 7 - Low-Carbohydrate Diets in the Management of Type 2 Diabetes – A Systematic Review and Meta-Analysis (Henny-Kristine Korsmo-Haugen, Norway)

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Objective: Controversy still remains about the safety and efficacy of a low-carbohydrate diet (LCD) in the longer term management of type 2 diabetes. We conducted a systematic review and meta-analysis of randomised controlled trials (RCTs) to investigate the effect of a LCD, containing ≤40 energy percent (E%) from carbohydrates, compared with a higher carbohydrate diet (>40 E%), on weight management, metabolic control and compliance in adults with type 2 diabetes.
Methods: We searched MEDLINE, EMBASE, CENRTRAL, CINAHL, Food Science Source and SweMed+ (through November, 2013) for relevant trials of ≥3 months duration. Two independent reviewers assessed the validity of studies using Cochrane Collaborations Risk of Bias Tool. The GRADE approach was utilised to assess the quality of evidence for primary outcomes. Pooled effects were calculated by random effects meta-analyses and expressed as mean differences (MD) for continues outcomes, and risk ratio (RR) for dichotomous outcomes. Statistical heterogeneity was quantified by I^2.
Results: Eighteen RCTs, with a total of 1832 participants, met the inclusion criteria. Compared to the control diet, no significant effect was found in favour of the LCD on weight management (weight loss: MD -0.29 kg; 95% CI -1.17, 0.58) or HbA1c (MD -0.04%; 95% CI -0.14, 0.06). Furthermore, no significant difference was observed for blood concentrations of total-, LDL- and HDL-cholesterol, triacylglycerol, or blood pressure. Compliance, as measured by attrition rates, showed a small but non-significant effect in favour of the control diet (RR 1.03; 95% CI 0.87, 1.21).
Conclusions: The findings from this meta-analysis suggest that LCDs may be an option in the long term management of type 2 diabetes but they are not superior to diets with a higher carbohydrate content regarding the effect on HbA1c, blood lipids, body weight and blood pressure.
Protocol registration: http://www.crd.york.ac.uk/PROSPERO/, CRD42013005825
Funding Source: None

Short Oral Abstract 8 - Fructose Containing Sugars-Sweetened Beverages and Their Contribution to Body Weight: a Systematic Review and Meta-Analysis of Controlled Feeding Trials
(Vivian L. Choo, Canada)

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Background: Sugars-sweetened beverages (SSBs) containing fructose are emerging as important public health targets in the epidemic of obesity.
Objectives: To conduct a systematic review and meta-analysis of controlled feeding trials to assess the effect of fructose containing SSBs on body weight.
Data sources: We searched MEDLINE, EMBASE, CINAHL, and the Cochrane Library (through May 23, 2014).
Data selection: Analyses included controlled dietary trials ≥7 days on the effect of fructose containing sugars in fluid form on body weight.
Data extraction: Two independent reviewers extracted relevant data from eligible trials and assessed study quality. Data were pooled using the generic inverse variance method and expressed as mean differences (MD) with 95% confidence intervals (95% CIs). Heterogeneity was assessed (Cochran's Q statistic) and quantified (I^2 statistic).
Data Synthesis: We included 28 substitution trials (isocaloric comparison of fructose containing SSBs with other carbohydrates) (n=822), 26 addition trials (hypercaloric comparison of excess calories from fructose containing SSBs compared to a diet without SSBs) (n=1165), and 6 subtraction trials (hypocaloric comparison through a reduction in calories from fructose containing SSBs using water or low calorie sweetened beverages) (n=2707).
Results: There was no effect of fructose containing SSBs in substitution trials, whereas fructose containing SSBs increased body weight in addition trials (MD, 0.59 kg [95% CI, 0.34 to 0.85]), and decreased body weight in subtraction trials (MD, -0.53 kg [95% CI, -1.02 to -0.03]).
Conclusion: Pooled analyses show that fructose containing SSBs do not alter body weight when provided in isocaloric substitution for other carbohydrates. However, fructose containing SSBs do lead to weight gain when they supplement diets with excess calories and weight loss when their calories are displaced from diets by water or low calorie sweetened beverages, suggesting that the effects of fructose containing SSBs are mediated through their contribution of energy. There is a need for larger, longer, higher quality trials that focus on ad libitum replacement of fructose containing SSBs with other sources of calories to inform public health policy.
Protocol registration: clinicaltrials.gov identifier, NCT01608607.
Funding: Canadian Institutes of Health Research (CIHR) Knowledge Synthesis Grant (funding reference number, 102078), Calorie Control Council, and Banting and Best CIHR Graduate Scholarship (to VLC).

Short Oral Abstract 9 - Effect of oat β-glucan on markers of lipid control: a systematic review and meta-analysis (Thanh Ho, Canada)

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Objective: Low-density lipoprotein cholesterol (LDL-C) lowering has been the focused of cardiovascular disease (CVD) prevention, however, despite highly effective statin therapy for LDL-C lowering, residual risk remains. Therefore, alternative lipid targets, ie. apolipoprotein B (apoB) and non-high-density lipoprotein cholesterol (non-HDL-C), have been implemented to assess residual risk. β-glucan, the main soluble fibre found in oats, is often ascribed with being the main active component responsible for the cholesterol-lowering effect. Given the established LDL-C lowering effect of oat β-glucan (OβG), this systematic review and meta-analysis seeks to update the evidence in the context of OβG and LDL-C and additionally, to summarize and quantify the effect of OβG on the alternate lipid targets, apoB and non-HDL-C, for the first time.
Methods: MEDLINE, Embase, CINAHL, and the Cochrane Central Register of Controlled Trials were searched. Randomized controlled trials ≥3 weeks reporting OβG consumption on LDL-C, apoB and/or non-HDL-C. Two independent reviewer's extracted relevant data and assessed study quality and risk of bias. Data were pooled using the generic inverse variance method with random effects models and expressed as mean differences with 95% confidence intervals (CI's). Heterogeneity was assessed (Cochran Q-statistic) and quantified (I^2).
Results: 51 trials were included (n=3420). A median dose of 3.6 g/d significantly lowered LDL-C (MD=-0.23 [95% CI: -0.33, -0.14]; p<0.00001), apoB (MD=-0.05 [95% CI: -0.08, -0.02]; p<0.00001) and non-HDL-C (MD=-0.24 [95% CI: -0.28, -0.20]; p<0.00001) compared with control diets.
Conclusion: Pooled analyses confirm an LDL-C lowering effect with consumption of OβG. It additionally implicates a beneficial effect on alternate lipid targets, apoB and non-HDL-C. Though, the results may be limited by the short duration, poor quality of the majority of the trials, and significant between-study heterogeneity.
Trial Registration: ClinicalTrials.gov NCT02068248
Funding: N/A

Short Oral Abstract 10 - The Effects of Maternal Diet on Glycemic Control: A Systematic Review and Network Meta-Analysis (Vanessa Ha, Canada)

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Background: Dietary advice in pregnancy is a key strategy promoted to prevent and manage gestational diabetes mellitus (GDM). However the evidence to support various healthful dietary patterns to achieve optimal glycemic control in pregnant women has not been adequately synthesized.
Objective: To conduct a systematic review and network meta-analysis of randomized trials of ≥4 week duration in order to compare the relative efficacy of healthful dietary patterns on measures of glycemic control (fasting blood glucose [FBG] and insulin [FBI], glycated hemoglobin [HbA1c], Homeostatic Model Assessment- Insulin Resistance [HOMA-IR]) in pregnant women.
Methods: MEDLINE, EMBASE, and COCHRANE (to July 2014) were used to identify randomized trials of dietary patterns for glycemic control during pregnancy. Two independent reviewers extracted relevant study characteristics and data. A network meta-analysis using a Bayesian framework and random-effects model was conducted to estimate the effectiveness of dietary patterns on FBG. Owing to a lack of trials that met the inclusion criteria, we conducted pair-wise meta-analyses using fixed-effects model with generic inverse variance weighting for FBI and HOMA-IR. There were insufficient trials to conduct a meta-analysis for HbA1c.
Results: Twelve studies with a median follow-up duration of 13 weeks met our inclusion criteria (n= 1869). There were no significant differences for any of the dietary comparisons (routine care, energy-restricted, high-fibre, low glycemic index, Dietary Approach to Stop Hypertension [DASH] diets) on FBG. Pair-wise meta-analyses between high-fibre and low glycemic index diets also did not show significant differences on FBI and HOMA-IR.
Limitation: <5 trials were identified for comparisons between diets.
Conclusions: The preliminary results from these analyses demonstrated that there are no significant differences between diets on FBG, FBI, and HOMA-IR. Larger trials of higher quality are needed to confirm these results.

Short Oral Abstract 11 - Cross-Sectional Associations of Plasma Fatty Acid Composition with Plasma Concentration of Leptin in Finnish Children (Taisa M Venäläinen, Finland)

Taisa M Venäläinen[1,2], Vanessa DF de Mello[2], Ursula S Schwab[2], Jyrki J Ågren[1], Aino-Maija Eloranta[1], Virpi I Lindi[1], Timo A Lakka[1]*
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Objective: We investigated the associations of proportions of fatty acids in plasma cholesteryl esters (CE), phospholipids (PL) and triacylglycerols (TG) with plasma concentration of leptin among Finnish children.
Methods: The subjects were a population sample of 376 children aged 6-8 years examined at baseline in the Physical Activity and Nutrition in Children (PANIC) study. Plasma fatty acid composition was measured by gas chromatography and plasma concentration of leptin by radioimmunoassay. Data were analyzed using linear regression models.
Results: Higher proportions of myristic acid and lower proportions of cis-vaccenic acid in plasma CE, PL and TG were associated with higher plasma concentration of leptin. In CE, higher proportion of gamma-linolenic acid and lower proportion of arachidonic acid were associated with higher leptin concentration. In PL, higher proportion of linoleic acid and lower proportions of nervonic and arachidonic acids were associated with higher leptin concentration. In TG, higher proportions of palmitic, stearic and gamma-linolenic acids and lower proportions of linoleic, oleic, cis-vaccenic and docosapentaenoic acids were related to higher leptin concentration.

Conclusions: Higher proportions of gamma-linolenic acid and SFA, especially myristic acid, and lower proportions of many MUFA and PUFA in plasma are associated with plasma concentration of leptin in children. Fatty acids in plasma TG fraction seem to have the strongest associations with plasma leptin concentration.
Protocol registration: Clinical trial number NCT01803776.
Funding: The Finnish Cultural Foundation, the Juho Vainio Foundation, the Finnish Foundation of Cardiovascular Research.

Short Oral Abstract 12 - Comparison of Glycemic Outcome and Relation to Changes in Liver Fat Content in Low-carb vs. Low-fat Dietary Regimes for Prediabetic Subjects
(Stefan Kabisch, Germany)

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Objective: Dietary strategies basing on the main nutrient components have been widely compared for their effectiveness in weight loss, weight maintenance and several metabolic outcomes. However, short- and long-term effects on glucose levels and liver fat content are controversially discussed. Furthermore, the interaction between weight loss, glycemic improvement and reduction of liver fat content is unclear.
Methods: In a subcohort of the Prediabetes Lifestyle Intervention Study (PLIS; n=99) we conducted a two-step dietary intervention with two different regimes. The initial three-weeks phase was hypocaloric (ca. 1500 kcal/day), the second phase (11 months) was isocaloric. We compared a low-carb regime (short term: < 40 g carbohydrates/day, long term: < 40 % of daily energy intake) and a low-fat diet (fat intake < 30 % of daily energy intake). Metabolic assessment throughout the study based on 2-hours oral glucose tolerance tests and magnetic resonance spectroscopy (liver fat).
Results: While both interventions show a similar statistically significant short-term reduction and long-term maintenance of glucose levels and liver fat content, only short-term reductions in fasting glucose levels appear to be significantly pronounced in the low-carb group (p=0,002). Correlation analysis shows, that despite similar magnitude of metabolic changes, liver fat reduction under low-fat diet is tightly linked to weight loss (p=0,003), but not in the low-carb group (p=0,17).
Limitations: Our data are preliminary results from an ongoing study. The final subcohort of PLIS will sum up about 200 subjects with one year of intervention and two additional years of follow-up.
Conclusions: Low-carb and low-fat diets are similarly effective to reduce glycemic parameters and liver fat content. However, the underlying mechanisms appear to differ regarding dietary composition. Further analysis will show, under which conditions weight loss is really necessary to achieve metabolic improvements.
Protocol registration: NCT01947595 (clinicaltrials.gov)
Funding Source: Federal Ministry of Education and Research

Short Oral Abstract 13 - The Effects of Dietary Glycemic Load on Plasma Proteomic Biomarkers (Joseph Jamnik, Canada)

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Background: The consumption of diets with a high glycemic load (GL) has been associated with an increased risk of type II diabetes and other chronic conditions. However, the effects of dietary GL on emerging risk factors for such conditions are unclear.
Objective: To determine the association between dietary GL and plasma proteomic biomarkers involved in diverse physiological pathways in a population of healthy young adults.
Methods: Subjects (n=1,100) were young adults from the cross-sectional Toronto Nutrigenomics and Health Study. Dietary GL was estimated using a one month 196-item Toronto-modified Willett food frequency questionnaire. The absolute concentrations of 54 plasma proteins were measured using a multiple reaction monitoring HPLC-MS/MS assay. The association between dietary GL and each proteomic biomarker was examined using general linear models adjusted for age, sex, BMI, physical activity, ethnicity, total energy intake and hormonal contraceptive use among women.
Results: Dietary GL was inversely associated with circulating concentrations of apolipoprotein A-I, a negative acute phase reactant involved in lipid metabolism and a major constituent of HDL cholesterol (p=0.0003). Additional adjustment for serum HDL levels attenuated the association, suggesting that the effects of GL on apolipoprotein A-I are driven by changes in HDL.
Conclusions: These findings provide further evidence for the beneficial effects of a low GL diet on blood lipid profiles.
Funding Source: Advanced Foods and Materials Network

Short Oral Abstract 14 - Serum Non-Esterified Fatty Acid (NEFA) Concentrations are Associated with Longitudinal Progression of β-Cell Dysfunction: Prospective Metabolism and Islet Cell Evaluation (PROMISE) Cohort (Luke W. Johnston, Canada)

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Objective: Elevated fasting NEFA concentrations are associated with incident type 2 diabetes (T2DM), however NEFA are physiologically diverse. Limited longitudinal data exist examining total and individual NEFA on the progression of metabolic disorders underlying T2DM. Our aim was to study the longitudinal associations of total and individual NEFA with insulin sensitivity (IS) and β-cell function.
Methods: Adults at-risk for T2DM in PROMISE had glucose and insulin measured from a glucose tolerance test at 3 visits over 6-yrs (n=478). Baseline NEFA were analyzed using thin-layer-chromatography and gas-liquid-chromatography with flame-ionization detector. The inverse of HOMA-IR (HOMA-IS) and the Matsuda index assessed IS, while the Insulinogenic Index over HOMA-IR (IGI/IR) and the Insulin Secretion-Sensitivity Index-2 (ISSI-2) assessed β-cell function. Dysglycemia was defined as incident pre-diabetes or T2DM. Generalized estimating equations was performed adjusting for waist, physical activity, alcohol, and sex.

Results: IS and β-cell function decreased over 6-yrs by 14-24.3% (all p<0.001; Fig. A-B); although BMI or WC did not change (<2%). Conversion to dysglycemia was ~12% over 6-yrs, where higher total NEFA increased the risk by 25% (RR=1.25 (1.02-1.52) per SD). While total NEFA were not associated with IS, palmitate predicted declines in HOMA-IS (p=0.037). Higher total NEFA predicted declines in IGI/IR and ISSI-2 (both p<0.02; Fig. C), with higher concentrations of palmitate, oleate, and linoleate predicting declines in ISSI-2 (p=0.003 to 0.043); these three species comprised 74.8% of total NEFA.
Conclusions: Given that palmitate, oleate, and linoleate comprise the majority of the NEFA pool, our findings suggest that *total* NEFA rather than individual species may more strongly influence T2DM risk, primarily through β-cell dysfunction.
Funding: Canadian Institutes for Health Research, Canadian Diabetes Association, Banting and Best Diabetes Center

Short Oral Abstract 15 – Increase in angiotensin converting enzyme in response to a high fat diet (Rita Schüler, Germany)

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Objective: In addition to an effective treatment in cardiovascular diseases, inhibition of angiotensin-converting enzyme (ACE) also improves insulin sensitivity. On the contrary, carriage of the D-allele of the ACE insertion/deletion (I/D) polymorphism is associated with increased ACE serum levels and impaired glucose tolerance. We aimed to investigate effects of a high-fat diet (HF) on ACE considering possible nutrigenetic effects.
Methods: In the NUGAT (NUtriGenomic Analysis in Twins) study 46 healthy twin pairs went from a 6-week carbohydrate-rich low-fat diet (LF) to a 6-week HF diet under isocaloric conditions. Clinical investigation days (CIDs) took place after 6 weeks LF and after 1 and 6 weeks of HF. At each CID subcutaneous adipose tissue biopsies were taken for gene expression analysis on Agilent 8x60K microarrays. Serum parameters were analyzed in blood samples using ELISA. To assess insulin sensitivity intravenous glucose tolerance tests (ivGTT) were performed and incremental areas under the curve (AUC) calculated. Genomic DNA extracted from whole blood was genotyped using Illumina HumanOmniExpressExome BeadChips.
Results: After six weeks HF circulating ACE levels increased by 15% (HF6 161±49 ng/ml vs. LF 139±41 ng/ml; p<0.001) paralleled by an increase in adipose tissue gene expression (1.41-fold, p<0.001). Interestingly, in homozygous carriers (GG) of the rs4343 polymorphism, which serves as a surrogate marker for ACE I/D polymorphism, the increase in serum levels was nearly twice as high as compared to non-carriers (AA) or heterozygous carriers (AG) (p<0.001). Whereas no change in glucose tolerance was observed for AA/AG-carriers, glucose tolerance significantly declined in GG-carriers after six weeks of HF ($\Delta AUC_{glucose}$, recessive model: p=0.009).
Conclusions: ACE might constitute a molecular link between dietary fat intake and cardiovascular diseases as well as impaired glucose metabolism. The extent of this relationship seems to be nutrigenetically modulated.
Protocol registration: www.ClinicalTrials.gov, identifier NCT01631123
Funding Source: German Federal Ministry of Education and Research (Grant No. 0315424)

Posters

1. Variability of Acute Response to Equicaloric Test Meals Varying in Glycemic Index and Glycemic Load on Postprandial Glycemia in Healthy Adults (Andreea Zurbau)

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Objective: The importance of the interrelation of the quality (glycemic index [GI]) and the quantity (glycemic load [GL]) of carbohydrate in the context of a mixed meal on blood glucose is still debated. This study therefore investigated all 4 permutations of high and low GI and GL meals on postprandial glycemia [PPG].
Methods: A total of 17 healthy subjects completed all test meals (8 males, 9 females; age 27 ± 12y; body mass index 22.2 ± 2.8 kg/m²). Subjects consumed 4 different test meals: LowGI-LowCHO (GI=28, GL=14), LowGI-HighCHO (GI=28, GL=42), HighGI-LowCHO (GI=85, GL=14) and HighGI-HighGL (GI=85, GL=42), with a carbohydrate content of 17, 94, 50 and 50g respectively. Energy was balanced by adding fat and protein. Capillary blood samples were collected at fasting and 15, 30, 45, 60, 90, 120, 190, and 240 minutes post-consumption.
Results: The incremental area under the blood glucose curve (iAUC) after the HighGI-HighCHO and LowGI-HighCHO meals were significantly higher than the LowGI-LowCHO and HighGI-LowCHO meals for 2h post consumption ($p<0.05$). The 2 to 4h iAUC was significantly higher following the LowGI-HighCHO meal compared to the HighGI-HighCHO and HighGI-LowCHO meals.
Conclusions: Postprandial glucose levels at 15, 30 and 45min were the lowest after the low GI, low GL test meal. Despite almost doubling the carbohydrate in the LowGI-HighCHO meals compared to the HighGI-HighCHO meal, there was no difference in iAUC. This preliminary analysis demonstrates that changing the GI and GL of meals result in different PPG profiles which were not necessarily predicted by carbohydrate content.
Protocol Registration: clinicaltrials.gov identifier NCT01883700
Funding: Risk Factor Modification Centre, St. Michael's Hospital

2. Study on Immediate and Long-term Effects on Incretin Release Induced by Artificial Sweeteners (ILIAS) – Results and Outlook from the SEGATROM Study (Andreas Pfeiffer)

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Objective: Sweet taste receptors are stimulated by natural carbohydrates but also non-caloric natural and artificial sweeteners, for example in energy-reduced softdrinks. Epidemiological studies suggest associations between those dietary components and the development of metabolic diseases. The reason for this relationship might be found in an unfavorable incretin release after ingestion of artificially sweetened food. As a result from the SEGATROM study, we are conducting the ILIAS project which aims to highlight possible selective properties of certain sweeteners and to assess the real-life effects under prolonged stimulation.
Methods: First, we will focus on short-term effects of several artificial sweeteners with different chemical structures. Additionally, a four-week stimulation with or without AS in a cross-over design is scheduled. As in SEGATROM, oral stimulation tests will be conducted. Plasma levels for glucose, insulin, GIP, GLP-1 and PYY will be assessed until 120 minutes after ingestion.
Results: The sweetener trials of the already completed SEGATROM study focussed primarily on saccharin, an AS with both sweet and bitter taste. Preliminary results show significantly higher insulin, GIP and GLP-1 levels under combined saccharin-glucose stimulation compared to glucose alone. PYY levels remained similar. Saccharin alone did not reliably seem to stimulate incretin release.
Conclusions/Outlook: The preliminary results from SEGATROM support the hypothesis, that food containing AS (e.g. softdrinks) may facilitate metabolic derangements, possibly by disturbing a beneficial incretin profile. As saccharin also stimulates bitter receptors, the role of sweet taste receptors could not entirely be clarified by the SEGATROM study, thus requiring a broader experimental design. We will investigate, if other sweeteners show similar or different effects, if co-administration of glucose is mandatory for the incretin release and if long-term effects on insulin sensitivity can be detected after four weeks of continuous stimulation.
Protocol registration: NCT02219295 (clinicaltrials.gov)
Funding Source: Federal Ministry of Education and Research

3. PREVIEW: Prevention of diabetes through lifestyle intervention and population studies in Europe and around the world - more than 2,000 volunteers randomized to the 3-y intervention trial

(Jennie Brand-Miller)

Anne Raben[1], Mikael Fogelholm[2], Thomas M Larsen[1], Mathijs Drummen[3], Sally Poppitt[4], J Alfredo Martinez[5], Ian Macdonald[6], Svetoslav Handjiev[7], Gareth Stratton[8], Edith Feskens[9], Tony Lam[10], Wolfgang Schlicht[11], Jennie Brand-Miller[12], on behalf of the PREVIEW consortium*
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Objective: PREVIEW is a 6-y EU project (2013-2018) under the FP7, KBBE programme. It involves 15 partners from Europe, Australia, Canada, and New Zealand. The primary goal is to identify the most efficient lifestyle pattern for the prevention of type-2 diabetes (T2D) in a population of pre-diabetic overweight and obese individuals.
Methods: The project comprises 2 main lines of evidence: a 3-y multicentre, 2x2 factorial, clinical, randomized controlled trial (RCT) with up to 2,500 participants as well as large population studies in about 170,000 individuals across all age groups. This presentation is focused on the RCT.
The impact of a high-protein, low-glycemic index diet vs a moderate protein, moderate-glycemic index diet in combination with moderate or high intensity physical activity on the incidence of T2D and

related end-points will be investigated. Interactions with habitual stress, sleeping pattern, behavioral, environmental, cultural, and socioeconomic variables are also being studied.
The intervention starts with an 8-week weight loss phase on a low-calorie diet, LCD (Cambridge Weight Plan) followed by randomization to a 146-weeks weight maintenance phase in the 4 intervention arms.
Results: Between Jun 2013 and February 2015, ~15,500 adults have been pre-screened; ~5400 screened and 2279 adults enrolled by the 8 intervention centres. Around 70 children/adolescents have also been included. The average age of the adults is 52 y, ~ 2/3 being female. A total of 1356 have achieved more than 8% weight loss by the end of the 8-week LCD (average ~11% of initial body weight of ~100 kg), allowing them to continue into the weight maintenance phase.
Conclusions: The PREVIEW project is running well with over 2200 participants enrolled in the RCT.
Protocol Registration: NCT01777893
Funding: The PREVIEW project receives funding from the EU 7th Framework Programme (FP7/2007-2013) under grant agreement no. 312057. National Health and Medical Research Council - EU Collaborative Grant, AUS. The NZ Health Research Council (14/191) and UoA Faculty Research Development Fund. The Cambridge Weight Plan has kindly donated all products for the 8-week Low-Calorie Diet.

4. The effects of Dairy and Non-Dairy beverages consumed with cereal on Post-prandial Glycemia in healthy young adults (Marron Law)

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Background: Consumption of dairy is associated with better body composition and lower incidences of type 2 diabetes. Studies show this may be due to dairy's effects on decreasing post-prandial glycemia. However, there is a lack of studies investigating the benefits of familiar dairy products, consumed in usual serving sizes and as part of a meal, on postprandial glycemia and insulin responses. Recently, Health Canada (HC) has released draft guidance documents for food health claims for the reduction in post-prandial glycemia. Therefore, the present study is aimed to evaluate the potential for dairy to carry comparative health claims relative to non-dairy alternatives.
Objective: To compare the effects of dairy and non-dairy beverages on post-prandial glycemia following the guidelines set forth by HC.
Methods: Thirty healthy males and females (20-30 years, BMI 20.0-24.9 kg/m^2) will be recruited for this randomized, crossover trial. The treatments are 250 mL of 1) 1% milk, 2) soy beverage, 3) almond beverage, 4) yogurt beverage, and 5) water consumed with 54 g of Cheerios cereal. At 0 (baseline), 15, 30, 45, 60, 75, 90, 120 minutes (pre-meal period) 140, and 170 minutes (post-meal period) blood will be collected for glucose analysis. Insulin will be analyzed every 30 minutes and for the last two timepoints. An *ad libitum* pizza meal will be provided at 120 minutes after the treatments to measure post-meal glucose and insulin as well as food intake. **Results:** Study sessions have commenced and 8 participants have now completed the study. Preliminary data suggests that dairy beverages (milk and yogurt) may reduce post-prandial glycemia levels more than non-dairy alternatives. Complete results, which will be available at the time of the symposium, may provide further support for increasing dairy consumption and for increasing communication of its post-prandial benefits through a health claim.
Funding: Dairy Farmers of Canada

5. The Effect of Highly Viscous Fibre-Gel on Appetite and Glycemic Response in Healthy Individuals
(Fei Au-yueng)

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Objective: Konjac-glucomannan (KGM) is a viscous dietary fibre that has been indicated in the treatment of body weight and diabetes. Pre-hydration of KGM greatly changes its physicochemical properties but little is known about its health benefits. Thus, we aim to assess the acute effects of KGM administered in the form of a powder or a pre-hydrated gel on appetite and glycemic response.
Methods: Following a randomized, double-blinded, cross-over design, participants were administered 1 of 5 test meals on 5 separate occasions with >2 day washout period. Each meal consisted of 50g carbohydrates (CHO) in the form of bread, margarine, and a gel dessert. The test conditions were: 50g CHO in bread with 5g KGM as a powder (50PK) or pre-hydrated into the gel KGM (50GK) or a fibre free control (50C), and 25g CHO in bread with 25g CHO in gel dessert with 5g KGM pre-hydrated into the gel (25GK) or fibre free control (25C). All test meals were identical except for the form of fibre. A standardized lunch was consumed 180min later. Satiety was recorded using visual analogue scales.
Results: Eighteen healthy individuals (M: 7/F: 11; Age: 28.6 ± 3yrs; BMI: 23.3 ± 0.7kg/m^2) were enrolled and 15 provided blood samples. The iAUC after 120 min for blood glucose was lower after 50PK (MD: -40%, $p<0.001$) and 50GK (MD: -23%, $p=0.049$) vs. 50C. No differences were observed between 50PK and 50GK ($p=0.16$). Additionally, 50GK increased satiety after 120 min vs. 50PK (MD: +26%, $p=0.035$) and 50C (MD: +28%, $p=0.025$). The iAUC after 120 min for blood glucose was lower in 25GK vs. 25C (MD: -28%, $p=0.006$), but no significant differences were observed in satiety.
Conclusions: These findings suggest that KGM may improve glycemic control irrespective of administration mode, but consumption in a pre-hydrated gel may confer additional benefits from improved satiety and should be further explored.
Protocol registration: Clinicaltrials.gov identifier, NCT01657058
Funding: This project was internally funded by St. Michael's Hospital.

6. A Randomized Crossover Trial Of Walking After Eating And Standard Physical Activity Advice In T2DM: Participant Acceptability And Compliance
(Bernard Venn)

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Objective: To compare participant acceptability and compliance to two approaches of increasing physical activity in people with T2DM.
Methods: Forty-one T2DM adults ($HbA1_c$ 58.9 mmol/mol) completed two 2-week interventions in randomized order of a 30-minute walk per day and walking for 10-minutes after each main meal with a four-week washout. Compliance with walking regimens was captured by tri-axial accelerometers (GT3X, ActiGraph). Walking preference and measures of motivation for physical activity were recorded pre- and post-intervention measured on a five-point Likert scale.

Results: There was no difference in compliance with walking instructions between interventions (P=0.08) with 45% of the 30-min walks and 52% of the 10-min walks undertaken. Fifty-nine percent of participants expressed preference for a 30-min walk; 32% favored three 10-min walks; and 9% had no preference. A significant improvement in enthusiasm for physical activity occurred after the 30-min walks when comparing between walking regimens (P=0.03). Participants' ratings of energy levels and mood were not different between interventions. When comparing baseline to end-of-intervention, there were improvements in energy level (P=0.01) and mood (P=0.03) whilst undertaking the 30-min walk.
Conclusions: Encouraging people with T2DM to undertake physical activity was partially successful. Personal preference for one approach over the other is likely to predispose to long-term compliance. Self-reported improvements in energy level, mood and enthusiasm for physical activity from taking a 30-minute walk each day are encouraging.
Protocol Registration: Australian New Zealand Clinical Trials Registry: ACTRN12613000832774
Funding: The University of Otago

7. Effect of Spinach, a High Dietary Nitrate Source, on Arterial Stiffness and Related Hemodynamic Measures: A Randomized, Controlled Trial in Healthy Adults (Elena Jovanovski)

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Objective: Diets rich in fruits and vegetables reduce risk of adverse cardiovascular events. However, the constituents responsible for this effect have not been well established. Lately, the attention has been brought to vegetables with high nitrate content with evidence that this might represent a source of vasoprotective nitric oxide. We hypothesized that short-term consumption of spinach, a vegetable having high dietary nitrate content, can affect the arterial waveform indicative of arterial stiffness, as well as central and peripheral blood pressure (BP).
Methods: Using a placebo-controlled, crossover design, 27 healthy participants were randomly assigned to receive either a high-nitrate (spinach; 845mg nitrate/day) or low-nitrate soup (asparagus; 0.6mg nitrate/day) for 7 days with a 1-week washout period. On days 1 and 7, profiles of augmentation index, central, and brachial BP were obtained over 180min post-consumption in 4 fasted visits.
Results: A postprandial reduction in augmentation index was observed at 180min on high-nitrate compared to low-nitrate intervention (-6.54±9.7% vs.-0.82±8.0%, p=0.01) on Day 1, and from baseline on Day 7 (-6.93±8.7%, p<0.001; high vs. low:-2.28±12.5%, p=0.35), suggesting that the nitrate intervention is not associated with the development of tolerance for at least 7 days of continued supplementation. High vs. low-nitrate intervention also reduced central systolic (-3.39±5.6mmHg, p=0.004) and diastolic BP (-2.60±5.8mmHg, p=0.028) and brachial systolic BP (-3.48±7.4mmHg, p=0.022) at 180min following 7-day supplementation only.
Conclusions: These findings suggest that dietary nitrate from spinach may contribute to beneficial hemodynamic effects of vegetable-rich diets and highlights the potential of developing a targeted dietary approach in the management of elevated BP.
Protocol Registration: Clinicaltrials.gov identifier, NCT01604993.
Funding: This study was funded by an internal research donation fund within the Li Ka Shing Knowledge Institute and St. Michael's Hospital.

8. Food Consumption Pattern and other associated factors of Overweight/Obesity and the prevalence of Dysglyceamia/Diabetes among employees attached to the Ministry of Economic Development.
(Sagarika G.S. Sumanasekara)

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Introduction: In Sri Lanka studies reveal higher trend in prevalence of diabetes. The office employees have sedentary life style and their eating patterns changed due to nutritional transition.
Objective of the study focused on general food pattern of office employees and its relation to overweight/obesity and prevalence of diabetes among them.
Method: The data was collected from office employees between 30-60 years (n-400).Data analyzed using SPSS 16 version.The Study design was a descriptive cross sectional study. The study setting was Ministry of Economic Development. Anthropometric measurements and blood glucose assessed by trained nurses. Dietary pattern was studied through a food frequency questionairre thereby calculated daily nutrient intakes.
Results: Mean age of office employees were 38.98 SD (7.033) CI=95%) and 245 females (61.2%) 155 males (38.8 %) ,Nationality includes Sinhala (67.5%), Tamil(20%), and Muslims (12.5%).Owerweight(7,1.8%), obese(36,9%), obese(66,16%)/ diabetes/obese(18,4.5%) out of 127(31.8%) who were above the normal BMI whereas 273(68.2) were within the normal. Mean BMI was 24.1593.Mean Blood sugar level was 104.646,SD(16.018).12% consume tobacco products,17.8 consumed alcohol.15.8% had nutrition training.
Two main dietary patterns identified who were vegetarians and non vegetarians .Mean energy intake 1727.1, (SD 4.97), Mean protein consumption(11.33, SD 1.811), Mean fat consumption(24.07, SD 4.131),Mean CHO consumption (64.56, SD 4.54), Mean Fibre (30.05, SD 17.9), Mean cholesterol(16.85, SD 17.22), Energy intake was higher in non vegetarians and larger propotion of energy derived from proteins , and fat. Their carbohydrate and cholesterol intake was also higher. Tamils were mostly vegetarians. Mainly BMI were within normal range(18.5-23.5) whereas Muslims who had higher energy intakes showed BMI above the normal.
Conclusion – Two distinct dietary patterns identified. Different ethnic groups consume different diets with different nutrient composition. Dietary pattern has a relation to overweight. Overweight related to high blood glucose levels but some overweight subjects do not show any relation.

9. Individual Serum Saturated Fatty Acids and Markers of Chronic Subclinical Inflammation: The Insulin Resistance Atherosclerosis Study (IRAS)
(Ingrid Dominique Santaren)

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Objective: Despite longstanding dietary recommendations for reduced saturated fatty acid (SFA) intake, growing evidence highlights distinct effects of individual circulating SFA on cardiometabolic outcomes, with potential protective effects of odd and longer-chain SFA. Less is known, however, regarding the impact of individual SFA on subclinical inflammation, a known predictor of type 2 diabetes and CVD. The study investigated cross-sectional associations of individual serum SFA (12:0, 14:0, 15:0, 16:0, 18:0, 20:0, 22:0, and total SFA) with pro-inflammatory biomarkers and adiponectin.
Methods: The study analyzed data from 624 White, African American, and Hispanic adults, aged 40-69 years and free of diabetes at baseline from the IRAS cohort. Serum SFA were analyzed using gas chromatography. Clinical measures included oral glucose tolerance tests, fasting serum pro-inflammatory markers (fibrinogen, CRP, white cell count, PAI-1 and TNF-α), and adiponectin, an adipokine which is inversely related to inflammation. Outcome variables included adiponectin concentrations as well as inflammatory variable clusters defined by principal components (PC) analysis of the five pro-inflammatory markers. Two PCs were identified, PC 1: fibrinogen, CRP and white cell count; and PC 2: PAI-1 and TNF-α. Multiple regression analyses were adjusted for demographic, lifestyle and dietary variables, waist circumference, and glucose tolerance status.
Results: Total SFA was not significantly associated with pro-inflammatory markers (PC 1 or PC 2) or with adiponectin ($p>0.05$), however, individual SFA had unique effects. 15:0 ($\beta=-0.10$; $p=0.01$) and 22:0 ($\beta=-0.08$; $p=0.04$) were negatively associated, while 14:0 ($\beta=0.13$; $p=0.0003$) and 16:0 ($\beta=0.17$; $p<0.0001$) were positively associated with PC 2 in fully adjusted models. Furthermore, 20:0 ($\beta=0.08$; $p=0.03$) was positively, and 14:0 ($\beta=-0.15$; $p<0.0001$) and 16:0 ($\beta=-0.15$; $p<0.0001$) were negatively associated with adiponectin in fully adjusted models. None of the SFA were associated with PC 1.
Conclusions: Lower circulating odd- and longer-chain, and higher even-chain SFA, were related to worsened subclinical inflammation status.
Funding Source: Banting & Best Diabetes Centre, Tamarack Graduate Award in Diabetes Research and Dairy Farmers of Canada Graduate Student Fellowship. IRAS was funded by the NHLBI of the NIH.

10. Nutrition related behaviors among parents who attended a Health Promotion camp organized by the School health Club, Sri Lanka. (Chamil Senavirathne)

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Introduction: Non communicable diseases which are caused by modifiable lifestyle factors, are in fact a worldwide pandemic of devastating proportions. It is required to introduce effective tools to improve skills on change the unhealthy lifestyle factors.
Aim- to observe the dietary and physical activity related behaviors among parents, attending the health promotion camp organized by school health club with the participation in Moneragala District, Sri Lanka.
Methods: Target population (n=119) was parents of school children. 32 we males (26.8%) This observational study was conducted through the school health club of the area. Students were trained to obtain physical measurements (BMI). Model dining table, model boutique was used to observe the nutrition related behaviors. Exercise session was carried out in order to encourage participants to improve the leisure time physical activities.

Results: Mean age of the participant was 36.9 years (SD 10.2 CI=95%). 77.2% of participants were females. Mean BMI of the participants was 23.0 Kgm^{-2} (SD 3.8, CI = 95. 78.5% of participant stated that they do not use a list of good while shopping. Only 30.6% of them chose healthy foods while shopping. Usually 50.4% of them buy vegetable and fruits. 28.9% (n=35) of the participants were overweight.
In terms of assessing the dinning pattern, 83.5% do not concern about the recommended amount of salt and coconut oil while cooking. 15.7% participants concern about the proportion they eat. Observation revealed that 84.3% of them do having their dinner in front of television. Only 11.6% use flat plate to have their meal. In terms of pattern of PA 94.2% are not active in leisure time domain. 85.1% participants attended the PA session at the HP camp.
Conclusion - Health promotion camp would be an effective platform observe the nutrition related behavior of parents of school children. Also this would be an effective approach to connect parents with the school.

11. The Effect of Dietary Habits on the Glycemic Control of Patients with Diabetes. (Charilaos Dimosthenopoulos)

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Objectives: The diet is considered as the cornerstone of the regulation of diabetes. Despite the current knowledge about the positive impact of the appropriate and healthy diet on type 2 diabetes mellitus (DM2) very often this diet is not followed by the diabetic patients. Hippoctates project is a study of recording the cardiometabolic risk factor of a specific elderly population, living in the municipalities of Maroussi and Nea Ionia, Athens, Greece. The purpose of this study was to document the dietary habits of people with type 2 diabetes and to correlate their dietary habits with the total treatment of DM.
Methods: The study enrolled 72 patients (43.1% male) aged over 60 years for 73.1% of the subjects (while there was not a statistically significant difference between the sexes, p = 0,205). Patients who took part in the study responded to a structured questionnaire on demographic, anthropometric data and information related to type 2 diabetes and to another questionnaire with information on their dietary habits.
Results: The mean glycosylated hemoglobin was (HbA1c) 7,69 ± 1,53%, with 32.7% of patients with a HbA1c value less than 7%. The duration of diabetes was 7,5 ± 2,1 years. The body mass index (BMI) was 32,46 ± 5,92 with no difference between sexes (p = 0,480). 73% of patients were overweight - obese [BMI> 25] with women having higher rates (p = 0,011).
73,9% of patients was consuming breakfast, 37.5% fruits over 8 times per week, 58.4% vegetables at least 2 times per week, 41% meat 2 times per week, 45,7% fish once a week , 63,2% pulses once a week, 31,2% chicken twice a week, 12.8% once a week. 17.3% of patients consumed sweets. We found a positive correlation of the control of diabetes with the breakfast consumption (p <0,0001), consumption of vegetables (p = 0,001), of fish (p = 0,001) and of the presence of two main meals in the daily program (p = 0,009). Negative effects was found with the higher consumption of junk foods (p = 0,008), the consumption of soft drinks (p = 0,036) and the consumption of sweets (p <0,0001).
Conclusions: The eating habits of people with type 2 diabetes affect the total control of diabetes. A well balanced dietary plan which follows the nutritional recommendations has a direct and positive effect on the glycemic control.

12. Impact of a 6-Month Healthy Lifestyle Education Program Tailored for Rural Adults with Prediabetes in Stratford and Tavistock, Ontario: Preliminary Nutrition Results
(Adrienne Vermeer)

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Objectives: To assess the impact on client's perception, dietary intake and type 2 diabetes mellitus (T2DM) risk factors of a 6-month healthy lifestyle education program tailored for rural adults with prediabetes.
Methods: Rural adults identified with impaired fasting glucose and/or impaired glucose tolerance were referred to the 6-month education program by their physician. The program provided participants with credible nutrition information and promoted the development of skills regarding healthy eating strategies known to help prevent or delay the development of T2DM. Pre- and post-program 3-day food records, as well as anthropometric, demographic and biochemical data were collected. Participants also completed a program feedback form. Food intake records were reviewed with clients by a registered dietitian and analyzed using the ESHA Food Processor SQL version 10.14.0.
Results: Preliminary data from 21 participants (13 men, 8 women) are presented. They attended 7.1±0.9 (mean ± SD) out of 8 visits. Participants were aged 61.9±6.5 and their average body mass index (BMI) was 32.5±6.6 kg/m^2. Ninety percent of the participants said they felt confident that they could continue to implement many of the healthy eating strategies learned as part of the prediabetes education program. Participants reduced their average energy (2151±675 *versus* 1771±453 kcal, p=0.01) and carbohydrate (250.6±89.0 *versus* 194.7±44.4 g, p=0,006) intake. Also, the average BMI (32.5±6.6 *versus* 31.6±6.4 kg/m^2, p=0.01) and fasting blood glucose (6.07±0.44 *versus* 5.27±0.54, p=0.05) improved significantly from before to after the 6-month education program.

Conclusions: Based on these preliminary results, it appears that this 6-month healthy lifestyle education program may have helped those rural adults improve some of their risk factors for developing T2DM, dietary behaviours, and confidence in making healthy eating choices.
Protocol registration: 6262-06-2010/0690496
Funding: Public Health Agency of Canada : Canadian Diabetes Strategy.

13. Lactose Intolerance Gene Variants, Dairy Consumption, Plasma 25-hydroxyvitamin D and Biomarkers of Type 2 Diabetes in Young Canadian Adults
(Ohood Alharbi)

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Background: Gene variants located upstream of the LCT gene have been associated with lactose intolerance (LI) in different ethnic groups. However, the prevalence of these gene variants in Canada remains unknown. Individuals with LI often limit or avoid dairy consumption, which may lead to an inadequate intake of vitamin D. Recent evidence suggests an inverse association between dairy intake and risk of type 2 diabetes.

Objective: To determine the prevalence of LCT genotypes associated with LI and to determine whether those genotypes are associated with dairy intake, circulating 25(OH)-vitamin D concentrations and biomarkers of type 2 diabetes.
Methods: Fasting blood samples were drawn from a total of 649 Caucasians aged 20-29 years from the Toronto Nutrigenomics and Health Study, for genotyping, plasma 25-OH vitamin D, fasting glucose and insulin. Dairy intake was assessed using a one-month, 196-item food frequency questionnaire. Analysis of covariance was used to determine the association between genotype and dairy intake, 25-OH vitamin D, as well as biomarkers of type 2 diabetes.
Results: Approximately 33% had the CC genotype at position -13910, which has previously been associated with LI. The CC genotype was significantly associated with lower circulating 25-OH vitamin D (p=0.0001). This association was due, at least in part, to low total dairy intake (p=0.003), particularly skim milk in this population (p=0.0008). No significant association was observed between the -13910C>T gene variant and biomarkers of type 2 diabetes. Total dairy intake was inversely associated with fasting glucose (p=0.04); however, the association was attenuated after adjusting for age, sex, and BMI (p=0.08).
Conclusion: The LCT genotype that has been implicated to LI is associated with lower plasma levels of vitamin D, which could impact the risk of certain chronic diseases.

14. Observing the differences of obesity pattern and food choices between super market and public market consumers in Kandy District, Sri Lanka. (Chamil Senavirathne)

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Introduction: Food systems, both traditional and modern, are fundamentally connected to the health and welfare of society. Furthermore, there are concerns that income growth, urbanization, and supermarket penetration in developing countries may contribute to an “obesogenic” diet transition, particularly increased consumption of energy-dense processed food at the expense of fresh fruits and vegetables and grains.
Objective of the study is to determine the difference of healthy food choices between people who use supermarket and public market in Kandy District, Sri Lanka.
Method: Data was collected from individuals who visit supermarket (n=214) and individuals who use public market (n=124) during three hours of time. Good pack of those who provided the consent, was assessed by using a check list. Weight and height measurement was taken using standard methods. SPSS 16 version was used to assess the data.
Results: Mean age of supermarket and public market visitors were (45.8 SD (13.9) CI=95%) and (49.5 SD 13.8 CI = 95%). 165 females (73.7%) were in supermarket group while 84 females (67.7 %) were in public market group. 77.2% supermarket visitors and 67.7% public market visitors are regular customers. Vegetable and fruit contain of the supermarket users, are 35.7% and 29% respectively, while 81.5% and 50.8% of public market users have vegetable and fruits in their good pack. Availability of carbohydrate enriched food in supermarket and public market are 61.6% and 62.1% respectively. In terms of availability of processed meat products, supermarket and public market users are 40.6% and 17.7%. Mean BMI of the supermarket and public market group is 25.4 Kgm^{-2} (SD 4.07) and 24.1 Kgm^{-2} (SD 4.6) respectively. 52.3 % of the supermarket users are overweight while 37.9% of public market users are overweight and obese.
Conclusion: compared to the public market users, supermarket customers likely to contain more unhealthy foods and less amount of vegetable and fruits in their good pack.
Funding: This was a self-funding research

15. Effects of FTO on Obesity-related Anthropometrics are modulated by Age, Physical Activity and Artificially Sweetened Beverages: results from The HUNT Study (Ingrid Lovold Mostad)

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Objective: To test for interactions of non-genetic factors with effects of FTO
Methods: The two outermost quartiles of waist-hip-ratio in the HUNT3 all adult population survey was genotyped for FTO (rs9939609). We analysed data emerging from this extreme phenotype sampling by complete response analysis, by estimating effects of environmental exposures as well as genetic effects, separately for men and women in age groups 20-40, 40-60 and 60-80 years. We tested for interaction effects between FTO and non-genetic factors by stratification on the non-genetic factors in the 40-60 year age group. A P-value < 6.5×10^{-4} was considered significant after Bonferroni correction.
Results: In the 40-60 year age group (7944 women, 6694 men) anthropometric measurements confirmed that the FTO minor frequency allele (A-allele, MAF 0.42) was associated with increases in waist-hip-ratio, BMI, body weight, waist and hip circumference, but not height. Effect sizes were similar but not significant in the 60-80 year age (3948 women, 4084 men) whereas they were lower in the 20-40 year age group (4816 women, 3273 men). Reported high physical activity reduced the FTO effect in women and reversed the effect in men, as evident from non-overlapping confidence intervals. Intake of artificially sweetened beverages significantly modulated effects of FTO on waist circumference in women, the effect size of the risk allele being larger for regular drinkers vs never drinkers. Smoking (in a comparison ever vs. never) tended to increase the impact of the risk allele in men but not in women.

Conclusions: In this Norwegian population the effect of the FTO obesity risk allele is modulated by age, physical activity and drinking artificially sweetened beverages, with a tendency also for interaction with smoking. The findings highlight the importance of interaction between environmental and genetic risk factors for obesity.
Funding: Liaison Committee between the Central Norway RHA and NTNU.

16. Plasma fatty acids as predictors of glycemia and type 2 diabetes – METSIM Study (Maria Lankinen)

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Objective: Our aim was to investigate the fasting proportions of fatty acids (FAs) and estimated desaturase and elongase activities in three different lipid fractions in plasma, phospholipids (PL), cholesteryl esters (CE) and triglycerides (TG), as predictors for the worsening of glycemia (area under the glucose curve in an oral glucose tolerance test, Glucose AUC) and incident type 2 diabetes (T2DM) in a 5.9-y follow-up of the population-based METSIM cohort.

Methods: The FA proportions were measured in plasma PL, CE and TG fractions in 1364 Finnish men aged 45 to 68 y at baseline (mean ± SD: age 55 ± 5.6 year; body mass index 26.5 ± 3.5 kg/m^2; fasting plasma glucose 5.8 ± 0.6 mmol/l). The prospective follow-up study included only men who were non-diabetic at baseline and had data available at the follow-up (n=1302). A total of 71 participants developed new T2DM during the follow-up.
Results: After the adjustment for confounding factors, total saturated FAs, palmitoleic acid (16:1n-7), di-homo-gamma-linolenic acid (20:3n-6) and estimated stearoyl coenzyme A desaturase 1 and delta-6 desaturase (D6D) enzyme activities significantly predicted the worsening of glycemia, whereas total PUFA, linoleic acid (18:2n-6) and elongase activity were the main predictors for decreased Glucose AUC. Estimated D6D activity and dihomo-gamma-linolenic acid (20:3n-6) increased the risk of incident T2DM. The results were consistent across the three different lipid fractions, but FA proportions in PL and CE were stronger predictors for worsening of glycemia and incident T2DM than FA proportions in TG.
Conclusion: FA proportions in plasma lipid fractions and their ratios reflecting desaturase and elongase enzyme activities predicted the worsening of glycemia and incident T2DM.
Funding: Academy of Finland, University of Eastern Finland.

17. Prospective relevance of fruit and vegetable consumption during puberty for risk markers of type 2 diabetes in young adulthood – the role of the dietary glycemic index

(Anette Buyken)

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Objective: A higher consumption of fruits and vegetable (FV) may confer a lower risk of developing type 2 diabetes. This protective link may be partly attributable to flavonoids provided by these foods (FV-flavonoid). In addition, many fruits in particular are also characterized by a low or intermediate glycemic index (GI). This study examined the prospective associations of habitual FV or FV-flavonoid intake during puberty with homeostasis model assessment insulin resistance (HOMA-IR), alanine aminotransferase (ALT) and γ-glutamyltransferase (GGT) in younger adulthood and whether these are partly attributable to the dietary GI.
Methods: Healthy participants from the DONALD Study were eligible for analysis if they had provided a fasting blood sample in adulthood (18-39 y) and at least two 3-day dietary records during puberty (girls: 9-15y, boys: 10-16y, n=260). Additional multivariable regression analyses among those providing at least three 24-h urines in puberty (n=222) addressed urinary hippuric acid (HA), a biomarker of FV-flavonoid.
Results: A higher FV intake was independently related to lower HOMA-IR values (p_{trend}=0.03) and a tendency for lower GGT values (p_{trend}=0.099) in adulthood. These associations were removed by additional inclusion of dietary GI (conditional model, p=0.2 and p=0.5). Similarly, associations between higher HA excretion in puberty and lower adult HOMA-IR (p=0.03) and GGT (p=0.0001) were attenuated in a conditional model with dietary GI (p=0.08 and p=0.0005). Associations between pubertal HA and adult ALT (p=0.009) were not responsive to dietary GI adjustments. FV-flavonoids estimated from dietary records were not related to adult risk markers of type 2 diabetes (p>0.05).

Conclusions: Benefits of a higher FV or FV-flavonoid intake for type 2 diabetes risk markers may be partly attributable to the lower dietary GI associated with a preferred consumption of these foods or nutrients.
Protocol registration: not applicable
Funding source: Wereld Kanker Onderzoek Fonds (WCRF NL) (grant 2013/975)

18. Liquid calories from sugars do not increase body weight more than solid calories: A Systematic Review and Meta-Analysis of Controlled Feeding Trials (Jarvis Noronha)

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Objective: Although liquid calories from sugars have been shown to be more poorly compensated than solid calories in pooled analyses of acute preload trials, it is unclear whether they contribute more to weight gain over the longer term. To synthesize the evidence of the effect of liquid calories from sugars versus solid calories on body weight in controlled trials.
Methods: We searched Medline, EMBASE, and Cochrane Library through September 15, 2014. We included controlled trials of $\geq$ 7 days investigating the effect of liquid calories from sugars in exchange for solid calories from various sources on body weight. Two independent reviewers extracted relevant data as well as assessed study quality (Heyland methodological quality score) and risk of bias (Cochrane Risk of Bias Tool). Data were pooled using the generic inverse variance method and expressed as mean differences (MD) with 95% confidence intervals (CIs). Heterogeneity was assessed (Cochran Q statistic) and quantified (I^2 statistic).
Results: Six trials involving 84 participants met the eligibility criteria. The exchange of liquid calories from sugars for solid calories from various carbohydrates did not lead to significant weight gain (MD= 0.14 kg (95% CI -2.24 kg to 2.53 kg) over a median follow-up of 6-weeks. There was no evidence of inter-study heterogeneity (I^2 = 0%). Most trials were of high quality without any serious risk of bias.
Conclusion: Pooled analyses failed to show that liquid calories from sugars result in weight gain compared to solid calories from different carbohydrates. The small number and short duration of the available trials are important sources of uncertainty. There remains a need for larger and longer high quality trials.
Funding: The Canadian Institutes of Health Research (funding reference number, 129920) through the Canada-wide Human Nutrition Trialists' Network (NTN) and PSI foundation.

19. Sugar-sweetened beverages and type 2 diabetes: a meta-analysis of observational prospective studies
(Douglas Weed)

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Background. Whether an association exists between sugar-sweetened beverages (SSB) and type 2 diabetes (T2D) is unclear. We undertook a meta-analysis of observational studies to examine this issue.

Methods. We searched PubMed and Scopus to identify prospective observational studies on SSB and T2DM. Data were combined using random effects meta-analysis. We identified possible confounders, assessed the control of confounding, and calculated summary relative risks (SRREs) and 95% Confidence Intervals (CIs) including dose-response. Publication bias was assessed using funnel plots and Egger's regression.
Results. Eight studies met inclusion criteria. The summary estimate for extreme categories of SSB intake across fully adjusted models (SRRE=1.16; 95% confidence interval, 1.07-1.26) relative to the age-adjusted models (SRRE=1.47) resulted in a large (66%) attenuation in T2D risk and decreased the variance due to statistical heterogeneity (85% to 37%). A dose-dependent increase in risk was observed for categories of SSB intake up to 1 serving/day, although not for the highest serving category (2+/day). Many confounding factors influenced the SSB-T2D association, which differed for each selected study. Statistical examination did not suggest publication bias; however, a tally of cohorts that have reported on diet and T2D (N=22) suggests that the SSB-T2D relationship has been published in only a subset (N=8).
Conclusion. Although positive associations between SSB intake and T2D were observed in several meta-analysis models, interpretation is complicated by confounding and the potential for selective reporting of results across cohort studies.
Source of Support: Funding was provided by The Coca-Cola Company. By contractual agreement, all decisions regarding the content of the manuscript—including design, analysis, and interpretation—rest solely with the authors.

20. Effect of a Low-Glycemic Index/Load Diet on Body Weight: A Systematic Review and Meta-Analysis of Randomized Controlled Trials
(Catherine Braunstein)

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Objective: It is unclear whether low glycemic index and load diets contribute to weight loss. To synthesize the evidence of the effect of low glycemic index/load (GI/GL) diets on body weight in order to inform clinical practice guidelines.

Methods: We conducted a systematic review and meta-analysis of the effect of a low GI/GL diet on body weight. We searched databases Medline, EMBASE, and Cochrane Library (through June 26 2014). We selected randomized controlled trials ≥12 weeks in duration reporting body weight. The intervention diet was either low GI or GL compared against high GI/GL diets. We extracted all relevant data, which was pooled using the generic inverse variance method using random effects models and expressed as mean differences (MD) with 95% CIs. Heterogeneity was assessed by the Cochran Q statistic and quantified by the I^2 statistic. Study quality was assessed using the Heyland Methodological Quality Score (MQS)[1] and to assess risk of bias the Cochrane Collaboration Risk of Bias Tool[2] was used.
Results: Eligibility criteria were met by 28 RCTs (31 comparisons) including 2,778 participants who were healthy (n=43), had type 2 diabetesmellitus (n=693), was overweight or obese (n=2382), or had the metabolic syndrome (n=448). Low GI/GL diets did not significantly decrease body weight compared to high GI/GL diets (MD= -0.44kg (95% Cis -0.92, 0.05 kg)) with evidence of substantial heterogeneity (p<0.05). Most of the trials were of short duration (<12 weeks) and of poor quality (MQS<8).
Limitations: Most of the trials were of short duration (<12 weeks) and of poor quality (MQS<8) with substantial unexplained inter-study heterogeneity.
Conclusion: Low GI/GL diets do not lead to significantly more weight loss than high GI/GL diets. To address the sources of uncertainty, there is a need for larger, longer, higher quality trials.
Funding: The Canadian Institutes of Health Research (funding reference number, 129920) through the Canada-wide Human Nutrition Trialists' Network (NTN) and PSI foundation.

21. Starch Intake and Incidence of Type 2 Diabetes: A Systematic Review and Meta-Analysis of Prospective Cohorts
(Sandhya Pudaruth)

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Objective: To investigate the association between starch intake and incidence of type 2 diabetes.
Methods: MEDLINE, EMBASE, and The Cochrane Registry were searched through February 10, 2015. Prospective cohort studies in humans investigating the association between starch intake and incidence of type 2 diabetes were included. Full article review and data extraction were conducted by two independent investigators. Pool analyses were conducted using the generic inverse variance method with random effects models. Interstudy heterogeneity was assessed using the Cochran Q (X^2) statistic and quantified by I^2 statistic.
Results: 12 prospective cohort studies were included with a total of 137,840 otherwise healthy and non-diabetic participants. The risk ratio for incident type 2 diabetes comparing the highest to the lowest quintile of starch intake was 0.90 g (95% CI, 0.81, 1.00 g), I^2 = 0%, P =0.04.
Conclusion: Our meta-analysis found that starch, regardless of the amount consumed was related with a reduced risk of type 2 diabetes. Our evidence is supported by prospective cohort studies only, and more research clarifying the mechanisms by which starch reduces the risk for type 2 diabetes should be explored.

22. Evaluation of the Antidiabetic Activity of Roselle (*Hibiscus sabdariffa*) via Inhibition of alpha-Glucosidase Evelyn Ambush & Patience Obih (Evelyn Ambush)

Diabetes mellitus is a chronic disease that has become a global problem. Currently, it is the seventh leading cause of death in the United States and affects more than 25 million Americans. It is associated with many complications such as retinopathy, neuropathy and nephropathy. One of the therapeutic approaches to treat diabetes is to slow down the postprandial hyperglycemia through the inhibition of α-glucosidase. Drugs like acarbose and miglitol that possess this mechanism of action are already in the market. These drugs also produce gastrointestinal symptoms as their side effects. An antidiabetic agent with little or no side effects is preferred and will be a better substitute. The objective of this study was to investigate the inhibitory activities of *Hibiscus sabdariffa* commonly known as hibiscus, roselle, zobo drink, or red tea, on α-glucosidase. Roselle extract obtained by homogenizing the calyces with ethanol in a blender and evaporating the filtrate, was used in enzyme inhibition studies. The study was done in vitro using α-glucosidase obtained from Bacillus Stearothermophilus. The inhibition study was carried out in a 96 well plate using PNPG as the substrate and measured with Thermo Scientific® Multiskan spectrometer. IC_{50} was obtained and compared with that of acarbose. The result showed that roselle has some inhibitory activity on α-glucosidase. However, more studies are needed to elucidate its antidiabetic potential.

23. Angiotensin-(1-7) Decreases Body Weight and Adiposity by Regulating Lipid Metabolism in Rats (Carolina Campos Lima Moreira)

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Objective: The prevalence of obesity and obesity-related diseases, like insulin resistance and metabolic syndrome, continues to increase worldwide. Our purpose was to investigate the role of the peptide angiotensin-(1-7) in the management of adiposity through changes in lipid metabolism.
Methods: We evaluated the lipid metabolism of transgenic rats that overexpress an angiotensin (Ang)-(1-7)-producing fusion protein, TGR(A1-7)3292 (TGR), which induces a lifetime increase in circulating levels of this peptide. Male Sprague-Dawley rats, control (C) and TGR, 12-15 weeks old, were used, and body weight and visceral adiposity index were analysed. Serum levels of triacylglycerols (TAG) and TAG-VLDL were assayed. Lipoprotein lipase (LPL), TAG hydrolases and *de novo* lipogenic activities were evaluated in the epididymal and retroperitoneal adipose tissues. Data are means±SEM ($P<0.05$).
Results: The results obtained in fed rats showed reduction of body weight (20%) and visceral adiposity (35%) in the TGR group in relation to control. Reductions in serum levels of TAG (24%) and TAG-VLDL (14%) were observed in the TGR group when compared to control. Significant reduction of basal lipogenesis in the epididymal (TGR:124±14; C:279±36) and retroperitoneal (TGR:4.4±0.6; C:10.6±0.8) adipose tissues of the TGR group was observed. The transgenic animals also presented decreased LPL activity in the epididymal (TGR:0.70±0.06; C:1.56±0.18) and retroperitoneal (TGR:0.33±0.05; C:0.77±0.11) adipose tissues. TAG hydrolases activity decreased in the epididymal adipose tissue (TGR:0.51±0.03; C:0.71±0.04) and increased in the retroperitoneal adipose tissue (TGR:1.01±0.05; C:0.79±0.05) of transgenic rats.

Conclusions: Our data show that increased levels of Ang-(1-7) induces a reduction in body weight and adiposity, by inhibiting lipid accumulation processes, which could represent an attractive therapeutic tool for management of obesity and related disorders.
Protocol registration: 88/2012 (CEUA/UFMG)
Funding: CAPES, CNPq, FAPEMIG

24. Pterostilbene Reduces Fat Deposition in Liver and Epididymal Adipose Tissue of Obese Rats

(Carolina Campos Lima Moreira)

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Objective: Obesity is a chronic disease associated with disorders like insulin resistance, diabetes, nonalcoholic fatty liver disease (NAFLD) and dyslipidemias. Our aim was to investigate the role of pterostilbene, a phytoalexin found in blueberries and grapes, in the metabolism of a rodent obesity model.
Methods: The obesity was induced by subcutaneous injection of monosodium glutamate (MSG) during the first ten days of life. At 70 days of age, control (C) and MSG (M) animals were divided into groups that received by gavage pterostilbene (P) (40 $mg.kg^{-1}.day^{-1}$) or vehicle (V) during 20 days. $P<0.05$ was considered statistically significant.
Results: The results showed increase in the Lee index and in the weight of epididymal adipose tissue in MSG group (MV) compared to control (CV). Treatment of obese rats with pterostilbene (MP) decreased these parameters compared to MV. Serum triacylglycerols (TAG) levels increased in MV group when compared to CV and pterostilbene in obese rats decreased these parameters compared to MV. Regarding epididymal adipose tissue, the results showed that the obese group treated with vehicle presented increased lipogenic activity, lipoprotein lipase activity and adipocyte area. The treatment of the obese group with pterostilbene reduced lipogenic activity (29%), lipoprotein lipase activity (22%) and adipocyte area. Regarding liver, there was a marked increase in the percentage of lipid deposition in the MV group compared to CV and reduction (82%) in the MP group compared to MV. It was observed a decrease in TAG-hydrolytic activity in the MV (31%) compared to CV and an increase in the MP (27%) compared to MV.
Conclusions: Our data clearly established that the treatment of obese rats with pterostilbene has beneficial effects on the reduction of obesity and NAFLD.
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25. SIRT1 enhances lipid storage and utilization in adipose tissues by promoting mitophagy: role of adiponectin

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Objective: SIRT1, as a NAD^+-dependent protein deacetylase, is a key energy sensor controlling cellular responses to nutrient availability and in turn protecting against ageing-related metabolic diseases. Previous study demonstrated mice overexpressing SIRT1 selectively in adipose tissues (Adipo-SIRT1) exhibit increased capacity of lipid storage and utilization, which contributes to their enhanced systemic insulin sensitivity. The present study aims to assess whether the beneficial effect of SIRT1 is dependent on adiponectin, an adipocyte-derived and insulin-sensitizing hormone.
Methods: In light of this, Adipo-SIRT1 mice have been crossed with adiponectin-knockout mice (AKO) to produce mice with both genetic modifications (Adipo-SIRT1/AKO).
Results: Compared to Adipo-SIRT1 mice, adiponectin deficiency prevents SIRT1-mediated lipid storage in adipose tissues, but enhances ectopic lipid accumulation in liver. Compared to wild type mice, Adipo-SIRT1/AKO mice are less insulin sensitive and show impaired glucose tolerance. Mechanistically, mitophagy is enhanced by SIRT1 overexpression in adipose tissues, accompanied by decreased activity of mitochondrial complex-I.
Conclusions: Adiponectin is involved in the regulation of mitochondria functions by SIRT1, through modulating lipid constituents in adipose tissues.
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