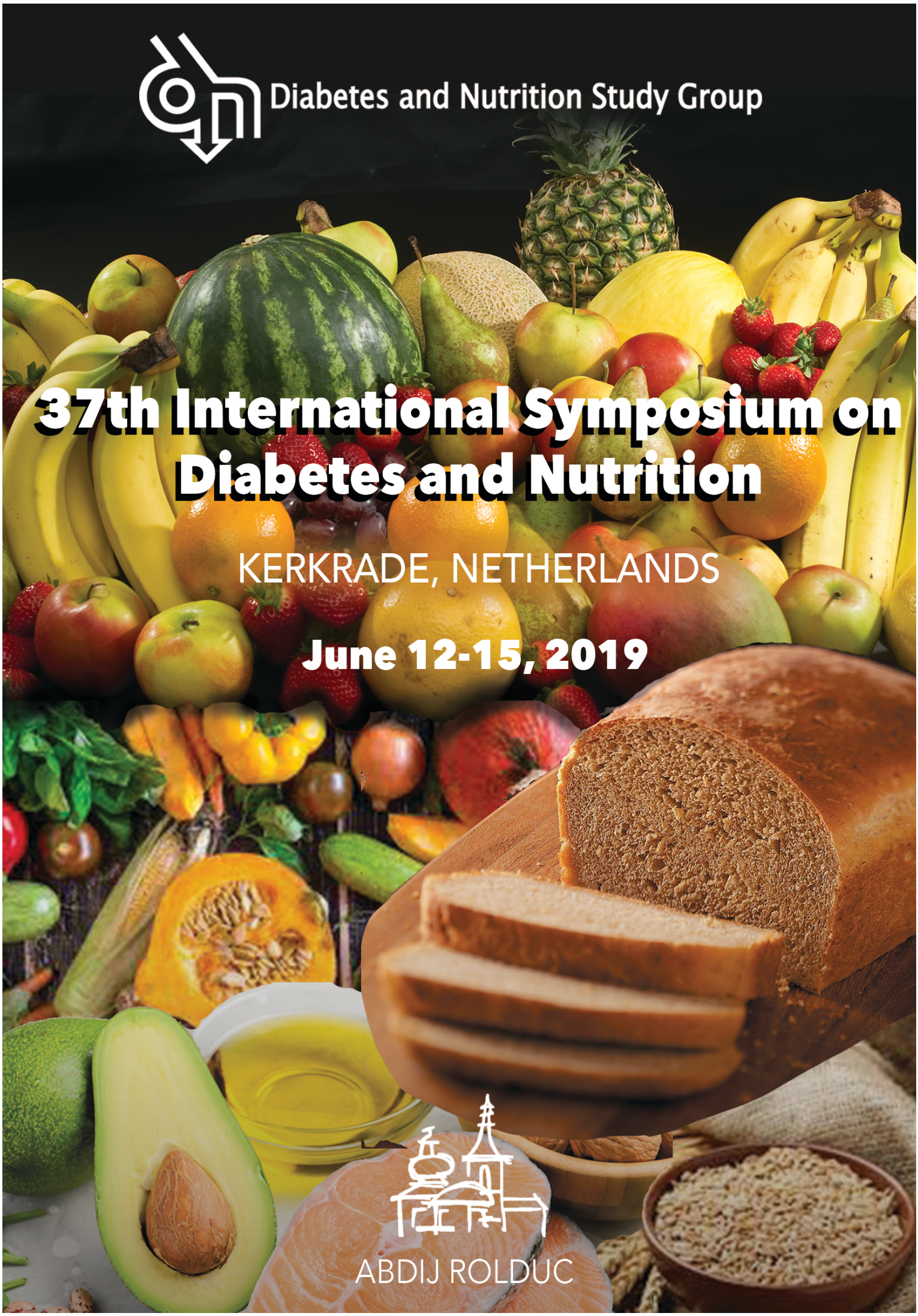
Diabetes and Nutrition Study Group
37th International Symposium on Diabetes and Nutrition
KERKRADE, NETHERLANDS
June 12-15, 2019
ABDIJ ROLDUC

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Welcome

We are delighted to welcome you to the 37th International Symposium on Diabetes and Nutrition, hosted in the beautiful ancient abbey ROLDUC in Kerkrade, close to Maastricht, the Netherlands.

The Diabetes and Nutrition Study Group (DNSG) of the European Association for the Study of Diabetes (EASD) was formed in 1982, and has worked to realize better scientific interchange on clinical and metabolic effects of nutrition in relation to diabetes etiology and the implementation of appropriate dietary and lifestyle measures to help prevent and manage diabetes optimally.

This symposium represents the annual international meeting of the Diabetes and Nutrition Study Group, bringing together scientists from around the globe, PhD students, physicians, and dietitians to showcase the latest advances in the field of Nutrition and Diabetes. We sincerely hope that you will enjoy this meeting, which will cover basic and applied sciences. The program will consist of plenary lectures, panel discussions and oral and poster abstract presentations, providing ample opportunity to discuss findings and meet (new) friends.

Sincerely yours,

The Organizing Committee

Ellen Blaak	*Maastricht University, Netherlands*
Fred Brouns	*Maastricht University, Netherlands*
Gijs H. Goossens	*Maastricht University, Netherlands*
Luc van Loon	*Maastricht University, Netherlands*
Simone J. Eussen	*Maastricht University, Netherlands*
Suzanne Bowser	*Maastricht University, Netherlands*
Tanja Adam	*Maastricht University, Netherlands*
Mireille Serlie	*Amsterdam UMC, Netherlands*
Edith Feskens	*Wageningen University, Netherlands*
Ulf Riserus	*Uppsala University, Sweden*

Diabetes and Nutrition Study Group

Scientific Programme

37TH INTERNATIONAL SYMPOSIUM ON DIABETES AND NUTRITION

ABBEY ROLDUC, KERKRADE, THE NETHERLANDS, JUNE 12-15, 2019

WEDNESDAY JUNE 12TH, 2019	
10:00	**Registration open**: Lobby-LOUNGE of the Abbey **Posters placement**: ZAAL 2
13:00 – 13:15	**OPENING CEREMONY**: AULA MINOR
	Ellen Blaak (The Netherlands) and Fred Brouns (The Netherlands)
13:15 – 13:45	**PLENARY LECTURE**
	Chairs: Ellen Blaak and Fred Brouns
	Current nutrition treatment guidelines in diabetes worldwide (Jim Mann, New Zealand)
13:45 – 15:45	**SESSION 1: IMPORTANCE OF CARBOHYDRATE QUALITY IN PREVENTION AND MANAGEMENT OF CARDIOMETABOLIC DIEASES**
	Chairs: John Sievenpiper (Canada) and Cyrill Kendall (Canada)
13:45 – 14:05	Carbohydrate quality scores and population health (Geoffrey Livesey, UK)
14:05 – 14:25	Glycemic index and load in diabetes prevention: Lessons learned from PREVIEW (Anne Raben, Denmark)
14:25 – 14:45	Beyond Porridge: Managing cardiometabolic risk with oats and barley (Vladimir Vuksan, Canada)
14:45 – 15:05	Lactose from dairy products and cardio-metabolic health (Fredrik Rosqvist, Sweden)
15:05 – 15:15	Replacing refined starch snacks with almonds on cardiometabolic health: New data from the ATTIS trial (Wendy Hall, United Kingdom)
15:15 – 15:25	Systematic review and network meta-analysis of non caloric sweetened beverages versus water and glycemic control (Néma McGlynn)
15:25 – 15:45	Panel discussion (all speakers and Tom Wolever)
15:45 – 16:15	**COFFEE BREAK**, ZAAL 4, FOYER
16:15 – 17:55	**SESSION 2: PROTEIN QUALITY AND QUANTITY AND DIABETES**
	Chairs: Ursula Schwab (Finland) and Hana Kahleova (Chez Republic)
16:15 – 16:35	Protein in the treatment of diabetes: animal versus plant-based (Andreas Pfeiffer, Germany)
16:35 – 16.55	Nutrition, diabetes and the anabolic resistance of aging (Luc van Loon, The Netherlands)
16:55 – 17:15	Dairy/protein intake and diabetes (Sabita Soedamah-Muthu, The Netherlands)
17:15 – 17:25	Whey protein combined with low fiber improves the lipid profile in abdominally obese subjects in a 12 week dietary intervention study: involvement of ApoB48, ApoB100 and adipose tissue LPL activity (Søren Gregersen, Denmark)

17:25 – 17:35	Dairy products consumption in the prevention of metabolic syndrome: a systematic review and meta-analysis of prospective cohort studies. (Guillermo Mena-Sánchez)
17:35 – 17:55	Panel discussion (all speakers)
18:00 –19:30	**SESSION 3: NETWORK POSTER SESSION WITH DRINKS AND BITES**
	Oral poster presentation and explanation session. Presenters have to stand with their poster.
20:00	**ALL PARTICIPANTS SOCIAL GATHERING, DINNER, DRINKS**: GROTE EETZAAL

THURSDAY JUNE 13TH, 2019	
08:30 – 10:00	**SESSION 4: DIETARY FAT QUALITY AND QUANTITY AND CARDIOMETABOLIC HEALTH**
	Chairs: Ulf Riserus (Sweden) and Jordi Salas Salvado (Spain)
08:30 – 08:50	Quantity and quality of lipids in diabetes prevention (Ursula Schwab, Finland)
08:50 – 09:10	Diet and hepatic steatosis (Leanne Hodson, United Kingdom)
09:10 – 09:30	Dietary fat quality and beta-cell dysfunction (Miriam Cnop, Belgium)
09:30 – 09:40	The effects of two energy restricted diets differing in nutrient quality on metabolic health in obese men and women; a randomized controlled trial (Lydia Afman, The Netherlands)
09:40 – 10:00	Panel discussion (all speakers)
10:00–10:55	**SESSION 5: THE MICROBIOME AND DIABETES**
	Chairs: Anne Marie Aas (Norway) and Emanuel Canfora (The Netherlands)
10:00 – 10:20	Prebiotics and probiotics in metabolic health (Koen Venema, The Netherlands)
10:20 – 10:40	Diet, microbiome and metabolic health (Gary Frost, United Kingdom)
10:40 – 10:55	Panel Discussion (all speakers)
10:55 – 11:25	**COFFEE BREAK**, ZAAL 4, FOYER
11:25 – 12:55	**SESSION 6: FRUIT SOURCES IN DIABETES – FRIEND OR FOE?**
	Chairs: Cyril Kendall (Canada) and John Sievenpiper (Canada) and Monica Bullo (Spain)
11:25 – 11:45	Fruit sources and cardio-metabolic health in the PREDIMED study (Jordi Salas Salvado, Spain)
11:45 – 12:05	Dried fruit in diabetes (David Jenkins, Canada)
12:05 – 12:25	Fruit juices in diabetes – a cause for concern? (John Sievenpiper, Canada)
12:25 – 12:35	Relation of different fruit sources with incident cardiovascular outcomes: a systematic review and meta-analysis of prospective cohort studies (Andreea Zurbau, Canada)
12:35 – 12:55	Panel discussion (all speakers)
12:55 – 14:25	**LUNCH**, GROTE EETZAAL

14:25 – 15:35	**SESSION 7: NUTRITION, INSULIN RESISTANCE AND THE BRAIN**
	Chairs: Tanja Adam (The Netherlands) and *tbd*
14:25 – 14:45	Nutrients and the central control of metabolism (Mireille Serlie, The Netherlands)
14:45 – 15:05	Diet and cognitive function in diabetes (Louise Dye, United Kingdom)
15:05 – 15:15	Striatal activity decreases following the intragastric infusion of glucose and lipids in the brain (Katy van Galen, The Netherlands)
15:15 – 15:35	Panel discussion (all speakers)
15:35 – 16:05	**COFFEE BREAK**, ZAAL 4, FOYER
16:05 –17:25	**SESSION 8: FOOD INTAKE & CIRCADIAN RHYTHM AND METABOLIC HEALTH**
	Chairs: Simone Eussen (The Netherlands) and Dario Rahelic (Croatia)
16:05 – 16:25	Timing of food intake and circadian rhythm (Andries Kalsbeek, The Netherlands)
16:25 – 16:45	Intermittent fasting and metabolic health (Courtney M. Peterson, United States)
16:45 – 17:05	Breakfast skipping and glycemic control (James Betts, United Kingdom)
17:05 – 17:25	Panel discussion (all speakers)
17:25 - 18:05	**SESSION 9: SHORT TALKS**
	Chairs: Charilaos Dimosthenopoulos (Greece) and Geoffrey Livesey (UK)
17:25 – 17:35	Modulation of sweet taste intensity using heterogenous distribution of sugars in liquid foodstuffs and its impact on postprandial metabolic response (Sameer Kulkarni, Switzerland)
17:35 – 17:45	Does the risk variant of the obesity-associated gene FTO rs9939609 affect insulin sensitivity in adults with obesity class 2 and 3? (A de Soysa, Norway)
17:45 – 17:55	Eating behavior associates with diet in men with impaired glucose metabolism (K Malkki, Finland)
17:55 – 18:05	Is there a soft drink vs. alcohol seesaw? A cross-sectional analysis of dietary data in the Australian Health Survey 2011-12 (T Wong, Australia)
18:30	**ALL PARTICIPANTS BUS DEPARTURE FOR EXTERNAL TOUR, DINNER, DRINKS**

FRIDAY JUNE 14TH, 2019	
08:30 – 09:30	**SESSION 10: NON-CALORIC SWEETENERS AND METABOLIC HEALTH: A DEBATE**
	Chairs: Per Bendix Jeppesen (Denmark) and Edith Feskens (The Netherlands)
08:30 – 08:50	Taking it personally: low calorie sweeteners, gut microbiome and metabolic health (Suez, Israel)
08:50 – 09:10	Low calorie sweeteners and metabolic health: evidence indicates benefits (John Sievenpiper, Canada)
09:10 – 09:30	Panel discussion (all speakers and Jennie Brand-Miller)

09:30 – 10:30	**SESSION 11: SHORT TALKS**
	Chairs: Anastasia Thanopoulou (Greece) and Suzanne Bowser (The Netherlands)
09:30 – 09:40	High dietary glycemic load is associated with higher concentrations of plasma and urinary advanced glycation endproducts: The CODAM Study (Kim Maasen, The Netherlands)
09:40 – 09:50	Changes in gut microbiota composition in response to a plant-based diet are related to changes in weight, body composition and insulin sensitivity (Hana Kahleova, USA)
09:50 – 10:00	Circulating but not fecal SCFA are related to GLP1 scretion, systemic lipolysis and insulin sensitivity (Mattea Müller, The Netherlands)
10:00 – 10:10	Effect of hydroxytyrosol administration, an olive oil phenolic compound on weight and fat loss: preliminary data from a randomized trial (Charilaos Dimosthenopoulos, Greece)
10:10 – 10:20	Dietary linoleate (18:2n-6) is not more readily oxidized than palmitate (16:0) but appears preferentially partitioned to phospholipids (Fredrik Rosqvist, United Kingdom)
10:20 – 10:30	A whole diet approach does not improve metabolic flexibility and insulin sensitivity but alters postprandial glucose profiles in overweight and obese adults (Eva Fechner, The Neherlands)
10:30 – 11:00	**COFFEE BREAK**, ZAAL 4, FOYER (POSTERS - ZAAL 2)
11:00 – 12:00	**SESSION 12: CARBOHYDRATE QUANTITY IN DIABETES PREVENTION: A DEBATE**
	Chairs: Jim Mann (New Zealand), Andreas Pfeiffer (Germany)
11:00 – 11:20	Role of carbohydrate restriction in the pathophysiology and management of type 2 diabetes (Hanno Pijl, The Netherlands)
11:20 – 11:40	Carbohydrate quantity in the dietary management of type 2 diabetes (Anne Marie Aas, Norway)
11:40 – 12:00	Panel discussion (all speakers and Fred Brouns)
12:00 – 13:00	**LUNCH**: GROTE EETZAAL
13:00 – 14:40	**SESSION 13: DOES ONE SIZE FIT ALL: PERSONALISED AND SUBGROUP-BASED NUTRITION**
	Chairs: Anne Raben (Denmark) and Gijs Goossens (The Netherlands)
13:00 – 13:20	Diet and gut microbiota interactions in personalised nutrition (Rikard Landberg, Sweden)
13:20 – 13:40	Personalised nutrition, glucose control and insulin sensitivity (Ellen Blaak, The Netherlands)
13:40 – 14:00	Personalised nutrition, inflammation and diabetes (Helen Roche, Ireland)
14:00 – 14:10	The impact of Personalised lifestyle advice as compared to regular care in newly diagnosed type 2 diabetics in Hellegom (Iris de Hoogh, The Netherlands)
14:10 – 14:20	Metabolic response to cereal fiber supplementation in subjects with prediabetes is depending on baseline glycemic and anthropometric status (OptiFiT) (Nina Meyer, Germany)
14:20 – 14:40	Panel discussion (all speakers and Jotham Suez)
14:40 – 15:10	**COFFEE BREAK**, ZAAL 4, FOYER (POSTERS - ZAAL 2)

15:10 – 15:35	**SESSION 14: DNSG PROGRAM AND ACTIVITIES UPDATES**
	Chairs: Ursula Schwab (Finland), Ulf Riserus (Sweden), Ellen Blaak (The Netherlands)
15:10 – 15:25	DNSG Clinical Practice Guidelines for Nutrition Therapy update (Andreas Pfeiffer, Germany)
15:25 – 15:35	36th ISDN Opatija, Croatia Recap Video (Dario Rahelic, Croatia)
15:35 – 15:45	**ANNOUNCEMENT NEXT DNSG MEETING**
	Chairs: Ursula Schwab (Finland), Ellen Blaak (The Netherlands)
	Invitation to the 38th International Symposium on Diabetes and Nutrition in Spain (Jordi Salas-Salvado, Spain)
15:45 – 15:55	**CLOSURE OF SYMPOSIUM**
	Ellen Blaak (The Netherlands) and Fred Brouns (The Netherlands)
16:00 – 17:00	**GENERAL ASSEMBLY** (Ursula Schwab, Finland)
18:00 – LATE	**BUS DEPARTURE FOR SURPRISE TOUR AND DNSG AWARDS DINNER PARTY**

Invited Speakers

Anne-Marie Aas

Anne-Marie Aas is a clinical dietitian at Oslo University Hospital, Aker, and associate professor at the Faculty of Medicine, University of Oslo. Both work and research is focused on diabetes and nutrition. Aas has been a member of the DNSG board since 2011 and a member of the study group since 2002. She has been a group leader for the work on carbohydrate-related recommendations in the ongoing revision of the DNSG's dietary recommendations. She has had similar obligations in the Norwegian guidelines for diet, physical activity and weight reduction in diabetes published 2016 and is also leading the work on an ongoing update of these guidelines. Aas is principal investigator for an RCT on prebiotic fibre's effect on blood glucose and appetite in people with type 2 diabetes. She is a member of the Medical Board of the Norwegian Diabetes Association and is also advisor for the association on issues regarding nutrition and dietetics.

James Betts

Professor Betts completed his PhD at Loughborough University in 2005 and joined the University of Bath the same year. Since then he has established a productive research group at Bath, working in the area of nutrition and metabolism. His research programme has been supported by over £2-million of external grant funding, awarded by UK research councils, international industry/governments and global charities – the findings of which have been published as over 70 papers in top-ranking scientific journals. James applies the concept of energy balance as a framework to explore metabolic regulation, most recently in relation to nutrient timing (chrononutrition), for which he was awarded the Nutrition Society Cuthberston Medal for *'excellence in clinical nutrition and metabolism research'* at the Royal Society of Medicine in 2015. James is a Fellow of the American College of Sports Medicine and Associate Editor of the *International Journal of Sport Nutrition & Exercise Metabolism*.

Ellen Blaak

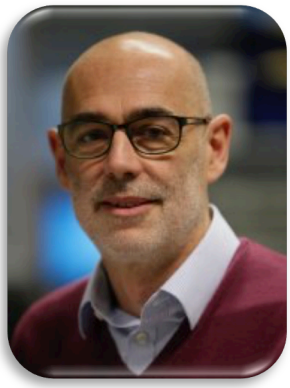
Professor Ellen Blaak has a chair in Human Biology at the Department of Human Biology; She acquired funding from Netherlands Organisation for Scientific research/Dutch Diabetes Research Foundation/European Union as a PI for 25 research projects, she has more than 230 publications in peer-reviewed journals and has supervised 25 PhD theses. She is actively involved in 7th and 8th framework EU projects. She is member of the Nutrition committee of the Dutch Health Council and of several advisory board/grant evaluation committees. She the secretary of the European Association for the Study of Obesity and is in this function involved in the promotion of obesity research, the dissemination of results and exchange of scientific information in the field of obesity within Europe. Beside being a professor at Maastricht University, she is a project leader within the Top Institute Food and Nutrition (in Wageningen, The Netherlands), a public private initiative, of knowledge centers and the (international) food industry.

Miriam Cnop

Miriam Cnop's research focuses on pancreatic β cell dysfunction and apoptosis in the pathogenesis of type 2 diabetes. Her team identified endoplasmic reticulum stress as a molecular mediator of saturated free fatty acid-induced β cell apoptosis. She has discovered and studied new forms of monogenic diabetes, where gene mutations affect β cell endoplasmic reticulum stress, mitochondrial function and tRNA biology. These diseases provide insight into key biological pathways important for β cell development, function and survival; dysregulation in these pathways by environmental factors underlies β cell failure in type 2 diabetes. To gain further insight into β cell failure in polygenic and monogenic diabetes and to test therapies, her team is differentiating patient-derived induced pluripotent stem cells into β cells, a highly disease-relevant model. She has published 94 papers that have been cited over 10,000 times. Her work has been funded by the European Foundation for the Study of Diabetes, the European Union FP 6 and 7, the Innovative Medicines Initiative and Horizon 2020, and the Belgian Fund for Medical Scientific Research. The European Association for the Study of Diabetes awarded her work with a Rising Star Award in 2005 and the Oskar Minkowski Award in 2013.

Louise Dye

Louise Dye is Professor of Nutrition and Behaviour in the Nutrition and Behaviour Group, in the Human Appetite Research Unit in the School of Psychology, University of Leeds. Louise is N8 Chair in Theme 3 (Improved Nutrition and Consumer Behaviour) and Academic Lead for the University of Leeds of the HEFCE catalyst funded N8 Agrifood Programme. The N8 Agrifood Programme brings together expertise across the N8 in agriculture, food production and supply in a changing environment with a global reach. In her N8 role, Louise is interested in how to encourage and sustain dietary behaviour change at individual, organisational and societal levels, linking to global issues of food production/supply, inequality and health. She is a member of the BBSRC Strategy Board for Biosciences for Health and of BBSRC's Diet and Health Research Industry club (DRINC) Steering Group. She is Associate Editor of Nutritional Neuroscience and the European Journal of Nutrition. She has published a number of influential systematic reviews and studies on the effects of impaired glucose tolerance and type 2 diabetes on cognition. She is a member of the Scientific Advisory Board of ILSI Europe and has served on 5 of their expert groups.



Gary Frost

Gary Frost currently is head of the Section for Nutrition Research and lead the Imperial Nutrition and Food Network. He qualified as a dietitian in 1982 and has always maintained a clinical input throughout his career. He was appointed to Professor of Nutrition and Dietetics at Imperial College Jan 2008. Prior to this, for 18 years Gary had work at Hammersmith Hospital. Over his time at Hammersmith he gained his PhD in Nutrition and was appointed Honorary Reader in Nutrition at Imperial College, then joined the University of Surrey as Professor of Nutrition and Dietetics in 2005. His research interests are very diverse, and some are listed below:

- Dietary Carbohydrates: These are a major focus of my work has been on the role of dietary carbohydrates on appetite regulation, insulin resistances and lipid metabolism in particular the glycaemic index as a model of the physiological effects of carbohydrates. We were the first to demonstrate the impact of low glycaemic diets on adipocyte metabolism. More recently in partnership with Professor Jimmy Bell we have used an integrative physiological approach to investigate the role of dietary carbohydrates on body composition and appetite regulation.
- Short Chain Fatty Acids: These are products of microbial fermentation of dietary carbohydrate in the gastrointestinal track. Our research program in partnership with the

University of Glasgow has led to the new understanding of the role for these molecules in appetite regulation.

- Food Structure: Over the last five years in partnership with colleagues at the Quadram Institute, John Innes Centre and the University of Glasgow we have had a major interest in how food structure influences human metabolism.

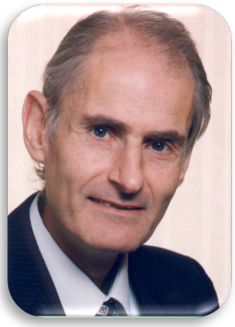
- Obesity Management: My group is part of the section of Division Diabetes, Endocrinology and Metabolism, which is headed by Professor Bloom where we have been part of the team that demonstrated the importance of a number of gut peptides in appetite regulation peptides in appetite regulation. We also have an on going project investigating the role of nutrients in the secretion of appetite regulating peptides and a major interest in the basic nutritional physiology involved in energy balance.

- Dietary intake: One of the major nutritional challenges is the actuate assessment of food intake in free living people. With Prof Holmes, Dr Garcia, Dr Posma and Prof Nicholson with had made a significant contribution by using metabolic profiling to improve dietary reporting. Also with Prof Yang and Dr Lo we are developing new camera technology to improve dietary reporting.

- Nutrition in the Elderly: My research group are interested in the relationship between food, the gastrointestinal tract and appetite regulation during aging. Over recent years we have demonstrated that anorexic hormones released from the gut higher than in young people.

Leanne Hodson

Prof Leanne Hodson obtained a PhD at the University of Otago in New Zealand for her nutrition research 'Biomarkers of Dietary Fat Intake'. She received the Girdlers Health Research Council (New Zealand) career development fellowship which provided the opportunity to work at the University of Oxford work with Professors Keith Frayn and Fredrik Karpe, to undertake research in human metabolism. In 2011 Leanne was awarded a British Heart Foundation Intermediate Basic Science Research Fellowship and in 2015 she received a British Heart Foundation Senior Basic Science Research Fellowship. Leanne became Professor of Metabolic Physiology, at the University of Oxford in 2018. For her work, Leanne has been awarded the Cuthbertson Medal from the Nutrition Society, UK (2017) and the Starling Medal from the Society of Endocrinology, UK (2018).

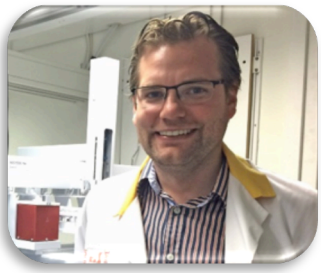


David Jenkins

Dr. David J.A. Jenkins is an University Professor, and Canada Research Chair, in the Departments of Nutritional Sciences and Medicines, 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, St. Michael's Hospital. He was educated at Oxford University, obtaining his DM, DPhil and DSc. He is a fellow of the Royal College of Physicians (London) and of the Royal College of Physicians of Canada. He has served on committees in Canada and the United States that formulated nutritional guidelines for the treatment of diabetes and recommendations for fiber and macronutrient intake under the joint US-Canada DRI system (RDAs) of the National Academy of Sciences. He also served as a member of Agriculture Canada's Science Advisory Board (2004-2009) on the future direction of Canada's agriculture and agricultural research. He has spent much time working with the food industry to develop products for the supermarket shelf and, for example, helped to initiate Loblaw's 'Too Good To Be True' and most recently their popular "Blue Menu" line of products. His research area is the use of diet in the prevention and treatment of hyperlipidemia and diabetes. He has over 300 original publications on these and related topics. His team was the first to define and explore the concept of the glycemic index of foods and demonstrate the breadth of metabolic effects of viscous soluble fiber, including blood glucose and cholesterol lowering. His group developed the cholesterol lowering concept of the dietary portfolio that has entered guidelines in many jurisdictions (e.g. CCS, Heart UK etc.). He believes in the therapeutic value of plant based diets and that diets have to be environmentally sustainable.

Andries Kalsbeek

Andries Kalsbeek is Professor of Experimental Neuroendocrinology at the Department of Endocrinology and Metabolism at the Amsterdam University Medical Center of the University of Amsterdam and head of the Hypothalamic Integration Mechanisms group at the Netherlands Institute for Neuroscience (NIN), both located in Amsterdam. He studied Biology at the University of Groningen (1978-1984) and obtained his PhD at the Netherlands Institute for Brain Research (NIBR) in Amsterdam (1989). He then went to Strasbourg (France) to perform a post-doc on the involvement of the brain biological clock in the control of seasonal rhythms. After his return to the NIBR (1992) his research concentrated on the output mechanisms of the biological clock and its control of hormone rhythms and the autonomic nervous system. In 2008 he joined the Department of Endocrinology and Metabolism and his research interests broadened to also include the hypothalamic control of energy metabolism, resulting in his current focus on glucose metabolism and circadian rhythms.



Rikard Landberg

Professor Rikard Landberg is the head of Division of Food and Nutrition Science at Chalmers University of Technology, Sweden. His group studies the preventive role of plant-based foods using observational- and intervention studies as well as various model systems. Landberg is the PI of several RCTs on the role of dietary fibre rich plant based foods in appetite and body weight regulation and on cardiometabolic risk. He also leads studies to test novel OMICs-based personalized concepts for improved CVD prevention. Metabolomics is a key technique in Landbergs' research program and it is developed and applied for discovery and validation of exposure and prediction biomarkers, and for molecular phenotyping as the basis for tailored dietary strategies for personalized nutrition. Novel biomarkers from his lab are extensively used all over the world. Professor Landberg has authored ~110 papers, ~10 book chapters, delivered ~20 invited/keynote lectures and is the editor of one book. He has an H-index of 28 according to Scopus. Professor Landberg is a member of the Young Academy of Sweden and of the National Committee for Nutrition and Food Science at the Swedish Royal Academy of Sciences.

Geoffrey Livesey

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 have seen him associate 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, Acumentia, DNSG & its Diabetes Nutrition Guidelines Committee.

Luc van Loon

Luc van Loon is a Professor of Physiology of Exercise at the Department of Human Biology at Maastricht University Medical Centre. Luc has an international research standing in the area of skeletal muscle metabolism. Current research in his laboratory focuses on the skeletal muscle adaptive response to exercise, and the impact of nutritional and pharmacological interventions to modulate muscle metabolism in health and disease. The main research interests of his laboratory include muscle metabolism, sports nutrition, clinical nutrition, adaptation to endurance and resistance type exercise, and the use of physical activity and/or nutritional interventions to improve health in chronic metabolic disease and aging. The latter are investigated on a whole-body, tissue, and cellular level, with skeletal muscle as the main tissue of interest.

Jim Mann

Jim Mann has been Professor in Medicine and Human Nutrition at the University of Otago and Consultant Physician (Endocrinology) in Dunedin Hospital for the past 30 years. Previously he lectured at the University of Oxford and was a Physician in the Radcliffe Infirmary. He is Director of the World Health Organisation (WHO) Collaborating Centre for Human Nutrition, the 'Healthier Lives' National Science Challenge and the New Zealand-China Non-Communicable Diseases Research Collaboration Centre and; co-Director of the Edgar Diabetes and Obesity Research Centre (EDOR). He is principal investigator for the Riddet Institute, a national Centre of Research Excellence at Massey University. He is a Fellow of the Royal Society of New Zealand and has been awarded the Hercus Medal of the Royal Society and the University of Otago Distinguished Research Medal. He was appointed a Companion of New Zealand Order of Merit for services to Medicine and medical research.

Courtney Peterson

Dr. Peterson is an Assistant Professor in the Department of Nutrition Sciences at the University of Alabama at Birmingham. Her research interests include intermittent fasting, circadian rhythms, food groups, and mathematical modeling of metabolism and body composition. The overarching goal of her research is to develop novel dietary interventions to treat type 2 diabetes, cardiovascular disease, and obesity. She is also interested in determining the degree to which dietary interventions can induce diabetes remission. Dr. Peterson recently conducted the first controlled feeding trial of time-restricted feeding, a form of intermittent fasting that involves eating in a ≤10-hour period and fasting for the rest of the day. She was also the first to combine time-restricted feeding with eating in alignment with the circadian clock. Called early-time-restricted feeding (early TRF), early TRF is tantamount to eating dinner in the afternoon. Her research investigates how time-restricted feeding affects glucose metabolism, blood pressure, lipids, inflammatory and oxidative stress markers, energy metabolism, autophagy, and gene expression in humans. Dr. Peterson has received The Obesity Society's Early Career Research Grant, and she holds a Ph.D. in physics from Harvard University and four Master's degrees.

Andreas F. H. Pfeiffer

Dr. Andreas Pfeiffer is Senior Professor of Internal Medicine and head of the Department of Endocrinology, Diabetes, and Nutrition at the Charité University Hospital, Campus Benjamin Franklin, Berlin, Germany, and the Clinical Nutrition/German Diabetes Center (DZD) Research Group at the German Institute of Human Nutrition in Potsdam. Andreas 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. Dr. Pfeiffer was Co-Editor of Diabetologia from 2003-2006, and currently serves on several editorial boards. He has published over 400 articles in peer-reviewed journals such as Endocrinology, Diabetes, Diabetes Care, Lancet, Science, and New England Journal of Medicine amongst others. Awards have included the German Association of Internal Medicine's Theodor Frerichs Award in 1990, the Herman and Lilly Schilling Professorship, 1992-1997, the Hippocrates Prize of the Greek Association of Internal Medicine in 2013 and the German Society of Endocrinology's Berthold Medal in 2014. 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.

Hanno Pijl

Hanno Pijl is an internist-endocrinologist at the Leiden University Medical Center (LUMC). He is professor of Diabetology at the same institution since 2007. He practices internal medicine, and co-authored over 250 papers in peer reviewed scientific journals, primarily related to obesity and type 2 diabetes. He has been a member of the Dutch Health Council (standing committee on nutrition) from 2008-2016. He is former president (2014-2017) of the Dutch Obesity Partnership, an umbrella organization connecting all stakeholders involved in obesity care in the Netherlands. He currently co-chairs the Dutch Innovation center for Lifestyle Medicine (www.nilg.eu), a joint effort of LUMC and the Dutch Organisation of Applied Science (TNO) focusing on lifestyle interventions in health care.

Anne Raben

Anne Raben is Ph.D.in Human Nutrition and Professor in the Obesity Research Unit at the Department of Nutrition, Exercise and Sports (NEXS), SCIENCE, University of Copenhagen, DK. AR has more than 25 years of clinical research experience with prevention and treatment of obesity and related diseases, eg type-2 diabetes and CVD. Her main focus has been on short and long-term dietary intervention studies, specifically studying the effect of amount and type of carbohydrate (ie sugar vs non-caloric sweeteners, low vs high-glycemic index, GI) and protein (animal and plant sources) on appetite and body weight regulation, glycemic and lipidemic control. Currently, she is Project Coordinator of the multinational EU project "PREVIEW" (2013 – 2018), PREVention of Diabetes through lifestyle Intervention and populations studies in Europe and around the World (www. previewstudy.com, grant no 312057). The main purpose was to investigate if a high-protein, low-GI diet is more effective than a conventional diet in preventing diabetes in pre-diabetic subjects. The role of physical activity levels, sleep and stress was also considered. The core of the project is a 3-year worldwide, multicentre, clinical intervention trial in 2,500 pre-diabetic subjects and population studies with up to 170,000 subjects. Anne is part of a consortium, which recently achieved a new Horizon2020 project on low-caloric sweeteners, "SWEET". The main purpose of the project is to study the efficiency, safety and risks/benefits of single or combined use of different sweeteners. Their effects on metabolism, gut brain signalling, neuro-behaviour, and microbiota will also be studied as will sustainability, market related aspects, consumer perceptions and preferences. The project will start 01-Oct-2018 and run for 5 years.

Helen Roche

Full Professor of Nutrigenomics, UCD Institute of Food & Health / UCD Conway Institute, School of Public Health, Physiotherapy & Sports Science, University College Dublin, Dublin 4, Ireland**.** Additional Professional Appointments: Visiting Professor of Nutrition, Queens University Belfast, Northern Ireland; Chair of the European Healthy Diet Healthy Life, Joint Programming Initiative, Scientific Advisory Board; Fellow of the International Union of Nutritional Sciences. Academic and Research Role**:** Helen Roche leads the Nutrigenomics Research Group at the UCD Conway Institute / UCD Institute of Food & Health. Nutrigenomics uses state-of-the-art 'omoics' technologies to gain a greater understanding of the molecular effects of nutrition on health. Her team has a specific interest in Personalised Nutrition, identifying and understanding the molecular basis of responsiveness and efficacy of more targeted lifestyle interventions in population sub-groups. Her research team explores different aspects of the interactions between food related, nutritional stressors, metabolism and inflammation within the context of obesity, insulin resistance, type 2 diabetes and sarcopenia. She leads / is co-PI within several national and international research programmes focused on dietary manipulations to attenuate risk of obesity, diabetes and sarcopenia. For further information see https://people.ucd.ie/helen.roche

Fredrik Rosqvist

Dr. Rosqvist has a broad interest in human nutrition and metabolic health, and a special interest in fatty acids and lipid metabolism. He is primarily involved in performing dietary intervention studies, investigating the effects of various nutritional challenges (e.g. dietary fats) on the accumulation of fat within the liver and on potential underlying mechanisms. Dr. Rosqvist obtained his undergraduate degree from Stockholm University and the Karolinska Institute and his doctoral degree from Uppsala University, under the supervision of Professor Risérus. He recently completed Postdoctoral studies at the University of Oxford, under the supervision of Professor Hodson, where he utilized stable-isotope tracer techniques to probe human lipid metabolism.

Jordi Salas-Salvadó

Jordi Salas-Salvadó is professor of Nutrition at the Rovira i Virgili University, Principal Investigator of the CIBER on Obesity and Nutrition Network of the Instituto Carlos III (CIBERobn), and member of the Catalan Government's Network of Experts of the Public Health Agency. Now is the vice-President of the Pere Virgili Research Institute on Health Sciences (IISPV) in Reus. He is also director of the Catalan Centre for Nutrition of the Institute of Catalan Studies (CCNIEC), the main aim of which is to contribute to basic and applied research in nutrition. He is a member of the Institute of Catalan Studies, a member of the Spanish Academy of Nutrition, a corresponding member of the Royal Academy of Medicine of Catalonia, and chairman of the World Forum for Nutrition Research and Dissemination, an international committee of experts under the auspices of the International Nut Council (INC) for the promotion and development of research into nuts and health. Between 2010 and 2015 he became a member of the Scientific Committee of the Spanish Agency for Food Safety (AESAN), which depends on the Ministry of Health. Also in this period he was elected president of the Spanish Federation of Scientific Societies of Food, Nutrition and Dietetics. In last years, Dr. Salas' research has focused on human clinical trials evaluating the effect of diets and dietary compounds on obesity, diabetes, metabolic syndrome and cardiovascular disease. Since 2005, he is one of the leaders of the PREDIMED Study and Chair of the PREDIMED-Plus study Steering Committee, two large clinical trials for the primary prevention of cardiovascular disease and mortality. Jordi Salas-Salvadó has published more than 500 scientific articles, and he has been cited more than 16,000 times. He has edited 9 books and has participated in more than 300 national and international congresses and symposia. He has been awarded numerous prizes. Of these particular mention should be made of the Danone Prize (1997), the Josep Trueta Prize of the Academy of Medical Sciences of Catalonia (2012), the Food and Health Prize of the University of Navarra, and the Josep Culebras Prize of the Spanish Society of Parenteral and Enteral Nutrition, and the Dupont Prize for Science 2014. All of these prizes were awarded in recognition of his scientific career.

Ursula Schwab

Ursula Schwab, PhD, is a 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 EU funding instruments. She is involved in the updating of the Nordic Nutrition Recommendations, and several national good practice guidelines.

Mireille Serlie

Mireille Serlie is an endocrinologist at the Amsterdam University Medical Centers, location AMC, in the Netherlands. Her research focusses on obesity, insulin resistance and the role of the brain in control of glucose metabolism in humans. She also studies effects of nutrients on brain regions involved in food intake. Her lab measures in vivo metabolic fluxes combined with tissue biopsies and neuroimaging studies. She recently showed a role for the dopaminergic system in insulin sensitivity and the effect of overfeeding and obesity on brain regions involved in the regulation of food intake. Her lab also recently showed that liver steatosis-induced hepatic insulin resistance is associated with diacylglycerol-associated protein kinase Cε translocation. Her work is mostly translational and her lab collaborates with national and international basic scientists.

Vladimir Vuksan

Dr. Vuksan is currently a professor in both, the Departments of Medicine and Department of Nutritional Sciences, Faculty of Medicine, University of Toronto, Canada. He is also Associated Director of Clinical Nutrition and Risk Factor Modification Center, St. Michael's Hospital and a Research Scientist of the Li Ka Shing Knowledge Institute. Dr.Vuksan has served as a chairman of the Canadian National Nutrition Committee of the Canadian Diabetes Association, Natural Health Products Research Society of Canada, and as Vice-president of the European Nutrition and Diabetes Study Group. Over the last 30 years in Toronto, as a transitional scientist Dr. Vuksan has made significant contributions within a unique multidisciplinary research group investigating the physiological effects of nutritional and herbal interventions in diabetes and heart disease. He has published over 150 original research publications, some of them in leading journals Lancet, NEJM, Circulation, Diabetes Care, Hypertension, Am J Clinical Nutr. ect., and holds an H-factor of 50 (Scopus), with over 8500 citation. He has received numerous awards in recognition of his contribution to nutrition, including a 2010 Charles H. Best award from the Canadian Diabetes Association for his translational work in diabetes; 2012 Korean National, World Science Award for his studies of ginseng, and received 2104' Graduate Teaching Award, Faculty of Medicine, University of Toronto, in recognition of excellence in graduate student mentorship.

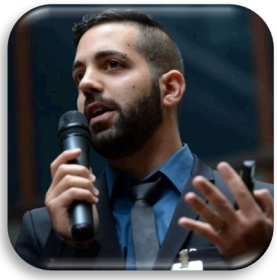
John Sievenpiper

Dr. Sievenpiper is a Clinician Scientist who holds appointments as an Associate Professor in the Department of Nutritional Sciences and the Lifestyle Medicine Lead in the MD Program at the University of Toronto. He also holds appointments as a Staff Physician in the Division of Endocrinology & Metabolism and Scientist in the La Ka Shing Knowledge Institute at St. Michael's Hospital. Dr. Sievenpiper completed his MSc, PhD and Postdoctoral Fellowship training in the Department of Nutritional Sciences at the University of Toronto. He completed his MD at St. Matthew's University followed by Residency training in Medical Biochemistry at McMaster University leading to his certification as a Fellow of the Royal College of Physicians of Canada (FRCPC). He has established an internationally recognized research program focused on using randomized controlled trials and systematic reviews and meta-analyses to address questions of clinical and public health importance in relation to diet and cardiometabolic disease prevention with a particular interest in the role of sugars, carbohydrate quality, and plant-based dietary patterns. He is directly involved in knowledge

translation with appointments to the nutrition guidelines' committees of Diabetes Canada, European Association for the study of Diabetes (EASD), Canadian Cardiovascular Society (CCS), and the Obesity Canada. He is the recipient of numerous awards including a PSI Foundation Graham Farquharson Knowledge Translation Fellowship, Diabetes Canada Clinician Scientist Award, Banting & Best Diabetes Centre Sun Life Financial New Investigator Award, CIHR-INMD/CNS–New Investigator Partnership Prize, and CNS Young Investigator Award. He has authored more than 175 scientific papers and 15 book chapters.

Sabita Soedamah-Muthu

Dr. Sabita Soedamah-Muthu is currently a full Associate Professor Diabetes Epidemiology at Tilburg University, Tilburg School of Social and Behavioral Sciences, Center of Research on Psychology in Somatic Diseases (CORPS), Department of Medical and Clinical Psychology, Tilburg, the Netherlands. She also has been appointed as a Senior Visiting Research Fellow at the University of Reading, Reading, United Kingdom, in the School of Agriculture, Policy and Development and institute for Food, Nutrition and Health. Her main research domains are: Epidemiology, Nutrition, Diabetes, Cardiovascular diseases. She completed her MSc (1996) degree in Biomedical Health Sciences at the Radboud University Nijmegen and her PhD (2003) degree in Epidemiology, University College London, United Kingdom. For her PhD thesis, she studied the risk of coronary heart disease in type 1 diabetes, mainly focused on inflammatory markers and lipoprotein subclasses. She obtained funding for her PhD by the Graduate School Research Scholarship, University College London. Her current appointment at the universities of Tilburg and Reading allows her to link her experience in clinical epidemiology, nutritional epidemiology with psychological interventions. She carried out several meta-analyses and initiated new projects to study nutritional factors (from nutrients, foods and dietary patterns) in the development of diabetes and cardiovascular diseases. Her main topics, are sugars, fibre, dairy products and dietary patterns. She has many national and international collaborations (Europe, USA, Australia) and access to several large cohort studies and clinical trials. She obtained an International Award, the Wiebe Visser International Dairy Nutrition Prize, for her research on dairy products. So far, all her work led to >100 full-text publications. A combination of hypothesis-driven epidemiological studies and good understanding of mechanisms is essential to progress scientific knowledge.



Jotham Suez

Dr. Jotham Suez is a post-doctoral fellow at the Weizmann Institute of Science in Israel, studying host-microbiome interactions under the supervision of Prof. Eran Elinav. His research is focused on harnessing gut bacteria to improve the efficacy and safety of therapeutics and dietary interventions. In his graduate work concerning personalized nutrition, Jotham discovered a surprising role for gut bacteria in mediating a detrimental effect of non-caloric sweeteners on the host's metabolic health. His work on probiotics further demonstrated the importance of the microbiome in precision therapeutics, as gut bacteria can confer person-specific colonization resistance to probiotics, potentially affecting their efficacy and safety. His work was published in highly impactful journals, including *Nature, Cell, Nature medicine*, and *Science*, and recieved multiple distinctions, including the John F. Kennedy Prize, the Strauss research award, and the Otto Schwarz scholarship for excellent PhD research. Jotham is a member of the American Society for Microbiology and the Israeli Society for Microbiology.

Koen Venema

Prof. Dr. Koen Venema is i) founder and CEO of the company Beneficial Microbes® Consultancy, ii) the initiator and co-organizer of the Beneficial Microbes Conference-series, iii) editor-in-chief of the journal Beneficial Microbes, and iv) Professor at Maastricht University - campus Venlo, where has a chair in Gut Microbiology. He obtained his PhD at the University of Groningen on the production of bacteriocins in lactic acid bacteria. After a PostDoc at NC State University in North Carolina USA, he has been working for >15 years at TNO (the Dutch Organization for Applied Scientific Research) using the sophisticated **T**NO ***i****n vitro* **m**odels of the gastrointestinal tract (nick-named TIM), where he focused on the use of these system studying the gut microbiota. The gut microbiota has been shown to be extremely important in health and disease. In his research group at Maastricht University over the past 4 years, the effect of food components on health and disease through the gut microbiota are studied using the TIM-systems, with which he now has ~20 years of experience. His research focuses on means to modify the composition, but especially the activity/functionality of the gut microbiota in relation to health and disease, including obesity and diabetes.

Abstracts – Short Oral Presentations

SESSION 1

O1 - Systematic review and network meta-analysis of non-caloric sweetened beverages versus water and glycemic control

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Background: Health authorities recommend a reduction in sugar sweetened beverages (SSBs). Water is the preferred replacement strategy as there is concern that non-caloric sweetened beverages (NSBs) contributes to increased diabetes risk. To address this concern, we conducted a systematic review and network meta-analysis (SRMA) of randomized controlled trials (RCTs) assessing the effect of NSBs versus water on glycemic control using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach.

Methods: Medline, EMBASE, Cochrane Library was search through March 6th, 2018. We included RCTs 7 days duration that compared the effect of any two of the three comparators (NSBs, water, SSBs) on HbA1c, fasting plasma glucose (FPG), fasting plasma insulin (FPI) and HOMA-IR. Two reviewers independently extracted relevant data and assessed risk of bias (Cochrane Risk of Bias tool). Data were pooled using random effects network meta-analysis in which mean differences (MD) with 95% confidence intervals (CIs) were synthesized for direct comparisons (NSB vs. Water) with contribution from indirect comparisons (NSB vs. SSB and SSB vs. Water). Heterogeneity was assessed (Cochran Q) and quantified (I2 statistic). The overall certainty of the evidence was assessed using GRADE.

Results: Eligibility criteria were met by 8 RCTs in 796 predominantly overweight/obese participants. Compared with water, NSBs did not show an effect on HbA1c (0.32 [-0.11, 0.74]), FPG (MD, 0.024 [-0.68, 0.114]), FPI (9.18 [-1.94, 20.31]), or HOMA-IR 0.19 [-0.18, 0.56]), and HbA1c (0.32 [-0.11, 0.74]) with evidence of substantial heterogeneity across all outcomes (all I2>50%, p<0.0001 from pairwise-analysis). The certainty of the evidence was graded as “high” for FPG, “moderate” for FPI and HOMA-IR with downgrades for serious imprecision and “very low” for HbA1c with additional downgrades for serious indirectness and inconsistency.

Conclusions: Current evidence does not allow us to conclude that NSBs are any worse than water in their effect on glycemic control. More high quality trials will improve our estimates. NCT02879500.

SESSION 2

O2 - Whey protein combined with low dietary fiber improves the lipid profile in abdominally obese subjects in a 12-week dietary intervention study: involvement of ApoB48, ApoB100 and adipose tissue LPL activity

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Background: Increased fasting and postprandial triglyceride (TG) levels are predictive markers of cardiovascular disease and type 2 diabetes. Acute studies indicate that whey protein (WP) and dietary fiber separately can reduce postprandial TG. We have previously reported that fasting TG and postprandial TG levels are reduced in abdominally obese subjects by a diet rich in whey protein (WP) and low in dietary fiber. However, the involvement of chylomicron secretion, endogenous VLDL production and adipose tissue TG clearance is unknown. The purpose of this study was therefore to examine the individual and combined effects of a longer-term dietary intervention with WP and dietary fibers from wheat on TG levels as well as ApoB48, ApoB100 and adipose tissue LPL activity.

Methods: Seventy-three abdominally obese subjects were randomized to one of four groups: WP-LoFi (60 g/d WP, 10 g/d fiber), WP-HiFi (60 g/d WP, 30 g/d fiber),MD+LoFi (60 g/d maltodextrin, 10 g/d fiber), MD- HiFi (60 g maltodextrin, 30 g/d fiber) in a 12-week, double-blinded intervention. A standardized high-fat meal tests was performed at baseline and end of intervention and fat tissue biopsies were performed. Primary outcomes were fasting and postprandial TG. Secondly, plasma apoB-48 and apoB-100 were measured and lipoprotein lipase (LPL) activity in adipose tissue was assessed.

Results: Sixty-five subjects completed the trial. Fasting ApoB48 and ApoB-100 were both lower after the intervention in WP-LoFi group ($p<0.05$). No change in LPL activity in adipose tissue was found.

Conclusions: 12 weeks of daily WP supplement reduces fasting and postprandial TG levels. The effect is most pronounced when combined with low fiber intake. The underlying mechanisms seems to involve reduced chylomicron secretion as well as endogenous VLDL production, but not TG clearance.

O3 - Dairy products consumption in the prevention of metabolic syndrome: a systematic review and meta-analysis of prospective cohort studies.

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Background: Previous meta-analyses have associated dairy products with a lower risk of metabolic syndrome (MetS). Since then, new studies evaluating not only total dairy. The objective of the present work was to systematically review and meta-analyze the associations between the consumption of total dairy products and subtypes (milk, yogurt and cheese) and the incidence of MetS.

Methods: Relevant studies were identified through MEDLINE and COCHRANE databases. Eligible studies were prospective cohort studies that examined the association between dairy product consumption and/or different subtypes of dairy and the risk of MetS. From the 2,994 identified articles, 12 and 11 studies were included for the qualitative and quantitative synthesis, respectively.

Results: Total dairy product consumption was inversely associated with the risk of MetS [9 study comparisons; RR: 0.73 (95%CI 0.64–0.83)]. Low-fat dairy was inversely associated with the risk of MetS [2 study comparisons; RR: 0.77 (95% CI 0.65–0.91)]. Total yogurt consumption was inversely associated with the risk of MetS [4 study comparisons; RR: 0.74 (95%CI 0.66–0.82)]. The linear RR per 1 serving of yogurt/ day was 0.77 (95%CI 0.60–1.00). Low-fat yogurt was inversely associated with the risk of MetS [2 study comparisons; RR: 0.72 (95%CI 0.62–0.84)]. Whole-fat yogurt was inversely associated with the risk of MetS [2 study comparisons; RR: 0.81 (95%CI 0.70–0.94)]. Total milk consumption was inversely associated with the risk of MetS [6 study comparisons; RR: 0.79 (95%CI 0.64–0.97)]. Whole-fat dairy consumption was not associated with MetS risk.

Conclusions: Our findings suggest that the consumption of total and low-fat dairy products, milk and yogurt, is inversely associated with the risk of MetS.

SESSION 4

O4 – The effects of two energy restricted diets differing in nutrient quality on metabolic health in obese men and women: a randomized controlled trial

Schutte S, Esser D, Siebelink E, Boshuizen HC, Mensink M, Afman LA, *on behalf of the Wageningen Belly Fat Study team*

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Background: Abdominal obesity increases the risks of chronic metabolic diseases. Energy restriction (ER) is a strategy to correct metabolic parameters associated with these diseases. Enhancing the nutrient quality of an ER-diet might improve metabolic health even further. Objective: We examined the additional effects of nutrient quality on top of ER by investigating the effects of two ER-diets differing in nutrient quality on cardio-metabolic risk factors in subjects with abdominal obesity.

Methods: We performed a parallel-designed 12 week 25% ER dietary advice intervention study. Participants aged 40-70 with abdominal obesity (BMI >27kg/m^2 or waist circumference >88cm for females, >102cm for males) were randomized over three groups; a Targeted diet (*n*=40, TD) enriched with monounsaturated fatty acids, *n-3* polyunsaturated fatty acids, soy protein, and fiber; a Western-type diet (*n*=40, WD) high in saturated fatty acids, predominantly animal protein, and fructose or a control group (*n*=30). Before and after the intervention, fasting HbA1c, glucose, insulin, triglycerides, free fatty acids, total cholesterol, HDL-cholesterol, ALT, AST, and GGT as well as postprandial responses of glucose, insulin, triglycerides, and free fatty acids to a mixed meal test (76.3g carbohydrates, 17.6g protein, 60.0g fat) were determined. Furthermore, intra-hepatic lipids and abdominal body fat distribution were assessed and fasting and postprandial vascular measurements were conducted.

Results: Participants in the TD lost significantly more weight (-8.4±3.2kg in total) than in the WD (-6.3±3.9kg). Both ER-diets significantly reduced intra-hepatic lipids as well as subcutaneous and visceral adipose tissue mass. Only the TD significantly lowered fasting total cholesterol and triglycerides while both ER-diets reduced fasting glucose, insulin, GGT, HbA1c, and postprandial responses of glucose as well as systolic and diastolic blood pressure.

Conclusions: A 25% ER-diet can induce clinically relevant weight loss, improvements in insulin sensitivity and glucose homeostasis, and reductions in intra-hepatic lipids and blood pressure, independent of nutrient quality. However, enhancing nutrient quality of a 25% ER-diet with monounsaturated fatty acids, *n-3* polyunsaturated fatty acids, soy protein, and fiber results in greater weight loss and reductions in total cholesterol and triglycerides. An enriched ER-diet with high nutrient quality can be considered as the superior whole diet approach in improving metabolic health in abdominally obese subjects.

SESSION 6

O5 – Relation of different fruit sources with incident cardiovascular outcomes: a systematic review and meta-analysis of prospective cohort studies

Zurbau A[1,2,3], Au-Yeung F[1,2,3], Blanco Mejia S[1,2,3], Khan TA[1,3], Vuksan V[1,2,3,4,5], Jovanovski[1,2], Leiter LA[1,2,3,4,5], Kendall CWC[1,2,3,6], Jenkins DJA[1,2,3,4,5], Sievenpiper JL[1,2,3,4,5]

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[5]*Division of Endocrinology and Metabolism, St. Michael's Hospital*
[6]*College of Pharmacy and Nutrition, University of Saskatoon*

Background: The benefit of fruit as part of a healthy diet is increasingly being balanced against concerns that certain sources may not have the intended benefits owing to their sugar content. Some diabetes associations including The International Diabetes Federation have even discouraged the intake of certain fruit sources in people with diabetes. To quantify the relation of different fruit sources with cardiovascular disease (the major cause of death and disability in people with diabetes), we undertook a systematic review and meta-analysis of prospective cohorts studies in people with and without diabetes.

Methods: MEDLINE, EMBASE and the Cochrane Library were searched through 24 May 2018 for prospective cohort studies reporting the relation of fruit and its sources with cardiovascular outcomes in people with and without diabetes. Two reviewers extracted data and assessed the quality of the studies (Newcastle-Ottawa Scale). Data were pooled using generic-inverse variance method with random effects models and expressed as risk ratios with 95% confidence intervals. Heterogeneity was assessed (Cochran Q statistic) and quantified (I^2 statistic). The quality of the evidence was assessed using GRADE.

Results: We included 74 prospective cohort comparisons involving 2,745,421 individuals 104,752 events. Total fruit intake was associated with decreased CVD (risk ratio, 0.94 [95% confidence intervals, 0.92 [0.86 to 0.98]), CHD (0.87 [0.83 to 0.92]) and stroke (0.82 [0.77 to 0.87]) incidence and CVD (0.82 [0.75 to 0.89]), CHD (0.84 [0.76 to 0.91]) and stroke (0.79 [0.71 to 0.89]) mortality. There was an interaction by fruit sources ($P<0.05$) with greater cardiovascular benefits seen for citrus, fruit juice, and pommes. No fruit sources, including dried fruit, showed evidence of harm. The certainty of the evidence was graded as "very low" to "moderate" with the highest certainty for total fruit.

Conclusions: Fruit from different sources are associated with a cardiovascular benefit and no sources indicated harm in people with and without diabetes. Further studies are needed to improve our confidence in the estimates for different fruit sources.

SESSION 7

O6 - Striatal activity decreases following the intragastric infusion of glucose and lipids in lean humans

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Background: Striatal dopamine signaling is involved in reward and the motivation to eat. Animal studies showed that nutritional signals that arise following the ingestion of nutrients induce striatal dopamine release. These post-ingestion nutritional signals may therefore play an important role in the rewarding aspects of food consumption and the regulation of feeding behavior. To study this in humans, we assessed the taste- and preference-independent effects of glucose and lipids on striatal activity in lean humans.

Methods: in 15 lean humans, we assessed the effects of direct intragastric infusions of glucose 50% (250ml, 500kcal), Intralipid ® (250ml, 500kcal) and water (250ml) on the BOLD signal of striatal subregions (the nucleus accumbens, the caudate nucleus and the putamen), using functional MRI.

Results: Relative to the infusion of water, intragastric glucose infusion induced a significant decrease in BOLD signal in the nucleus accumbens ($p<0.001$), caudate nucleus ($p=0.049$) and putamen ($p=0.006$). The intragastric Intralipid® infusion induced a significant decrease in the nucleus accumbens ($p=0.025$) and putamen ($p=0.025$). There was no difference between the effects of glucose and Intralipid® infusion on neuronal activity in these striatal regions.

Conclusions: These findings show that, in lean individuals, striatal neuronal acitivity is reduced following intragastric infusion of macronutrients in a taste- and preference independent manner. These data suggest an important role for post-ingestion nutritional signals in the regulation of hedonic eating behavior. We are currently assessing these post-ingestion nutritional effects in obese individuals before and after weight loss.

SESSION 9

O7 - Modulation of sweet taste intensity using heterogeneous distribution of sugars in liquid foodstuffs and its impact on postprandial metabolic response

Kulkarni SS[1], Aubert B[2], Lima A[2], Thomazo JB[2], Frei N[1], Beaumont M[3], Lepage M[4], Camacho S[2], Macé K[1], Rytz A[3], Lê KA[1] , Le Révérend B[2]

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Background: The heterogeneous repartition of taste active molecules as means to tune taste perception has been extensively investigated. Yet there is neither a scientific understanding of the phenomena, nor a robust pattern identified to trigger a specific sensory modulation. Using numerical simulations, a specific heterogeneous pattern enhancing tastants concentration near taste pores was hypothesized. The pattern was reproduced by gustometer and confirmed to be sweeter against a homogeneous reference with the same sucrose concentration allowing 30% decrease in sucrose without any sensory impact.

Methods: Tuning taste perception in this manner represents a unique opportunity to explore the relative contribution of a caloric sweetener load and oral sweet taste perception on metabolic responses. For that purpose we performed an open, randomized, cross-over, controlled study (n=16) where glucose, insulin and C-peptide values were measured over 3 hours after ingestion of 300ml of either a homogeneous control (HM43, 43g glucose, high sweetness), a negative homogeneous control (HM30, 30g glucose, low sweetness), the patterned heterogeneous product (HT30, 30g glucose, iso-sweet with HM43) or a mixed glucose/sucralose product (SUCRAL30, 30g glucose + 18mg sucralose, iso-sweet with HM43).

Results: Glucose incremental Area Under the Curve (iAUC) elicited by all the 30g glucose treatments was lower ($p<0.05$) than that of HM43, regardless of sweetness. Insulin and C-peptide iAUC elicited by all the 30g glucose treatments was lower than that of the 43g glucose treatment ($p<0.05$). Interestingly, HT30 elicited a lower insulin and C-peptide iAUC ($p<0.05$), compared to HM30 suggesting an impact of sweet taste on insulin response. This was not observed in SUCRAL30.

Conclusions: In summary, we showed that sweet taste can be tuned using taste delivery systems, without apparent negative impact on metabolic responses.

O8 - Does the risk variant of the obesity-associated gene FTO rs9939609 affect insulin sensitivity in adults with obesity class 2 and 3?

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Background: Metabolic effects of FTO related to its effects on BMI have been proposed; however, they have been only sparsely investigated in obese individuals. We investigated whether the FTO risk allele SNP rs9939609 is associated with insulin resistance (IR) and in particular with hepatic IR.

Methods: In 79 participants (68% women) with BMI obesity class 2-3, hepatic IR was measured with a 2h hyperinsulinaemic euglycaemic clamp (0.3 mU/kg/min) including a stable tracer infusion of [6,6-2H2] glucose. Study participants, recruited from an outpatient obesity clinic, were double blindly enriched for homozygous (hz) carriers of rs9939609. By this design, 1/3 was hz (A/A-genotype), 1/3 heterozygote (A/T) and 1/3 was hz of the non-risk allele (T/T). We calculated glucose infusion rate (GINF), rate of appearance and disappearance (Ra and Rd) as tracer variables, and metabolic clearance rate (MCR) response. Results: Although we did not detect genotype effects on the tracer variables we found a significant negative effect of FTO risk on MCR response (p=0.024). A unit increase in FTO-risk decreased MCR response by 30% of a standard deviation of MCR response (i.e. more insulin resistant). The effect was reduced to 25% when controlling for gender (p=0.06). For the whole study population women were more insulin sensitive than men, indicated by higher GINF (p=0.01), lower Ra response (p<0.007) and higher MCR response (p<0.02).

Table 1. Participants and hepatic insulin resistance by genotype, mean values (SD)

Risk allele	Age (years)	BMI (kg/m2)	GINF (µmol/kg/min)	Ra response (µmol/min/kg)	Rd response (µmol/min/kg)	MCR response (ml/min/kg)
T/T, n=25	38.8 (9.5)	43.1 (5.7)	20.48 (8.33)	2.88 (1.09)	10.00 (2.02)	2.04 (0.39)
A/T, n=27	43.7 (10.1)	41.8 (4.7)	22.52 (9.45)	2.81 (1.33)	10.74 (2.44)	2.14 (0.61)
A/A, n=27	43.9 (13.3)	44.3 (4.7)	19.06 (6.34)	2.64 (0.93)	9,32 (1.55)	1.82 (0.32)
P (lin.regr.)	0.121	0.370	0.484	0.380	0.168	0.024

Conclusion: Using a euglycemic clamp protocol in obesity class 2 and 3 revealed a fairly robust effect of the A allele (risk allele) of FTO SNP rs9939609 on the MCR of glucose, indicating a link to insulin resistance.

O9 - Eating behavior associates with diet in men with impaired glucose metabolism

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Background: Eating behaviour (EB) offers information about why and how people eat and choose their food. However, studies on EB of aging men are scarce. The aim was to investigate whether EB is associated with diet, body mass index (BMI), glucose metabolism, or HbA1c in aging Finnish men with impaired glucose tolerance.

Methods: Altogether 420 men in the T2D-GENE study (mean age 65 y, BMI 29 kg/m2, total cholesterol 5.03 mmol/l, fasting plasma glucose 6.03 mmol/l, HbA1c 37.5 mmol/mol, blood pressure 134/84 mmHg) were included in these analyses. Half of the subjects had low and half had high genetic risk of type 2 diabetes (T2D). EB was measured by the 18-item Three Factor Eating Questionnaire (TFEQ-R18) and scores for factors Cognitive Restraint (CR), Uncontrolled Eating (UE) and Emotional Eating (EE) were calculated and were each categorized into 3 groups (low, medium, high) and were analysed with one-way ANOVA. Nutrient intake was measured by a 4-day food record and a food frequency questionnaire. A 2-hour Oral Glucose Tolerance Test (OGTT) was used to assess glucose and insulin metabolism.

Results: The mean of CR was 49.8%, UE 27.3%, and EE 18.7%. The men with high CR had lowest intake of energy and sodium compared with those with less CR. Similar association were seen with intake of saturated fatty acids and alcohol, and opposite association with carbohydrates. CR was not associated with any OGTT measurements. Participants with the high UE or EE had highest 2-hour plasma insulin concentrations. High UE and EE were also positively associated with BMI, and the higher the EE the higher HbA1c. CONCLUSIONS: CR is the most prevalent feature of EB in aging Finnish men with impaired glucose tolerance. CR is associated with dietary patterns associated with lower risk of T2D, whereas UE and EE with metabolic factors associated with higher risk of T2D.

O10 - Is there a soft drink vs. alcohol seesaw? A cross-sectional analysis of dietary data in the Australian Health Survey 2011-12

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Background: Previous studies in older Australians have reported higher alcohol intake in those with low intake of added sugars. The relationship between energy in liquid form (alcoholic beverage vs. sugar- sweetened beverages (SSB)) and measures of obesity, has not been evaluated. We aimed to assess the association between the energy derived from SSB and alcoholic beverages, and to model the association between the substitution of SSB with alcoholic beverages and waist circumference.

Methods: Dietary data from the Australian Health Survey 2011-12 were analyzed. Usual SSB intake of adults ≥19 years old was estimated using the Multiple Source Method and participants were classified into zero-, low- or high-SSB consumers according to their usual SSB intake. Energy from alcoholic beverages in the 3 SSB-consumption groups was compared using multivariable general linear models, adjusting for sex, socioeconomic variables, and energy intake from energy sources other than SSB and alcoholic beverages. A substitution model was used to assess the association between the replacement of SSB with alcoholic beverages and waist circumference.

Results: Zero-SSB consumers made up 33% of the included participants. In all age groups, zero-SSB consumers had significantly higher energy intakes from alcoholic beverages than low- and high-SSB consumers. Low- and high-SSB consumers had similar consumption of alcoholic beverages. Substituting SSB intake with alcoholic beverage intake was not associated with significant differences in waist circumference in most age groups.

Conclusions: In Australia, adults who avoid SSB are common but consume substantially more energy in the form of alcoholic beverages. An increase in alcoholic beverage intake could be an 'unintended consequence' of strictly discouraging SSB consumption.

SESSION 11

O11 - High dietary glycemic load is associated with higher concentrations of plasma and urinary advanced glycation endproducts: The CODAM Study

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Background: Advanced glycation endproducts (AGEs) and their precursors (dicarbonyls) are associated with the progression of diseases such as diabetes and cardiovascular disease. Plasma concentrations of dicarbonyls methylglyoxal (MGO), glyoxal (GO), and 3-deoxyglucosone (3-DG) are increased after an oral glucose load indicating that consumption of diets high in carbohydrates may induce endogenous formation of dicarbonyls and AGEs. This study examines the associations of dietary glycemic index (GI) and glycemic load (GL) with the concentration of dicarbonyls and AGEs in plasma and urine.

Methods: Cross-sectional analyses were performed in an observational cohort [CODAM, n=494, 59±7 years, 25% type 2 diabetes]). GI and GL were derived from FFQs. Dicarbonyls and AGEs were measured in the fasting state by UPLC-MS/MS. MGO, GO and 3-DG and protein-bound N -(carboxymethyl)lysine (CML), N -(1- carboxyethyl)lysine (CEL) and pentosidine were measured in plasma. Free forms of CML, CEL and N -(5- hydro-5-methyl-4-imidazolon-2-yl)-ornithine (MG-H1) were measured in both plasma and urine. Multiple linear regression was performed. Models were adjusted for health and lifestyle factors, and dietary factors.

Results: GI was not associated with any of the dicarbonyls or AGEs. GL was positively associated with free plasma and urinary MG-H1 (=0.23, 95% CI [0.02,0.43], p=0.03 and =0.34, 95% CI [0.12,0.55], p=0.003), as well as free urinary CML (=0.28, 95% CI [0.06,0.50], p=0.01), in the fully adjusted model including GI.

Conclusions: A habitual diet higher in GL is associated with higher concentrations of free plasma and urinary AGEs. These AGEs are most likely a reflection of AGE accumulation and degradation in tissues, where they may be involved in tissue dysfunction. The associations with GL, but not GI, indicate that carbohydrate quantity might play a larger role than carbohydrate quality.

O12 - Changes in gut microbiota in response to a plant-based diet are related to changes in weight, body composition and insulin sensitivity: A 16-week randomized clinical trial.

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Background: The aim of this study was to test the effect of a 16-week plant-based dietary intervention on gut microbiota composition, body weight, body composition, and insulin resistance in overweight adults with no history of diabetes.

Methods: Participants (n=148) were randomized to follow a low-fat vegan diet (n=73) or to make no diet changes (n=75) for 16 weeks. At baseline and 16 weeks, gut microbiota composition was assessed, using uBiome kits. Dual energy X-ray absorptiometry was used to measure body composition. PREDIM index was used to assess insulin sensitivity. Repeated measure ANOVA was used for statistical analysis.

Results: Body weight was reduced significantly in the vegan group (treatment effect -5.8 kg [95% CI, -6.9 to -4.7 kg]; p<0.001), particularly due to a reduction in fat mass (treatment effect -3.9 kg [95% CI, -4.6 to -3.1 kg]; p<0.001) and in visceral fat (treatment effect -172 cm3 [95% CI, -308 to -37 kg]; p=0.01). PREDIM increased significantly (p<0.001) in the vegan group (treatment effect +0.88 [95% CI, +0.5 to +1.2]; p<0.001 The relative abundance of Faecalibacterium prausnitzii increased in the vegan group (treatment effect +4.8 [95% CI, +1.97 to +7.58%]; p=0.001). Relative changes in Faecalibacterium prausnitzii correlated negatively with changes in body weight (r=-0.26; p=0.008), fat mass (r=-0.26; p=0.008), and visceral fat (r=-0.25; p=0.01). The relative abundance of Bacteoides fragilis increased in the vegan group (treatment effect +19.5% [95% CI, +14.7 to +24.3%]; p<0.001). Relative changes in Bacteroides Fragilis correlated negatively with changes in body weight (r=-0.48; p<0.001), fat mass (r=-0.48; p<0.001), visceral fat (r=-0.24; ; p=0.02), and positively with changes in PREDIM (r=0.36; p=0.0004).

Conclusions: A 16-week low-fat vegan dietary intervention induced changes in gut microbiota that were related to changes in weight, body composition and insulin sensitivity in overweight adults.

O13 – Circulating but not fecal SCFA are related to GLP-1 secretion, systemic lipolysis and insulin sensitivity

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Background: The microbial-derived short-chain fatty acids (SCFA) acetate, propionate and butyrate may provide a link between gut microbiome and whole-body insulin sensitivity (IS). We investigated associations between fecal and circulating SCFA and fasting circulating glucose, insulin, lipid metabolites, gut hormones (glucagon-like 1 (GLP-1), peptide YY), substrate oxidation and with clamp-derived insulin sensitivity.

Methods: In 160 participants (64% male, nondiabetic BMI: 19.2-41.0 kg/m2) fecal and circulating SCFA, circulating insulin, glucose, lipids, and gut hormones were measured. In an obese/overweight subgroup (n=93), IS was determined using a hyperinsuliemic-euglycemic clamp. Data were analyzed using multiple linear regression analysis adjusted for sex, age and BMI.

Results: Plasma acetate, propionate and butyrate concentrations were positively associated with fasting GLP-1 levels. Additionally, these SCFA were negatively related to whole-body lipolysis (glycerol), triglycerides and free fatty acids levels (standardized (std) ß adjusted (adj) -0.190, P=0.023; std ß adj -0.202, P=0.010; std ß adj, respectively). The subgroup analysis showed that plasma acetate and propionate were negatively and positively correlated with IS (M-value: std ß adj -0.294, P<0.001; std ß adj 0.161, P=0.033, respectively). From faecal SCFA, only fecal propionate was associated positively with plasma propionate (std ß 0.268 P=0.001).

Conclusions: We show that circulating rather than fecal SCFA associated with GLP-1 concentrations, whole-body lipolysis and peripheral IS in humans. Our data suggest that circulating SCFA may be a better indicator of microbial SCFA production than fecal SCFA and/or may indicate that SCFA may have to enter the systemic circulation to elicit an effect on metabolic health.

O14 - Effect of hydroxytyrosol administration, an olive oil phenolic compound, on weight and fat loss: preliminary data from a double-blind prospective study

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Background: Olive oil is a basic nutrient of the Mediterranean diet which has favorable effects in cardiometabolic health. Hydroxytyrosol (HXT) is a phenolic compound of olive oil which is derived from oleuropein and has antioxidant, anticancer, and anti-inflammatory properties. However, the potential effect of HTX on weight loss has not been examined so far.

Methods: Thirty overweight and obese adult women with BMI 27-35 kg/m2 with stable body weight defined as <5% change during the past 3 months, euthyroidic status, standard hypolipidemic and other treatment and without serious health problems were included in the study. Participants were randomly assigned to 3 groups: group A receiving 15mg of HXT daily, group B received 5mg of HXT daily and group C received placebo; HTX or placebo was administered in the form of capsules 3 times daily before meals. All visited a dietitian in a monthly basis, for 6 months and all investigators were blinded to the trial.

Results: Changes in body weight, fat mass and visceral fat were compared with ANOVA. There were no significant differences at baseline in age, level of exercise and menstruation status among the study groups. Mean weight loss was -4.17, -1.21 and -1.98kg for groups A, B and C, respectively at month 1 (P=0.01). At 3 months, mean weight loss was -8.00, -2.77 and -4kg, respectively (P=0.005) while at 6 months it was -11, -2.73 and -2.33kg, respectively (P<0.001). Similar significant reductions were observed in fat mass and visceral fat between group A and B, as well as between group A and C (P<0.05), while no significant differences were found between group B and C. Participants did not report any problem with capsules consumption or adverse events.

Conclusions: Consumption of 15 mg HXT daily divided in 3 doses before main meals for 6 months seems to be effective in reduction of body weight, fat mass and visceral fat in overweight and obese women. This intervention was acceptable and well tolerated.

O15 - Dietary linoleate (18:2n-6) is not more readily oxidised than palmitate (16:0) but appears preferentially partitioned to phospholipids

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Background: There is a commonly held view that dietary polyunsaturated fatty acids (PUFAs) are more prone to enter oxidation pathways compared with saturated fatty acids (SFAs). This view is generally supported by animal work, although human evidence is limited and contrasting. Here, we utilised stable- isotope tracers to compare the whole-body oxidation of palmitate (16:0, the major dietary SFA) with linoleate (18:2n-6, the major dietary PUFA) in healthy men and women matched for age and BMI.

Methods: 12 men and 12 women were fed a standardised breakfast meal containing [U13C]-labelled palmitate or linoleate in a cross-over design separated by a wash-out period of at least two weeks. Blood and breath were collected before (time 0) and at 30, 60, 90, 120, 180, 240, 300 and 360 minutes after consuming the meal and expired 13C-labelled CO2 was used as a measure of whole-body fatty acid oxidation. We further analysed the enrichment of 13C-labelled palmitate and linoleate in plasma triglycerides (TAG), phospholipids (PL) and non-esterified fatty acids (NEFA) to investigate potential differential enrichment in plasma lipid fractions.

Results: Preliminary results indicate that whole-body oxidation of palmitate and linoleate were similar during the initial 180 minutes but started to diverge thereafter with palmitate being oxidised to a higher degree than linoleate at 300 min ($P=0.02$) and 360 min ($P<0.001$) after the meal. 13C-labelled linoleate was preferentially enriched in plasma PL compared with 13C-labelled palmitate, which was preferentially enriched in plasma TAG and NEFA.

Conclusions: In healthy humans, dietary linoleate is not more readily oxidised than palmitate but appears preferentially partitioned to phospholipids.

O16 - A whole diet approach does not improve metabolic flexibility and insulin sensitivity, but alters postprandial glucose profiles in overweight and obese adults.

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Background: Metabolic flexibility is the ability to adapt fuel oxidation to fuel availability. Metabolic inflexibility has been associated with obesity, the metabolic syndrome, type 2 diabetes and insulin resistance, which is characterized by an impaired ability to increase glucose oxidation upon insulin stimulation. Metabolic flexibility can be improved by lifestyle changes like exercise and weight loss. However, little is known about the effect of nutrition on metabolic flexibility.

Methods: In this parallel randomized trial, healthy men and women (50-70 years) with a BMI of 25-35kg/m² consumed a healthy diet (HD; high in fruits and vegetables, pulses, fibers, nuts, fatty fish, polyunsaturated fatty acids, and low in salt and high-glycemic carbohydrates; n=19) or a typical Western diet (WD; n=21) for 6 weeks, following a 2-week run-in period. Metabolic flexibility, measured as the change in respiratory quotient upon insulin stimulation (ΔRQ), and insulin sensitivity, expressed as the M-value, were both determined with a hyperinsulinemic euglycemic clamp. Additionally, glucose and insulin responses were measured under fasting and postprandial conditions during a 5-hour high-fat high-glycemic mixed meal challenge.

Results: ΔRQ (p=0.730) and insulin sensitivity (p=0.802) were not significantly affected by diet. Postprandial RQ did also not show significant differences (p=0.610), whereas postprandial glucose excursions were significantly higher in the HD group at T30 (p=0.014) and T45 (p=0.026) after mixed meal ingestion (diet*time, p=0.037). Fasting glucose (p=0.530) and HbA1c (p=0.124) remained unchanged, whereas decreases in fasting insulin were significantly more pronounced with the HD (p=0.038).

Conclusions: A whole diet approach for 6 weeks did not improve metabolic flexibility and insulin sensitivity. Surprisingly, higher postprandial glucose excursions were observed with the HD, which could not be directly linked to metabolic flexibility or postprandial substrate oxidation. It remains to be determined whether the short-time increase in postprandial glucose is physiologically relevant or detrimental to metabolic health.

SESSION 13

O17 - The impact of Personalized Lifestyle Advice as compared to regular care in newly diagnosed type 2 diabetics in Hillegom

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Background: Several studies have shown that improving lifestyle can result in remission of type 2 diabetes (T2D). However, T2D is not one disease, but can manifest itself in different organs to a different extent. An oral glucose tolerance test can provide information on which organs are mainly compromised for an individual patient, by evaluating the glucose and insulin response (subtyping diabetes). This information can be used for a more personalized lifestyle treatment. The aim of this study was to determine whether a subtype diagnosis of T2D based on organ-specific insulin resistance and beta-cell function and subsequent personalized lifestyle treatment is feasible in a primary care setting. The effectiveness in improving T2D related health status was compared to standard care.

Methods: 60 primary care T2D patients were included in the intervention group, and were assigned to seven phenotypes according to the type of insulin resistance (liver or muscle) and degree of beta-cell function, as determined by an OGTT (baseline). The OGTT was repeated after 13 weeks. Based on the phenotype, subjects received a low-caloric diet, strength & endurance training, or both for 13 weeks. HbA1c, fasting glucose, body weight and BMI were measured at baseline and 13 weeks. Control data were collected retrospectively (n=58).

Results: The intervention group showed a significant reduction in body weight (9.0±4.0kg; $p<0.005$), BMI (3.1±1.3kg/m2; $p<0.001$), HbA1c (-2.87±3.08mmol/mol; $p<0.005$) and fasting glucose (±0.70mmol/l; $p<0.001$) after 13 weeks, while the control group showed no significant changes in any of these variables. The subgroups were unevenly distributed over the phenotypes; the muscle insulin resistance and healthy phenotype were completely absent. Whilst there were no subjects with the healthy subtype at baseline, after the 13-wk intervention 31,7% of the subjects were assigned to the healthy subtype. In subgroups with hepatic insulin resistance with or without poor beta-cell function even 50% was classified as healthy after the intervention.

Conclusion: A personalized lifestyle treatment based on the subtype of T2D was more effective in reducing body weight and glycemic parameters as compared to standard primary care. This suggests that embedding lifestyle treatment within a primary care setting may be beneficial in reducing T2D.

O18 - Metabolic response to cereal fiber supplementation in subjects with prediabetes is depending on baseline glycemic and anthropometric status (OptiFiT)

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Aims: Within the Optimal Fibre Trial, intake of insoluble oat fibers was shown to significantly reduce glycemia. This effect might be modulated by presence or absence of impaired glycemic response and/or obesity (Hjorth et al., 2017, DOI: 10.3945/ajcn.117.155200, 10.1002/oby.22004). The OptiFiT cohort is appropriate for a stratified analysis.

Methods: 180 Caucasian participants with impaired glucose tolerance (IGT) were double-blindly randomized between twice daily insoluble, little fermentable oat fiber (15g/day) taken as a drink or placebo supplementation for 2 years (n = 89 and 91, respectively). Once yearly, they underwent fasting blood sampling, oGTT and full anthropometry. At baseline, out of 136 subjects (PP), 72 (54 %) showed additionally impaired fasting glucose (IFG) and 87 were (62 %) classified as obese (BMI>30). Based on those two parameters, we performed a stratified per-protocol and intention-to-treat analysis of metabolic effects.

Results: The NFG+IGT (n=64) as well as the non-obese subgroup (n=49) did not show significant differences between fiber and placebo groups concerning metabolic, anthropometric and inflammatory parameters. Within the IFG+IGT stratum (n=72), 2-h glucose, CRP, HbA1c and GGT decreased significantly stronger in the fiber group (adjusted for weight change). In obese subjects (n=87), a significant superiority for fiber intervention was present regarding change in HbA1c and leukocyte count. An ITT analysis did not reveal any results differing from PP analysis.

Conclusions: Cereal fiber improves glycemic metabolism, with pronounced effectiveness in subjects with impaired fasting glucose and/or obesity. Cereal fiber supplementation in staple food should be considered a treatment option.

Abstracts – Poster Presentations

P1 – Important food sources of fructose-containing sugars and fasting lipids: a systematic review and meta-analysis of controlled feeding trial

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Background: Sugar-sweetened beverages are associated with cardiovascular disease. Whether this association is mediated by blood lipids and holds for other important sources of fructose-containing sugars is unclear. To help address this question, we conducted a systematic review and meta-analysis of the effect of food sources of fructose-containing sugars on established lipid targets using GRADE.

Methods: MEDLINE, EMBASE, and Cochrane Library were searched through March 9, 2019. We included controlled feeding trials ≥7-days assessing the effect of different food sources of fructose-containing sugars on fasting blood lipids at 4 levels of energy control: substitution (energy matched comparisons); addition (energy from sugars added to diet); subtraction (energy from sugars subtracted from diet); or ad libitum (energy from sugars freely replaced). Two independent reviewers extracted data and assessed risk of bias. Data were pooled using generic inverse variance method and expressed as mean differences (MDs) with 95% confidence intervals (CIs). The overall certainty of the evidence was assessed using GRADE.

Results: 81 substitution (n=2848). 27 addition (n=1453), and 7 subtraction trials (n=1023) met eligibility criteria. No ad libitum trials were identified. In substitution and subtraction trials, there was no effect on LDL (mmol/L), HDL, non-HDL, total cholesterol, or triglycerides on total fructose-containing sugars or individual food sources. In addition trials, fruit juice reduced LDL (-0.19 [-0.34,-0.03]), non-HDL (-0.26 [-0.39,-0.14]), and total cholesterol (-0.19 [-0.28,-0.09]), increased HDL-cholesterol (0.07 [0.02,0.12]), with no effect on triglycerides (-0.03 [-0.10,0.05]). No other effects were observed in addition trials for other food sources. The overall certainty of evidence was "moderate" for fruit juice in addition trials and mixed sources for all other energy controls and "low" for all other comparisons.

Conclusions: Fructose-containing sugars do not have an adverse effect on established lipid targets irrespective of energy control or food source. Further research is needed to improve our estimates. Protocol registration: ClinicalTrials.gov Identifier, NCT02716870.

Funding: Diabetes Canada, CIHR, PSI Foundation, B&B Diabetes Centre, Toronto3D foundation.

P2 - Important food sources of fructose-containing sugars and serum uric acid: a systematic review and meta-analysis of controlled feeding trials in people with and without diabetes

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Background: Excess fructose intake is purported to increase blood uric acid (UA), yet the effect of important food sources of fructose-containing sugars on UA is unknown.

Methods: We conducted a systematic review and meta-analysis using GRADE in people with and without diabetes. MEDLINE, EMBASE and the Cochrane Library were searched (through September 9th, 2017). We included controlled feeding trials of 1-week on the effect of important food sources of fructose-containing sugars on UA in those with and without diabetes at any one of 4 levels of energy control: substitution (sugars in energy matched comparisons with other macronutrients); addition (excess energy from sugars added to diets); subtraction (energy from sugars subtracted from diets); or ad libitum (sugars freely replaced by other macronutrients without control of energy). Two independent reviewers extracted data and assessed risk of bias (Cochrane Collaboration Risk of Bias Tool). Data were pooled by random effects models and expressed as mean differences (MDs) with 95% confidence intervals (CIs). Heterogeneity was assessed (Cochran Q statistic) and quantified (I2 statistic). The certainty of the evidence was assessed using GRADE.

Results: We identified 53 trial comparisons (n=1,401) involving 3 levels of energy control: substitution, addition, and subtraction. Total food sources of fructose-containing sugars increased UA in substitution comparisons (MD, 0.12 mg/dL [95% CI, 0.02 to 0.23]) and decreased UA in subtraction comparisons (MD, -0.38 mg/dL (95% CI -0.73 to -0.03]). No effect was seen in addition comparisons (MD, 0.05 mg/dL [95% CI, -0.22 to 0.33]). There was a significant interaction by food sources of fructose-containing sugars in subtraction and addition comparisons with only sugar-sweetened beverages showing an increasing effect ($P<0.05$). In subgroup analyses, there was no effect modification by diabetes status. The certainty of the evidence was assessed as “moderate”.

Conclusion: The effect of fructose-containing sugars on UA levels is dependent on both energy control and food source in people with and without diabetes. Future research is needed to improve our estimates. Protocol registration: NCT027168.

Funding: Diabetes Canada, PSI Foundation, Banting and Best Diabetes Centre and Canadian Institutes of Health Research

P3 – Association between dairy product consumption and hyperuricemia in an elderly population with metabolic syndrome

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Background: The prevalence of hyperuricemia has increased substantially in recent decades. It has been suggested that it is an independent risk factor for weight gain, hypertension, hypertriglyceridemia, metabolic syndrome (MetS), and cardiovascular disease (CVD). Results from epidemiological studies conducted in different study populations have suggested that high consumption of dairy products is associated with a lower risk of developing hyperuricemia. However, this association is still unclear.

Aims: The aim of the present study is to explore the association between the consumption of total dairy products and their subtypes and the risk of hyperuricemia in an elderly Mediterranean population at high cardiovascular risk. Methods: Baseline cross-sectional analyses were conducted on 6,329 men and women (mean age 65 yrs) with overweight or obesity and MetS from the PREDIMED-Plus cohort. Dairy consumption was assessed using a validated food frequency questionnaire Multivariable-adjusted Cox regressions were fitted to analyze the association between quartiles of consumption of total dairy products and subtypes and the prevalence of hyperuricemia.

Results: When compared to the lowest quartile, participants in the upper quartiles of total dairy (multiadjusted prevalence ratio (PR)= 0.84; 95% CI: 0.75-0.94; P-trend= 0.02), low-fat dairy products (PR= 0.79; 95% CI: 0.70-0.89; P-trend <0.001), total milk (PR= 0.81; 95% CI: 0.73-0.90; P-trend<0.001), low-fat milk (PR= 0.80; 95% CI: 0.72-0.89; P-trend<0.001 respectively), low-fat yogurt (PR= 0.89; 95% CI: 0.80-0.98; P-trend 0.051) and cheese (PR= 0.86; 95% CI: 0.77-0.96; P-trend 0.003) presented a lower prevalence of hyperuricemia. Whole-fat dairy subtypes, total fermented dairy and total yogurt consumption were not associated with hyperuricemia.

Conclusions: High consumption of total dairy, total milk, low-fat dairy, low-fat milk, low-fat yogurt and cheese is associated with a lower risk of hyperuricemia.

P4 - Effects of sugar-sweetened beverages on fatty acid profile in plasma lipids in overweight individuals

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Background: De novo lipogenesis (DNL) is up-regulated in diabetes, fatty liver and insulin resistance. High carbohydrate (especially sugars) intake may induce DNL, and high sugar consumption may be reflected in the plasma by elevated levels of the DNL product palmitic acid, and by monounsaturated fatty acids through enhanced activity of stearoyl-CoA desaturase (SCD-1). Only few intervention studies exist, but were short- term studies lasting for a few days or weeks. We aimed to investigate the influence of sugar-sweetened soft drinks (SSSD) during 6 months on proposed plasma fatty acid derived markers of DNL and SCD-1 activity.

Methods: Overweight non-diabetic subjects (n = 47) were randomized to consume four different test drinks (1 L/day) during 6 months: SSSD (regular coca-cola), isocaloric semi-skimmed milk, diet coke, (aspartame) and water. Fatty acid profiles were measured in plasma cholesterol esters (CE), triglycerides (TG) and phospholipids (PL) using liquid gas chromatography. The primary outcome was palmitic acid, and secondary outcomes included the monounsaturated SCD-1 products palmitoleic acid and oleic acid, and its latter precursor stearic acid.

Results: Palmitic acid evels in PL, but not in CE or TG were higher after SSSD consumption compared with water, also after adjusting for palmitoleic acid baseline level, gender, age, and weight change ($P<0.05$ for all). Palmitoleic acid levels were consistently higher in all lipid fractions after SSSD compared with all other beverages in all adjusted models ($P<0.01$ for all). In addition, oleic acid levels were higher in PL and CE after SSSD compared with the other beverages ($P<0.05$). Stearic acid levels were not significantly different between the groups.

Conclusions: Intake of 1 L of SSSD for 6 month increased palmitic acid in PL, but not in other lipid fractions, whereas palmitoleic acid increased in all lipid fractions, possibly reflecting up-regulated DNL and/or SCD-1 activity in this overweight study population. In contrast, iso-caloric intake of milk did not induce such lipogenic fatty acid pattern.

P5 - A Nutrigenetic Approach to Fatty Liver Response in Type 2 Diabetes Patients: Potential nexus between GIPR SNP s10423928 and liver fat

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Background: Incretins have become a novel target for the prevention and treatment of type 2 diabetes mellitus (T2DM) and co-existing morbidities. Gastric inhibitory polypeptide/ glucose dependent insulinotropic polypeptide (GIP) is an incretin secreted from enteroendocrine K cells in response to meal ingestion and stimulates directly insulin secretion through the pancreatic GIP receptor (GIPR). Ongoing research revealed that GIP also promotes fat accumulation in adipose tissue and liver. Interestingly, individuals with T2DM have a reduced insulinotropic response to GIP, suggesting that GIPR is tangled in T2DM associated pathologies. Furthermore, mice studies demonstrated that the inactivation of GIPR prevents high fat / high sucrose diet induced obesity and NAFLD. However, little is known about the effects of GIPR single nucleotide polymorphisms (SNP). An observational study indicated that GIPR genotype may influence the T2DM risk by dietary intake of carbohydrates and fats. A recent meta-analysis found that the A allele of rs10423928 in GIPR was associated with increased 2-h glucose levels and lower insulinogenic index. Therefore, we wondered whether GIPR SNP s10423928 affects glucose homeostasis, lipid distribution and ectopic lipid deposition in T2DM subjects, who underwent different dietary interventions.

Methods: For this analysis data of 74 T2DM participants was collected. 32 subjects underwent an isocaloric protein rich diet, (HPD) (30% protein), 19 subjects a hypocaloric low carbohydrate diet (LCD) (5–10% carbohydrate), and 23 subjects a hypocaloric low fat diet (LFD) (<30% fat).

Results: HPD:T homozygous individuals of GIPR SNP s10423928 showed significantly greater response to the diets compared with A allele carriers, having an intrahepatic lipid reduction almost twice as large (A: -5.0 ± 3.2 vs TT:-8.8 ± 6.1, P=0.036). LCD: T/T individuals had a significantly greater reduction of TAG compared with A allele carriers. (A: -3.0 % ± 36.2 % vs TT -49,2% ± 39.9%, P=0.018). LFD: A carriers showed significant higher levels of hepatic aminotransferases (AST: A: 5 U/l ± 7 U/l vs TT -3 U/l ± 7.6 U/l, P=0.012; ALT: A: 7 U/l ±13 U/l vs TT -7 U/l ± 12 U/l, P=0.017).

Conclusion: GIPR SNP s10423928 determines the response to diet-based treatment for fatty liver reduction in type 2 diabetes patients?

P6 - Cross-sectional association between non-soy legume consumption, serum uric acid and hyperuricemia: The PREDIMED-Plus study

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Background: To assess the association between the consumption of non-soy legumes and different subtypes of non-soy legumes and SUA levels or hyperuricemia in elderly individuals with overweight or obesity and metabolic syndrome.

Methods: A cross-sectional analysis was conducted in the framework of the PREDIMED-Plus study. We included 6,329 participants with information on non-soy legume consumption and SUA levels. Non-soy legume consumption was estimated using a semi-quantitative food frequency questionnaire. Linear regression models and Cox regression models were used to assess the associations between tertiles of non-soy legume consumption, different subtypes of non-soy legume consumption and SUA levels or hyperuricemia prevalence, respectively.

Results: Total non-soy legume, lentil and pea consumption, was associated with lower SUA levels with differences of 0.14 mg/dL, 0.19 mg/dL and 0.12 mg/dL between extreme tertiles, respectively. Chickpea and dry bean consumption showed no association. In multivariable models, participants located in the top tertile of total non-soy legumes (Prevalence Ratio (PR): 0.89; 95%CI: 0.82 to 0.97; p-trend = 0.01, lentils (PR: 0.89; 95%CI: 0.82 to 0.97; p-trend = 0.01), dry beans (PR: 0.91; 95%CI: 0.84 to 0.99; p-trend = 0.03) and peas (PR: 0.89; 95%CI: 0.82 to 0.97; p-trend = 0.01) presented a lower prevalence of hyperuricemia (vs. the bottom tertile). Chickpea consumption was not associated with hyperuricemia prevalence.

Conclusions: In this study of elderly subjects with metabolic syndrome, we observed that despite being a rich-purine food, non-soy legumes were inversely associated with SUA levels and hyperuricemia prevalence. Trial registration: ISRCTN89898870. Registration date: 24 July 2014B

P7 - The association between change in plasma fatty acids and change in Lp(a) levels during weight loss dieting in obese adults with type 2 diabetes

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Background: Lipoprotein (a) [Lp(a)] is an independent risk factor for CVD, especially in type 2 diabetes (T2D). Previously, we have shown that weight loss dieting results in an increase in plasma Lp(a) levels in obese individuals with and without T2D. The type and content of fat in the diet may be an important determinant of the effect on Lp(a) levels. The aim of this study is to determine the effect of weight loss dieting on plasma free fatty acids (FFA), and the association with plasma Lp(a) during the diet in patients with T2D.

Methods: Included were 161 adults with T2D and BMI >27 of the outpatient diabetes clinic of the Erasmus MC, who participated in the POWER study. Before and after a 20-week low-calorie diet, fasted blood samples were obtained. Plasma Lp(a) concentrations were measured using a particle-enhanced immuno- turbidimetric assay, FFAs were measured in collaboration with the University of Oslo via gas chromatography with Flame Ionization Detector (GS-FID). Spearman correlations were determined of both baseline Lp(a) levels and change in Lp(a) with baseline and change in FFA levels (% of total).

Results: At baseline, Lp(a) levels correlated positively with %PUFAs (r=0.248, p=0.004), and negatively with %SFAs (r=-0.179, p=0.038) and %MUFAs (r=-0.245, p=0.004). During weight-loss dieting, %SFAs decreased and %PUFAs increased (p<0.001), while Lp(a) levels increased (20.3 (IQR 6.6-73.6) to 27,1 (IQR 10.3-94.9) mg/dl; p<0.001). The increase in Lp(a) levels was not associated with change in %SFA, %MUFA or %PUFA, but was positively correlated with the change in %oleic acid (r=0.196, p=0.004) and change in the absolute level of arachidonic acid (r=0.223, p=0.022) and vaccenic acid (r=0.193, p=0.048).

Conclusions: In this explorative study, we found that the change in Lp(a) level upon weight loss dieting in patients with T2D, was not associated with change in SFA, MUFA or PUFA levels, but possibly with specific FFAs. The mechanism behind this finding and the clinical implications deserve further study.

P8 - Effects of resistant starch intake on postprandial lipemia and appetite in subjects with type 2 diabetes

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Background: Postprandial hypertriglyceridemia is recognized as an important risk factor for cardiovascular disease. Resistant starch (RS) has demonstrated beneficial effects on postprandial lipemia in rats, however, the effects on humans remain poorly characterized. The aim of this study was to determine the effects of two RS types on postprandial lipemia and appetite in subjects with type 2 diabetes (T2D).

Methods: As part of a crossover study in which 17 patients with T2D consumed digestible starch (DS), Hi- Maize® (HM), or native banana starch (NBS) for 4 days, a 360-min meal tolerance test (MTT) was performed on day 5. In this test, subjects received 20 g of RS from HM or NBS with the meals in comparison with placebo (100% DS). All treatments were matched by available carbohydrates (13.3 g). Appetite was estimated using visual analogue scales (VASs) and GLP-1 temporal profiles.

Results: A reduction in fasting blood glucose was observed after 4-days NBS intake compared to DS. However, during the MTT, NBS did not reduce the glycemic excursion, although induced a lowered insulin response. No effect of RS on postprandial triglycerides and cholesterol profiles was observed. NBS and HM reduced hunger and increased satiety.

Conclusions: None of the two types of RS induced a reduction on postprandial lipemia. However, both of them reduced feelings of hunger and satiety, although these results were not associated with GLP-1 modifications. The beneficial effect of NBS on fasting glycemia was confirmed.

P9 - Is there a soft drink vs. alcohol seesaw? A cross-sectional analysis of dietary data in the Australian Health Survey 2011-12

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Background: Previous studies in older Australians have reported higher alcohol intake in those with low intake of added sugars. The relationship between energy in liquid form (alcoholic beverage vs. sugar-sweetened beverages (SSB)) and measures of obesity, has not been evaluated. We aimed to assess the association between the energy derived from SSB and alcoholic beverages, and to model the association between the substitution of SSB with alcoholic beverages and waist circumference.

Methods: Dietary data from the Australian Health Survey 2011-12 were analyzed. Usual SSB intake of adults ≥ 19 years old was estimated using the Multiple Source Method and participants were classified into zero-, low- or high-SSB consumers according to their usual SSB intake. Energy from alcoholic beverages in the 3 SSB-consumption groups was compared using multivariable general linear models, adjusting for sex, socioeconomic variables, and energy intake from energy sources other than SSB and alcoholic beverages. A substitution model was used to assess the association between the replacement of SSB with alcoholic beverages and waist circumference.

Results: Zero-SSB consumers made up 33% of the included participants. In all age groups, zero-SSB consumers had significantly higher energy intakes from alcoholic beverages than low- and high-SSB consumers. Low- and high-SSB consumers had similar consumption of alcoholic beverages. Substituting SSB intake with alcoholic beverage intake was not associated with significant differences in waist circumference in most age groups.

Conclusions: In Australia, adults who avoid SSB are common but consume substantially more energy in the form of alcoholic beverages. An increase in alcoholic beverage intake could be an 'unintended consequence' of strictly discouraging SSB consumption.

P10 - Plasma metabolites behind frequent red wine consumption: a multi-metabolomics approach in the framework of the PREDIMED study

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Background: The relationship between red wine (RW) consumption and metabolism is poorly understood. The aim of this study is to assess the circulating metabolomics profiles in relation to frequent RW consumption as well as the ability of a set of metabolites to discriminate RW consumers from non-consumers.

Methods: Cross-sectional analysis of 1,157 participants from the PREDIMED study. Subjects were divided according to RW consumption (non-consumers versus consumers of > 1 glass (100 mL/day) at baseline. Plasma metabolomics analysis was performed using two methods based on liquid chromatography-mass spectrometry. Associations between 387 identified metabolites and RW consumption were assessed using elastic net regression analysis taking into consideration baseline significant covariates. Ten-cross-validation (CV; 90% training, 10% validation) was performed and receiver operating characteristic (ROC) curves were constructed in each of the validation datasets based on weighted models.

Results: A set of 33 metabolites were selected at least one time in the elastic net logistic regression. Out of them, a subset of 13 metabolites was consistently selected in all the 10 CV iterations, discriminating RW consumers versus non-consumers. Based on the multi-metabolite model weighted with the regression coefficients of metabolites and selected covariates, the area under the curve (AUC) was 0.82 (95% CI: 0.79-0.86). These metabolites mainly consisted of lipid species (e.g. triglycerides and phosphatidylcholines), some organic acids and alkaloids.

Conclusion: A multi-metabolite model identified in a Mediterranean population appeared useful to discriminate between frequent RW consumers and non-consumers. Further studies are needed to assess the contribution of the identified metabolites in health and disease.

P11 – Effect of weight loss with a hypocaloric Mediterranean style diet and physical activity promotion on kidney function in the PREDIMED-Plus study

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Background: No controlled, randomized field trial in large populations has addressed the long-term effects of sustained weight loss with intensive lifestyle interventions on renal function. We addressed the 1-year efficacy of an intensive weight-loss intervention with energy-restricted Mediterranean diet (erMedDiet), physical activity (PA) promotion and behavioural support on renal function and kidney disease progression.

Methods: Multicenter randomised controlled "PREvención con DIeta MEDiterránea-Plus" (PREDIMED-Plus) trial including 6,008 overweight/obese men and women aged 55-75 years with metabolic syndrome. Participants were randomly assigned to two interventions: an intensive lifestyle intervention promoting and maintaining weight loss through erMedDiet, PA and behavioral support (intervention group, IG) or control group (CG). The primary outcomes included 1-year changes in serum creatinine, glomerular filtration rate estimated (eGFR), and albuminuria using urine microalbumin-to-creatinine ratio (UACR). The incidence and reversion of CKD (eGFR <60 ml/min/1.73 m2) and micro-macroalbuminuria (UACR≥30 mg/g) after 12- months of intervention were considered as other outcomes. For the statistics we used multiadjusted linear and logistic regression models.

Results: After 1-year, eGFR significantly declined in both groups (-0.6 vs. -1.3 ml/min/1.73 m2 for IG and CG, respectively) compared with baseline, and significant reductions in eGFR of -0.6 ml/min/1.73 m2 (95% CI, -1.1 to -0.1; P=0.04) favouring the IG were observed. The UACR levels also increased significantly in both groups (2.9 vs. 3.7 mg/g for IG and CG, respectively), but between-group differences remained non-significant (P=0.64). The incidence and reversal rates of CKD were 1.2% (P=0.01) lower and 9.6% (P=0.04) higher, respectively, in IG vs. CG. The multiadjusted Odds ratios were 0.67 (0.49 to 0.91) for CKD incidence and 1.67 (1.05 to 2.64) for CKD reversion in the IG vs. CG. No significant associations were found for albuminuria.

Conclusions: An intensive lifestyle intervention for 1-year using an erMedDiet, PA promotion and behavioural support resulted effective in preserving renal function and preventing/delaying CKD progression in overweight/obese adults with metabolic syndrome.

P12 - Adherence to the DASH and Portfolio-like dietary patterns and prevalence of cardiovascular disease risk factors in PREDIMED-Plus: A cross-sectional analysis

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Background: The Dietary Approaches to Stop Hypertension (DASH) and Portfolio diets have been shown to lower cardiovascular disease (CVD) risk factors in randomized controlled trials (RCTs). The Portfolio diet has only been assessed in RCTs of hyperlipidemic patients and its' association with CVD risk factors in other populations has not been assessed.

Methods: Cross-sectional analysis of baseline data from PREDIMED-Plus (6,636 elderly participants with overweight/obesity and metabolic syndrome). Adherence to DASH and Portfolio diets were derived from a validated 143-item food frequency questionnaire. Multiple linear regression was used to estimate associations between diet indices and CVD risk factors. Cox regression models were used to estimate prevalence ratios (PR) for CVD risk factors and T2DM per quantiles of diet indices. Models were adjusted for potential confounders.

Results: Greater adherence to the DASH diet was significantly associated with lower systolic blood pressure (BP), non-HDL-C, triglycerides, HbA1c, fasting glucose, waist circumference (WC), body mass index (BMI), and higher HDL-C. Greater adherence to the Portfolio diet was significantly associated with lower WC, BMI, LDL-C (males only), and with higher diastolic BP. Compared to low adherence (≤21), high adherence to the DASH diet (≥28) was inversely associated with the prevalence of hypertriglyceridemia (PR=0.92 [95%CI: 0.85-0.99]), low HDL-C (0.92 [0.85-0.99]), obesity (0.93 [0.90-0.97]) and abdominal obesity (0.98 [0.96-0.99]). Compared to low adherence (≤14), high adherence to the Portfolio diet (≥21) was inversely associated with the prevalence of obesity (0.95 [0.90-0.99]) and positively associated with the prevalence of T2DM (1.14 [1.02-1.28]). A similar trend for T2DM was seen with the DASH diet (1.10 [0.99-1.22]).

Conclusion: Among elderly adults at high CVD risk, greater adherence to the DASH and Portfolio diets showed significant inverse associations with many CVD risk factors, with the DASH diet showing more favorable associations. The positive associations with diabetes prevalence is at high risk of reverse causality. Trial registration: ISRCTN89898

P13 - Diet with High Slowly Digestible Starch content positively impacts glycemic profile in type 2 diabetic patients

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Background: Decreasing glycemic variability in type 2 diabetic patients (T2D) is a key challenge to decrease the occurrence of diabetic complications. The diet is one action that can be set up above medications. Particularly, a high content in slowly digestible starch (SDS) in single eating occasion demonstrated lower postprandial glycemic and insulin responses in healthy and insulin resistant subjects. This study aimed at studying the glycemic impact of a high SDS diet in T2D.

Methods: This pilot randomized controlled cross-over clinical trial included eight T2D patients (6.5% ≤ HbA1c ≤ 8.5%, 22 ≤ IMC ≤ 37 kg/m2, treated by Metformin & Sitagliptin). They consumed twice, one week of controlled diet containing starchy food products screened and selected to be either High or Low in SDS, as determined by the SDS in-vitro method. During each diet period, the glycemic profile was monitored during 6 days using a Continuous Glucose Monitoring System (CGMS). Multiple metrics related to glycemic variability and responses were calculated.

Results: 222 SDS analysis were realized on commercial products. 23 High-SDS and 20 Low-SDS food items with associated cooking instructions were selected to design diets in agreements with local T2D recommendations. The High-SDS diet demonstrated a significant higher SDS content compared to low-SDS diet (61.6 vs 11.6 g/day; p<0,0001), mainly driven by pastas, rices and high-SDS biscuits (75.6% of the consumed SDS content). A significant decrease in Mean Amplitude of Glycemic Excursion (79.6 for Low-SDS vs 61.6 mg/dL for High-SDS; p = 0.0067), a key parameter in glycemic variability, validated the High-SDS diet. This was consolidated by a significant correlation between meals SDS contents and various glycemic parameters such as postprandial iAUC, tAUC (up to 180 min) or peak value (p < 0.05 for all).

Conclusions: It was the first demonstration that a diet including various food items and cooking recommendations designed to preserve products' high SDS content impacts beneficially glycemic profile in T2D subjects. Carefully selecting carbohydrates based food may be a simple and valuable tool to improve glucose control in T2D.

P14 - The PERSON-study: PERSonalized glucose Optimization through Nutritional intervention

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Background: Maintaining well-controlled blood glucose (BG) concentrations is essential in the prevention of chronic cardiometabolic diseases. The BG response to dietary and/or lifestyle patterns may vary between individuals depending on an individual's metabolic phenotype. Therefore, different individuals or subgroups may benefit more from certain diets. A better understanding of inter-individual differences in these responses may contribute to the development of more personalized intervention strategies that optimize the effect on BG control.

Objective: To establish the effect of a metabolic phenotype targeted, optimal versus suboptimal, macronutrient manipulated 12-week dietary intervention on disposition index (composite marker of first phase insulin secretion and insulin sensitivity) and other parameters related to metabolic health, physical and mental well-being.

Study design: Two hundred and forty overweight/obese (BMI 25-40 kg/m²) Caucasian men and women (age 40-70y) who are characterized by insulin resistance predominantly at the level of skeletal muscle (MIR) or the liver (LIR), determined by the glucose and insulin responses during a 7-point oral glucose tolerance test (OGTT), will participate in a two-center (Maastricht University and Wageningen University and Research), double-blind, randomized, parallel dietary intervention study. Participants will follow either an optimal diet for their own metabolic phenotype (MIR/LIR) or an optimal diet for the other metabolic phenotype (MIR/LIR) for 12 weeks. The two diets, which both meet the Dutch dietary guidelines, differ in macronutrient quality and quantity. Detailed laboratory and daily life phenotyping will be done before and after the intervention.

Primary outcome: Disposition index (oral glucose tolerance test)

Secondary outcomes: Tissue-specific insulin sensitivity (2-step hyperinsulinemic-euglycemic clamp with D-glucose (6,6-D2) tracer), 24h glucose values (continuous glucose monitoring), fasting and insulin-stimulated energy expenditure and substrate oxidation (indirect calorimetry), metabolomics, adipose tissue and skeletal muscle gene/protein expression, fecal and oral microbial composition, anthropometrics, physical and mental performance and well-being.

Funding: This study is funded by TIFN and NWO.

P15 - Can viscous fiber supplementation affect body weight independent of an energy restrictive diet? A systematic review and meta-analysis of randomized controlled trials

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Background: Viscous dietary fiber may have the potential to facilitate weight loss; however, clinical evidence is lacking. Our objective is to conduct a systematic review and meta-analysis of randomized controlled trials (RCT)s to summarize and quantify the effects of viscous fiber on body weight, waist circumferences and body fat, independent of calorie restriction.

Methods: RCTs of ≥ 4 weeks in duration that assessed the effect of viscous fiber added to a weight-maintaining diet relative to comparator diets were included. MEDLINE, EMBASE, and Cochrane library were searched through 16 August 2018. Two independent reviewers extracted relevant data. Data were pooled using generic inverse variance method and random effects models and expressed as mean differences with 95% confidence intervals. Heterogeneity was assessed (Cochran Q statistic) and quantified

Results: Findings from 63 trials (n=3355) showed that a median dose of 5 g/day of viscous fiber supplementation over median duration of 10 weeks, reduced body weight (-0.32 kg [-0.51, -0.14]; P=0.004), BMI (-0.28 kg/m2 [-0.42, -0.14]; P=0.0001), and waist circumference (-0.63 cm [-1.11, -0.16]; p=0.008), with no significant change in body fat (-0.72 %; p=0.06). Greater reductions in body weight and body fat were observed in overweight and obese individuals. The certainty of evidence was graded low for body weight and BMI due to downgrades for inconsistency and imprecision and graded moderate for waist circumference and body fat due to risk of bias.

Conclusions: Dietary viscous fiber has a modest yet significant effect on body weight and other parameters of adiposity in background of non-energy restricted diets. Future RCTs are warranted to address the limitations defined through GRADE and to determine long-term weight-loss sustainability.

P16 - Higher intake of insoluble cereal fiber improves metabolic state in prediabetes – a compliance-based re-analysis of the Optimal Fiber Trial (OptiFiT)

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Background: Cohort studies consistently report, that insoluble cereal fiber significantly and strongly decrease the risk of type 2 diabetes and many long-term complications. The Optimal Fiber Trial as the world's first RCT on insoluble cereal fiber has shown a small interventional effect of oat fiber on HbA1c and 2-hours glucose levels in subjects with prediabetes after one year of intervention (ITT analysis). Up to now, fiber group subjects with low compliance and placebo subjects with exceptionally high dietary intake of cereal fiber have not yet been differentiated within the entire cohort.
This second-line re-analysis of OptiFiT intends to measure the effect of fiber intake with respect to actual intake from both supplement and daily diet.

Methods: 180 subjects with IGT prediabetes received dietary advice in a modified PREDIAS program (low-fat scheme) for one year and an additional year of follow-up. They were also randomly attributed to a blinded supplement, containing fiber (2 x 7,5 g of insoluble fiber per day) or placebo (mainly isomaltulose), for the entire study period. Metabolism was assessed by oGTT and fasting parameters every 12 months. 120 subjects completed the 12-months-visit and provided dietary information for the intervention period. We defined tertiles of actual average insoluble fiber intake during these 12 months (supplement plus regular diet): tertile 1 (14 ± 2 grams of fiber / day) was compared to tertile 3 (31 ± 5 grams of fiber / day).

Results: We detected a significantly stronger improvement of 2-hrs glucose levels, fasting (HOMA-IR, ISI-ffa) and dynamic (Belfiore Index) insulin sensitivity, hepatic insulin clearance (HIC), inflammation (leucocyte count, CRP) and NAFLD (fatty liver index). Correlation analyses indicate only few connections between increased fiber intake and metabolic improvement, while absolute fiber intake and weight change were more strongly correlated to glycemic amelioration.

Conclusions: Especially when considering actual fiber intake based on objective compliance parameters, cereal fiber shows an antidiabetic effect. Larger long-term studies are required to replicate our findings.

P17 – Physical activity changes in men and the risk of type 2 diabetes: a prospective study of METSIM cohort

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Background: Physical inactivity is one of the main contributors to the epidemic of type 2 diabetes (T2D) and obesity. Lifestyle interventions including physical activity have managed to prevent incidence of T2D. However, we lack prospective information of physical activity changes predicting more comprehensive insulin secretion and insulin sensitivity markers. We have also on interest if simple, practical questionnaire is sufficient to identify different metabolic characteristics between physical activity levels, since measuring physical activity can be complicated in a larger population and objective equipment can be expensive for the health care system.

Methods: The prospective Metabolic Syndrome in Men (METSIM) cohort includes 10,197 men, aged 45-73, randomly selected from the population register of Kuopio town, Eastern Finland. We used baseline and 4.6-year follow-up data, which included 5,550 without T2D diagnosed at baseline. Physical activity (PA) was evaluated by questionnaire based on Mini-Finland Health Survey. Laboratory measurements such as oral glucose tolerance test, concentrations of plasma insulin, BMI and body composition have been conducted at baseline and at the follow-up visit. Statistical analyses were made with IBM SPSS version 25.

Results: The increase of PA was significant ($p<0.001$) during the follow up, although 54 % of the participants did not make any changes, 18 % decreased and 27 % increased their PA. After adjusting for age, follow-up time in months, corresponding measure at baseline, BMI, smoking and alcohol consumption, baseline PA had an independent association with insulin concentrations and insulin sensitivity ($p<0.05$) at follow-up. A decrease in PA predicted deterioration of fasting plasma insulin, 2 h insulin, Matsuda ISI ($p<0.001$) and Disposition index ($p=0.001$). A decrease in PA also increased the risk of T2D by 40 % ($p<0.001$) and an increase in PA decreased the risk by 21 % ($p=0.017$) compared to those, who did not change PA.

Conclusions: Decrease in PA seems to be detrimental for metabolism of middle-aged to older men. Thus, promoting to maintain PA is very important for metabolic health in aging.

P18 - Salivary α-amylase copy number does not associate with weight trajectories and glycemic improvements following clinical weight loss: results from a two-phase dietary intervention study

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Background: Several studies recently reported contradicting results regarding the link between AMY1 copy numbers (CNs), obesity, and type 2 diabetes. In this study we aimed to assess the impact of AMY1 CN on anthropometrics and glycemic outcomes in obese individuals following a 2-phase dietary weight loss intervention.

Methods: Using the Paralogue Ratio Test, AMY1 CNs were accurately measured in 761 obese individuals from the DiOGenes study. Subjects underwent first a 8-week low-caloric diet (LCD, at 800kcal/d) and were then randomized to a 6-month weight maintenance dietary (WMD) intervention with arms having different glycemic loads.

Results: At baseline, a modest association between AMY1 CN and BMI (p=0.04) was observed. AMY1 CN was not associated with baseline glycemic variables. Additionally, AMY1 CN was not associated with anthropometric or glycemic-outcomes following either LCD or WMD. Interaction analyses between AMY1 CN and nutrient intake did not reveal significant association with any clinical parameters (at baseline and following LCD or WMD) or when testing gene x WMD interactions during the WMD phase.

Conclusions: In the absence of association with weight trajectories or glycemic improvements, the AMY1 CN cannot be considered as an important biomarker for response to a clinical weight loss and weight maintenance programs in overweight/obese subjects.

P19 - Nitrate-rich interventions for blood pressure and arterial stiffness: A systematic review and meta-analysis of randomized controlled trialsi

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Background: Emerging clinical evidence suggests that consumption of nitrate-rich vegetables enhances nitric oxide (NO) bioavailability and therefore may represent a sound dietary strategy to regulate blood pressure (BP). Pooled findings from previous systematic reviews and meta-analyses (SRMAs) are largely driven by acute interventions in healthy populations. We aim to synthesize effects of repeated administration of inorganic nitrate on BP, and explore whether effects differ between healthy and patient populations.

Methods: We conducted a SRMA of randomized controlled trials (RCTs) to pool evidence on the effect of inorganic nitrate from vegetables and concentrated sources, on BP in healthy and disease populations. MEDLINE, EMBASE and the Cochrane Library were searched through Sept 6th, 2018. RCTs were included if they were ≥3 days in duration. Two independent reviewers extracted relevant study characteristics and study data. Data were pooled using the generic inverse variance method with the random-effects model, and expressed as mean differences (MDs) with 95% confidence intervals (CIs). The overall certainty in the pooled evidence was assessed using GRADE.

Results: 45 eligible studies were included in the analysis (n=1151). Compared to control, nitrate interventions showed clinically significant improvements in BP, with a reduction in systolic BP (MD: -2.29 mmHg; 95% CI: -3.43 to -1.14; P <0.0001; I2: 73%) and diastolic BP (MD: -1.11 mmHg; 95% CI: -2.06, -0.16; P = 0.02; I2: 77%). The overall effect appears to be attributable to reductions in healthy, hypertensive and overweight/obese individuals. The overall certainty in the evidence was graded as moderate.

Conclusions: It's reasonable to consider nitrate-rich interventions as strategies to lower systolic and diastolic BP. With the evidence graded as moderate, more high-quality RCTs are required.

P20 - Dietary intake of advanced glycation endproducts is associated with higher levels of advanced glycation endproducts in plasma and urine: the CODAM study

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Background: Advanced glycation endproducts (AGEs) are formed by the reaction between reducing sugars and proteins. AGEs in the body have been associated with several age-related diseases. High-heat treated and most processed foods are rich in AGEs. The aim of our study was to investigate whether dietary AGEs are associated with plasma and urinary AGE levels.

Methods: In 450 participants of the Cohort on Diabetes and Atherosclerosis Maastricht study (CODAM study) we measured plasma and urine concentrations of the AGEs Nε-(carboxymethyl)lysine (CML), Nε-(1-carboxyethyl)lysine (CEL) and Nδ-(5-hydro-5-methyl-4-imidazolon-2-yl)-ornithine (MG-H1) using UPLC-MS/MS. We also estimated dietary intake of CML, CEL and MG-H1 with the use of a dietary AGE database and a food frequency questionnaire (FFQ). We used linear regression to investigate the association between standardized dietary AGE intake and standardized plasma or urinary AGE levels, after adjustment for age, sex, glucose metabolism status, waist circumference, kidney function, energy- and macronutrient intake, smoking status, physical activity, alcohol intake, LDL-cholesterol and markers of oxidative stress

Results: We found that higher intake of dietary CML, CEL and MG-H1 was associated with significantly levels of free plasma and urinary CML, CEL and MG-H1 (ßCML=0.253 (95% CI 0.086; 0.415), ßCEL. = 0.194 (95% CI 0.040; 0.339), ßMG-H1=0.223 (95% CI 0.069; 0.373) for plasma and ßCML=0.223 (95% CI 0.049; 0.393), ßCEL=0.180 (95% CI 0.019; 0.332), ßMG-H1=0.196 (95% CI 0.037; 0.349) for urine, respectively). In addition, we observed non-significant associations of dietary AGEs with their corresponding protein bound plasma AGEs.

Conclusions: We demonstrated that higher intake of dietary AGEs is associated with higher levels of AGEsin plasma and urine. Our findings may have important implications for those who ingest a diet rich in AGEs.

P21 - Sustained changes in body composition during 6 months follow-up after combined lifestyle intervention in older adults with obesity and type 2 diabetes

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Background: Patients with obesity and type 2 diabetes (T2D) are advised to reduce their body weight to lose fat mass. We have recently shown that older adults with obesity and T2D who consumed a whey protein drink enriched with leucine and vitamin D lost fat mass and preserved muscle mass during a 3m combined lifestyle intervention of hypocaloric diet and resistance exercise (PROBE study). We now evaluated to what extent body composition change was sustained after 6m follow-up without intervention.

Methods: 105 older adults with obesity and T2D completed the 3m PROBE intervention and were followed from 3 to 9m after baseline according to protocol. 76 subjects participated at 9m, of whom 38 had received the whey protein drink (test) and 38 had received an isocaloric control drink (control) during intervention. Body weight (scale), lean mass, appendicular muscle mass and fat mass (DXA), and dietary intake and physical activity level (3d record) were assessed. Change over time was analysed using paired samples t-test. Additional ANOVA was used for evaluation of differences in change in body composition between test and control.

Results: At 9m, an average of 2.1 kg (78%) of the initial 2.7 kg weight reduction at 3m was maintained. Lean mass significantly increased (+0.60 +- 2.2 kg, p=0.026), whereas fat mass (+0.03 +- 2.8 kg, p=0.94) and appendicular muscle mass (+0.18 +- 0.98 kg, p=0.12) did not change. Protein intake (0.84 +- 0.32 g/kg body weight) returned to baseline level. The observed slight increase in physical activity level during 3m intervention (+0.05 +- 0.02, p=0.009) was maintained during 6m follow-up. There were no significant differences between the test and control group during follow-up.

Conclusions: Body weight change during the 3-month combined lifestyle intervention in the PROBE study was sustained after 6 months follow-up without intervention. In addition, lean mass had increased, whereas fat mass remained unchanged. We speculate this is due to a prolonged adherence (after intervention) to increased physical activity of at least these subjects who participated.

P22 - Nielsen Investigation of the effects of a new vegan product on the recovery and performance of healthy individuals – can these effects be of clinical benefit to Type 2 Diabetes patients?

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Background: Type 2 diabetes (T2D) can be defined as a bi-hormonal metabolic disorder characterised by insufficient insulin secretion and abnormal glucagon secretion. Exercise offers a unique opportunity to hold the diabetic diseases in check as it improves the regulation of glucose homeostasis. Physical activity intervention has therefore become a cornerstone in the care of T2D. It is recommended that T2D patients should perform at least 150 minutes per week of moderate-intensity aerobic exercise (i.e. 40-70% of VO2PEAK) in combination with resistance exercise. Furthermore, High-Intensity Interval Training (HIIT) has received more focus over the years as studies have shown health beneficial effects of different HIIT regimens to T2D. Findings include reduced hyperglycaemia, ameliorated insulin action and improved pancreatic β-cell functions. A new vegan product has been developed, which contains both carbohydrates and essential amino acids with anabolic abilities. A special technology has been implemented, so when ingesting the product, the substrates are released slowly. This slow-release may have beneficial health effects (i.e. stabile blood glucose levels) for T2D patients, who are engaging in prolonged or strenuous exercise. The aim of this study is to investigate the effects of the new vegan product on the recovery and performance of healthy individuals. Resulting data from this model, using healthy subjects, which will be applicable for T2D patients.

Methods: The study is a single-blinded randomised controlled cross-over study. Involving 20 healthy moderate-to-trained participants aged 18-50 years with a VO2max > 50 ml/min/kg. The participants will be ingesting both the intervention (vegan product) and a control product in a randomised order. Overall, the subjects meet in on three separate days: on the first occasion a maximal oxygen uptake cycle ergometer test will be conducted. On the two other occasions, which are separated by approximately 7 days, the subjects will meet up at the lab to perform an exhaustive exercise, followed by 5 hours of recovery and a performance test until exhaustion. Blood parameters will be analysed e.g. the effect on glucose, insulin and glucagon.

Results and Conclusions: The study is on-going. We expect having results ready to present at the DNSG symposium.

P23 - Nut Consumption Does Not Increase Risk of Adiposity: A Systematic Review and Meta-Analysis of Randomized Controlled Trials

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Background: Nuts have been shown to have cardiovascular and diabetes related health benefits, yet there remains concern that nuts may contribute to weight gain due to their high energy density. To address this, we conducted a systematic review and meta-analysis of the effect of nut consumption on markers of adiposity in randomized controlled trials using the Grading of Recommendations, Assessment, Development, and Evaluation (GRADE) approach.

Methods: MEDLINE, EMBASE, and Cochrane databases were searched (through January 4, 2019). Randomized controlled trials ≥ 3-weeks assessing the effect of nut intake on measures of adiposity were included. Three independent reviewers extracted relevant data and assessed risk of bias of included trials. Data were pooled using the generic inverse variance method and expressed as mean differences (MDs) with 95% confidence intervals (CIs). Heterogeneity was assessed (Cochran Q statistic) and quantified (I2 statistic). The overall certainty of the evidence was assessed using GRADE approach.

Results: 79 randomized controlled trial comparisons involving 4453 people met eligibility criteria. There was no adverse effect of nut consumption on global adiposity (BMI: MD -0.18 [95% CI: -0.41, 0.05]; body weight: MD 0.10 [95% CI: -0.18, 0.39], % body fat: MD -0.26 [95% CI: -0.64, 0.12]) with even a signal for benefit for abdominal adiposity (waist circumference: MD -0.58[95% CI: -1.11, -0.05]). The overall certainty of the evidence was graded as "moderate" for all outcomes owing to inconsistency.

Conclusions: Pooled analyses show nut consumption does not have an adverse effect on measures of adiposity. The concern that nuts may result in weight gain owing to their high energy density appears unwarranted.

P24 - Suboptimal weight loss 10 years after Roux-en-Y Gastric Bypass – Investigation of potential causes

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Background: Obesity has reach epidemic proportions wordwide and bariatric surgery is per today the only effective long-term treatment for severe obesity. Obesity has the attributed risk of 50 % of all diabetes cases, and bariatric surgery is found to be an efficient treatment option for diabetes. However, there is a subgroup of patients who experiences suboptimal weight loss (WL) or even weight regain (WR) after bariatric surgery and very little is known regarding the etiology of the problem. Therefore the aim of this project is to identify variables associated with suboptimal WL and/or WR 10 years after Roux-en-Y Gastric Bypass (RYGB).

Methods: A cross-sectional study will be conducted where patients who present with successful WL10 years after RYGB (>50% excess weight loss (EWL) will be compared with an unsuccessful group (<50% EWL). A control group of patients with severe obesity on waiting list for bariatric surgery and matching the pre-operative BMI of the other two groups will also be included (n=25/group). Food hedonics, plasma concentration of appetite-related hormones, subjective feelings of appetite, food patterns, eating behavior, eating disorders, physical activity and gut microbiota will be measured in the three groups. Participants will be selected from the Bariatric surgery observation study (BAROBS) in Helse Midt-Norge.

This study has important clinical implications because the findings can be incorporate in clinical practice by adjusting the advice given to patients during follow up.

P25 - The association between long term coffee consumption and body fat: the Amsterdam Growth and Health Longitudinal Study

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Background: Coffee consumption has consistently been associated with a lower risk of type 2 diabetes, in a dose response manner. One of the suggested mechanisms of action involves effects of coffee on body fat. Coffee may reduce body fat as found in human trials and observational studies, but prospective studies are scarce. Therefore the purpose of this study is to investigate the association between long term coffee consumption and body fat.

Methods: Prospective data were derived from the Amsterdam Growth and Health Longitudinal Study (AGAHLS), an observational longitudinal study that started in 1976 with a total inclusion of 698 boys and girls. Its initial goal was to describe the natural development of growth, health, and lifestyle of adolescents and to investigate longitudinal relations between biological and lifestyle variables. The mean (±SD) age of the subjects at the beginning of the study was 13.1 ± 0.8 y. Since then, subjects have been measured 3–9 times during a 30-y follow-up period. At each measurement, anthropometric, biological, and lifestyle variables were assessed. Coffee consumption was assessed through a questionnaire at the ages of 27, 29, 32, 36 y. When the subjects' mean age was 36.6 ± 0.6 y, body composition by means of dual-energy X-ray absorptiometry (DXA) measurements were added to the study. Complete DXA data on the components of body fat; total percentage body fat, trunk fat, peripheral fat, and peripheral lean mass, as well as important covariates were obtained in 336 individuals. For the current study we will analyze the association between long term coffee consumption and body fat mass distribution through multivariate linear regression analyses.

Results and Conclusions: Data are currently being analyzed and will be available in June 2019.

P26 - Postprandial glucose response after the consumption of three mixed meals based on the carbohydrate counting method in adults with type 1 diabetes. A randomized crossover trial

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Background: People on intensive insulin therapy usually calculate their premeal insulin dose based on the total amount of consumed carbohydrates. However, arguments have been expressed supporting that also the protein and fat content of the meals should be considered when estimating premeal insulin dose. We examined the effectiveness of the carbohydrate counting method after consumption of mixed meals, and we further explored the effects of added extra virgin olive oil in these mixed meals, in adults with type 1 diabetes.

Methods: Twenty adults (35.0±8.9 years, BMI 27±5 kg/m2) with diabetes duration 17±11 years, on intensive insulin therapy with multiple injections, consumed 3 mixed meals (pasticcio, chicken with vegetables and baked giant beans), with and without the addition of 11ml extra virgin olive oil (total of 6 meals), in random order, with the insulin dose determined by using the carbohydrate counting method. Capillary blood glucose was measured at premeal (baseline) and 30, 60, 90, 120, 150 and 180 min after meal consumption. At every visit, participants were assessed for anthropometric parameters and subjective stress.

Results: Participants had mean HbA1c 7.5±1.2%, mean carbohydrate to insulin ratio 9:1 IU and stable body weight, waist circumference and subjective stress throughout the study. The mean glucose concentration, for all 6 meals, 120 min postprandially was within target (<180 mg/dL) in nearly 80% of the sample. Addition of olive oil produced sustained increased postprandial glucose concentrations only to pasticcio meal,although within target, and no significant differences were noticed for the grilled chicken with vegetables or the baked giant (legume) meals.

Conclusions: The carbohydrate counting method was effective for achieving postprandial glucose levels within target threshold up to 3 hours postprandially. Moreover, adding small amounts of dietary fat (extra virgin olive oil) to low fat meals does not significantly alter the postprandial response within the first 3 hours, whereas caused a sustained increase in postprandial blood glucose concentrations to the high energy density meal (i.e. the pasticcio meal).

P27 - Insulin resistance subtypes of patients with Diabetes Mellitus type 2 are differently affected by lifestyle and protein drink intervention

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Background: Patients with Type 2 Diabetes Mellitus (T2DM) are mostly overweight or obese. The advice to lose weight for health status improvement may also result in loss of lean mass, deteriorating glucose disposal further. Therefore, we examined insulin resistance older obese patients with T2DM before and after a lifestyle intervention with or without a whey protein drink enriched with leucine and vitamin D aimed to preserve muscle mass during weight loss (PROBE study).

Methods: In a randomized-controlled trial 123 patients with (pre)-T2DM were treated with a 13-week lifestyle intervention (energy restricted diet and strength training 3x/week). The test group received a protein enriched supplement (n=62) and the control group received an iso-caloric control supplement (n=61). Before and after the intervention an OGTT was conducted. Based on fasting (t=0) glucose and insulin concentrations and of t=30, 60, 90 and 120 minutes after glucose drink consumption, indices representing the insulin resistance or sensitivity of organs were calculated. So disposition index (DI) for pancreas function, hepatic insulin resistance for liver function and muscle insulin sensitivity index (MISI) for muscle function. These indices were used to identify subgroups of patients ('subtyping tool'). For statistics, data of 88 subjects that were compliant with respect to energy restriction, supplement intake and training attendance was used (PP analysis).

Results: At baseline, all subjects had a poor beta cell functioning and hepatic insulin resistance, while two main subgroups, one with and one without muscle insulin resistance could be identified for both the test and the control group (equally distributed). After the intervention, of all the subgroups only for the test subgroup with muscle insulin resistance MISI improved, whereas no significant changes were observed in the control group with impaired MISI. Interestingly, also the DI only improved in the muscle insulin resistant subgroup using the test product.

Conclusions: The insulin resistance subtyping tool showed different subgroups in patients with T2DM. The effectiveness of the intervention and the protein drink was especially present in subjects with impaired MISI. Identifying subgroups with the subtyping tool may therefore be a useful diagnosis tool and provide personalized treatment.

P28 - Literature review on effects of L-arabinose on glycaemic response, satiety and body weight in humans

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Background: High sugar consumption increases blood glucose levels which may lead to increased risk for type II diabetes. Approaches that improve postprandial glycemic response, such as sugar reduction, would help address this, and may also lead to more satiety and better weight management. Besides sweetening foods/drinks, sugar has an important structural functionality in some foods. Reformulation of food/drinks is one way of reducing the glycemic effects, however another promising approach is by enriching them with alternative sugars that hinder sugar uptake. L-arabinose is a five-carbon sugar widely found in nature, for example in hemicellulose and pectin, that inhibits sucrase activity and it may be manufactured from sugar beets.

Methods: Search was performed in two databases: Google Scholar and Scopus.

Results: In total 8 papers were included based on the criteria, 5 studies looked at acute effects – one-time exposure to an enriched food/drink - and 3 investigated longer term effects of L-arabinose enrichment. Almost all studies showed a beneficial effect on blood glucose, as well as a beneficial effect on insulin. No effects were observed on satiety, food intake or body weight. Importantly, no side effects were reported. Heterogeneity of the studies, poor design and reporting of the studies made further quantitative analyses impossible. Studies varied in the dose of L-arabinose, the dose of sucrose, type of product/matrix/nutrition composition and the population under study, i.e. healthy or diabetic population.

Conclusions: L-arabinose enrichment of foods/drinks high in sucrose is a promising approach for lowering postprandial glycaemic responses. However, well-designed randomized clinical trials are needed to further explore the potential for enrichment of L-arabinose for sugar containing food applications.

P29 - The effects of a vegan based nutrition drink on inflammatory factors and restitution in a diabetes perspective

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Background: Studies have demonstrated a close correlation between high level of inflammatory factors and development of type-2 diabetes (T2D). The inflammation seen in T2D may be similar to what can be observed in relation to the surgical stress response. Both situations lead to increased secretion of cortisol and cytokines. Cortisol has a negative effect on the metabolism of fat, carbohydrates and protein. Rising gluconeogenesis in the liver, resulting in breakdown of skeletal muscle and increased insulin resistance leading to hyperglycaemia. The inflammatory response following surgery are caused partly by cytokines, leading to increased production of IL-6, CRP, TNF-alfa, among others, which are also increased in patients with diabetes, cardiovascular disease and metabolic syndrome. Vegetable and fruit contain a large number of secondary metabolites. These metabolites give the plant its colour, bitter taste and plays an important role in their defence against microbes and insects. These secondary metabolites are believed to play a role as anti-inflammatory and anti-oxidative agents in humans. In this study we want to investigate the effects of a vegan based nutrition drink in post-operated patients. Beside vegetable and fruit, the primary source of protein is isolated from potato, which has a high content of lysine, leucine, isoleucine and valine, all important for muscle anabolism and believed to stimulate insulin secretion.

Methods: The study is a randomized controlled parallel intervention study involving patients undergoing an abdominal surgery. The participants were randomized into two groups, an intervention group getting the vegan nutrition drink or a control group having an isocaloric dairy based nutrition drink and placebo. The two groups consumed vegan nutrition drink or dairy nutrition drink, respectively, for three days at the hospital, and vegan drink or placebo drink, respectively for three weeks at home. Primary outcome will be inflammatory factors and insulin resistance.

Results and Conclusion: The project is presently ongoing, and we expect to have result to be presented at the DNSG19.

P30 - Mediterranean diet in Croatian hospitals – step in treating obesity

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Background: Overweight and obesity rates have been increasing over the recent decades, and today are considered to be one of the major causes for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. According to Croatian Institute of Public Health, 57.4% of Croatians have excessive body mass, of which 18.7% are obese. European obesity guidelines point that Mediterranean-type dietary pattern have benefits in reducing weight, but only if associated with regular physical activity. Study conducted in University Hospital Dubrava on 24 obese patients showed results in implementing energy restricted Mediterranean diet, using computer program "Dietitian", UH Dubrava, in body weight reduction along with other biomarkers.

Methods: Department of Nutrition and Dietetics participates in group treatment of obesity along with individual treatment with Division of Endocrinology, University Hospital Centre Zagreb. Primary goal of dietetians is to educate patients to establish healthy eating and lifestyle habits to improve health outcome. Mediterranean diet is considered to be most beneficial in achieving mentioned dietary and lifestlye habits. During their stay in 5-day group treatment, patients are adapted to energy restricted Mediterranean diet, complied with personal energy requirements and health status and in accordance with Croatian Standard for Nutrition of Patients in Hospitals.

Results: Mediterranean diet menus are made using computer program "Dietitian", UHC Zagreb. They are 15–30% decreased in energy intake from habitual intake in a weight-stable individual. Also evenly distributed macronutrient intake, adequate intake of vitamins, minerals, fiber and essential nutrients were assured. Patients are educated how to implement Mediterranean dietary regimen tailored to their individual needs in everyday life.

Conclusion: A total of 190 patients in 5-day group treatment in period of 3 years lost together arround 849.4 kg. Special designed Mediterranean diet in hospitals, can have the best chance for long-term success in reducing weight.

P31 - Food composition compliance and reliability in calculations of diabetic, mediterranean and chronic pancreatitic diet offers in hospital

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Background: Medical nutrition therapy defines food consumption subordinated to different medical conditions and must meet certain nutritional requirements. Inadequate intake of certain macronutrients, as well as micronutrients, has a negative impact on the patients condition. Control of some food components and contents of macro- and micro-nutrients become extremely important in hospitals. The aim of this study was to analyse the energy and nutrient offers for menus of diabetic, mediterranean and pancreatic diets and to define their compliance to the DRI recommendations using different Food Composition databases FCDB.

Methods: We used the recipes and food ingredients of above mentioned hospital diets, which are applied in University Hospital Dubrava, to calculate the food composition of a meal and daily menu using four different FCDBs, Croatian, Danish, USDA and hospital FCDB. Analysis of the menus was conducted for seven consecutive days in 2 seasons (Spring/Summer and Autumn/Winter). Descriptive statistics as well multivariate tools were used to investigate differences in the food composition, when different FCDB's were the basis of calculations.

Results: In all diets the fat intake was in accordance with the recommendations, while carbohydrate intake was lower than recommended only in a case when Croatian database was used, specifically in the season Autumn/Winter in pancreatic diet. The most important result in is the content of carbohydrates because high deviation would indicate that some of the FCDBs are problematic in calculating carbohydrates and the counting of carbohydrates is important in the diabetic diet. Protein intake deviates from the recommendations in at least one database in all the menus of above mentioned diet.The average daily intake of niacin,vitamin B6 and vitamin C is in accordance to the recommendations in diabetic and pancreatic diets. Calcium intake below recommendations was obtained only by analyzing menu using the USDA database for the season Spring/Summer in the Mediterranean and pancreatic diet.

Conclusions: FCDBs may contain different content of energy and nutrients for the same food.When choosing a FCDB, priority should be given to the FCDB made in the region of the country where it is used.

P32 - Dietary fibre in diabetes management: systematic review and meta analyses

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Background: Fibre is promoted as part of a health dietary pattern and in diabetes management. We have considered the role of high fibre diets on mortality in prospective studies and increasing fibre intakes on cardiometabolic risk factors in intervention trials of adults with diabetes or prediabetes.

Methods: We have conducted a systematic review of published literature to identify prospective studies or trials which have examined the effects of higher fibre or wholegrain rich diets without additional lifestyle modification in adults with prediabetes, gestational diabetes, type 1 diabetes, and type 2 diabetes. Meta analyses were undertaken to determine the effects of higher fibre intakes on all-cause and cardiovascular mortality and increasing fibre intakes on a range of cardiometabolic risk factors. Dose response testing and meta regression analyses were undertaken, GRADE protocols were followed to assess quality of evidence.

Results: Two prospective studies of 8,300 adults wand 40 trials including 1,691 adults were identified. Prospective data indicate an absolute reduction of 45 fewer deaths (95%CI 14 to 66) when comparing higher with lower fibre intakes, with a clear dose response relationship apparent. Trials of increasing fibre supplements or wholegrain intakes reduced HbA1c MD -2·00 mmol/mol (95%CI -3·38 to -0·61), fasting plasma glucose MD -0·55 mmol/L (-0·73 to -0·37), insulin SMD -2·14 (-3·03 to -1·21), HOMA IR MD -1·36 mg/dL (-1·87 to -0·85), total cholesterol MD -0·32 mmol/L (-0·45 to -0·20), LDL MD -0·16 mmol/L (-0·26 to -0·06) and triglycerides MD -0·15 (-0·22 to -0·08), body weight MD -0·59kg (-1·03 to -0·15), BMI MD -0·39 (-0·59 to -0·19), and C-reactive protein SMD -2·80 (-4·52 to -1·09) when compared with lower fibre diets.

Conclusions: Higher fibre diets are a useful component of diabetes management, likely due to the observed improvements in measures of glycaemic control, blood lipids, body weight, and inflammation which translate into clinical benefit. These benefits were not confined to any fibre type or to any type of diabetes and were apparent across the range of intakes although greater benefits were often observed for glycaemic control when moving from low or average intakes to higher intakes.

P33 - Effects of a high-protein diet on appetite and gut peptides in post-obese participants – a PREVIEW respiratory chamber study

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Background: Even though effects of an acute high-protein (HP) diet on appetite perception and regulation have been shown before, long-term effects and exact pathway(s) by which dietary proteins influence appetite and energy intake remain unknown. We aimed to assess the effects of a high-protein (HP) diet versus normal-protein (MP) diet after weight loss on various aspects of energy intake regulation in energy balance, in a controlled respiration chamber setting.

Methods: Twenty-two female and 16 male subjects (mean age 64.5±5.9 years; BMI 28.9±3.9kg/m²) completed the 48-h respiratory chamber study, being fed in energy balance with a HP: 25P/45CHO/30F or MP: 15P/55CHO/30F En% diet. Relevant postprandial hormones (GLP-1, PYY), hunger, satiety, and ad lib food intake were determined. The study was part of the PREVIEW intervention study, a multi-center EU project (EU-FP7-nr. 312057, Clinicaltrials.gov number NCT01777893) aiming to identify the most effective lifestyle components regarding diet and physical activity in the prevention of T2D, in participants with pre-diabetes. The respiration chamber experiment was done in the end of the PREVIEW intervention study.

Results: Hunger dAUC was lower in the HP condition compared to MP ($p<0.05$). Incremental AUCs of gut-peptides, and HOMA-IR were not different between conditions. Hunger dAUC was inversely associated with PYY iAUC in the HP group ($r=-0.7$, $p<0.01$). Ad lib food intake was not different between groups.

Conclusions: HP is associated with decreased hunger perception, in part through an interaction with PYY.

P34 - Association between polyphenol intake and prevalence of diabetes in the PREDIMED-Plus trial

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Background: Type 2 diabetes is a worldwide burden that can be delayed or prevented by a healthy lifestyle and diet. Dietary polyphenols from plant-based foods have beneficial effects on insulin resistance through the promotion of glucose uptake in tissues. Only few studies evaluating the association between all polyphenol subclasses and the prevalence of diabetes have been conducted so far.

Methods: This is an observational, cross-sectional study within the PREDIMED-Plus cohort(ISRCTN89898870), a trial that is aimed to assess the effect of an energy-restricted Mediterranean diet, physical activity and behavioural support on the primary prevention of cardiovascular diseases. Dietary intake of polyphenols and subclasses at baseline were obtained from yearly food frequency questionnaires (FFQ) using the Phenol-explorer database. Cox proportional hazards regression with a robust variance estimator and follow-up time of 1 were used to estimate risk ratios and 95% Confidence Intervals. Statistical analyses were conducted in STATA software (version 14.0; StataCorp, College Station, TX).

Results: 6874 PREDIMED-Plus participants were studied, 96 of which did not have FFQ and 187 had extreme values of energy intake. Therefore, of the 6591 participants available for the present analysis, 2120 had T2D (32%). After multivariable adjustment, flavonoids, lignans, stilbenes and hydroxybenzoic acids were inversely associated with T2D prevalence, whereas hydroxycinnamic acids were directly associated.

Conclusions: A polyphenol-rich diet, and specially some classes of polyphenols, are associated to T2D prevalence in this population at high cardiovascular risk.

P35 - The 'Glycoprofit' project: In vitro investigation of metabolic health effects of rare sugars

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Background: Sugar consumption may contribute to obesity development, which is a major risk factor for chronic diseases such as diabetes. Rare sugars may offer an alternative for conventional sugars such as sucrose, by providing sweetness and bulk with less negative impact on health. Known health effects of rare sugars include low glycaemic effects, low caloric content and liver-protective effects. However, only a few rare sugars have been studied so far. This study investigates metabolic health effects of rare sugars using high-throughput methods, in order to select promising sugar replacers.

Methods: Sugar-free cell culture medium was supplemented with glucose, fructose, xylose, L-arabinose, maltose, kojibiose and trehalose. First, mitochondrial energy (resazurin assay) effects for rare versus conventional disaccharides were tested in intestinal Caco-2 cells. Subsequently, the inhibiting effect of xylose and L-arabinose on this energy provision by conventional sugars was tested. In addition, the effect of various monosaccharides on fat accumulation (AdipoRed assay) in HepG2 liver cells was determined.

Results: The rare glycobioses trehalose and kojibiose did not provide a significant boost to mitochondrial energy production, whereas maltose increased energy production by almost 50%. Energy provided by conventional sugars was non-significantly lower in the presence of xylose and L-arabinose, with concentration-dependent trends visible for the latter. Intracellular hepatic fat accumulation was enhanced by fructose and glucose, but not by L-arabinose.

Conclusions: This study suggests that certain rare sugars lack negative effects of conventional sugars, regarding energy provision and liver fat accumulation. These findings strengthen the hypothesis that rare sugars are digested and metabolized differently and challenges the notion that all sugars are equally unhealthy, although confirmation in vivo is required.

P36 - The 'Glycoprofit' project: Biocatalytic Synthesis of the Rare Sugar Kojibiose: Process Scale-Up and Application Testing

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Background: Sugar consumption may contribute to obesity development, which is major risk factor for diabetes. In the search for sugar replacers, rare sugars are candidates for which many health benefits have been reported in recent years. However, only a few rare sugars have been investigated due to low availability of rare sugars. Here efficient synthesis of the rare glycobiose kojibiose is described, as well as the first characterization of its cellular health effects.

Methods: Kojibiose synthesis from sucrose and glucose using genetically engineered enzymes, was optimized and its digestion was simulated using the internationally accepted Minekus protocol. In Caco-2 cells, effects of kojibiose on oxidative stress (intracellular ROS), nitric oxide production and mitochondrial respiration (MTT) were tested. Finally, microbial fermentation of kojibiose was determined in fecal samples from human volunteers.

Results: Synthesis at a 10L scale gave a 3 kg yield of 99% pure kojibiose. Kojibiose was not digested in the upper gastrointestinal tract and its digestion rate by α-glucosidases rate was 10 fold smaller than for maltose. Furthermore and unlike glucose, kojibiose at 4.5 g/l did not increase mitochondrial respiration or nitric oxide production. In addition, kojibiose increased short chain fatty acid production 2-fold after 24 hour exposure.

Conclusions: Highly pure kojibiose was successfully produced from sucrose on a large scale. The in vitro tests suggest that this sugar has a low digestibility and prebiotic properties, while lacking the unfavourable mitochondrial effects of pure glucose.

Aknowledgements: Research was performed within the 'Glycoprofit' project, which is a SBO project funded by FWO.

P37 – Effects of almond consumption on chronic glucose regulation, vascular function and cognitive performance: The AL-INCLUSIVE trial

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Background: The prevalence of diabetes, a risk factor for the development of cardiovascular diseases, is rapidly rising. Shorter-term studies have suggested that almonds lower the risk of developing diabetes and cardiovascular disease as shown by improvements in plasma glucose, serum lipids and blood pressure. Almond consumption also seems to have beneficial effects on cognitive function by attenuating cognitive decline. To examine whether these effects are sustained over a longer period of time and to address mechanisms underlying these health effects, we initiated a long-term intervention study in which subjects with prediabetes consume almonds.

Objective: To examine the impact of long-term almond consumption on glucose metabolism, vascular function and cognitive performance in subjects with prediabetes. Study design: Forty-three overweight/obese (BMI 25-35 kg/m2) men and women (age 40-70y) with prediabetes participate in a 12-month randomized, controlled trial with a cross-over design. During the intervention period subjects will consume 50 grams almonds per day.

Outcome: The primary outcome is whole body insulin sensitivity measured by a hyperinsulinemic euglycemic clamp. Secondary outcomes are 1) peripheral vascular function as measured by pulse wave analysis and pulse wave velocity, 2) central vascular function analyzed via cerebral blood flow (Arterial Spin Labeling) and 3) neuropsychological tests. To explore underlying mechanisms, changes in hepatic lipid accumulation and inflammation, visceral and subcutaneous fat accumulation, pancreatic function and fecal microbiota composition are investigated.

Current status: Eighteen participants have been recruited and one has completed the study.

Funding: The study is funded by the Almond Board of California.

P38 – Dairy matrix affects postprandial triglyceride concentration: preliminary results from a randomized, cross-over meal test study

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Background: It has previously been suggested that the risk of developing type 2 diabetes and cardiovascular diseases increases with consumption of dairy products, due to a high content of saturated fatty acids. However, this does not seem to be the case. A hypothesis is that the dairy matrix itself influences how nutrients are absorbed. Therefore, this study investigates how dairy matrix alterations affect the postprandial lipid profile.

Methods: In total, 25 normal-weight males were recruited for a randomized cross-over meal study with 4 test days. An isocaloric macronutrient matched test meal including 1 of 4 dairy products was served; CHEESE, cheddar cheese; H.CHEESE, homogenized cheddar cheese; MCI DRINK, micellar casein isolate (MCI) with added cream; GEL, gel product made from the MCI drink. Fasting and 8 hours postprandially blood samples were drawn. Analyses of: apolipoprotein (Apo) B48, glucose, insulin, cholesterol, free fatty acids and ApoB100 are ongoing. For triglycerides (TG), the effect of the meals on incremental area under the curve (iAUC) has been analysed by linear mixed model including subject as random effect and adjusted for age, body mass index and visit.

Results: Preliminary results from 20 participants showed a significant difference between the dairy products ($p<0.001$) in iAUC for TG (mean ±SE: CHEESE, 242±35; H.CHEESE, 237±36; MCI DRINK, 297±32; GEL, 338±40 mmol/L×8 hours). After Tukey adjustment, post hoc analyses showed that CHEESE intake lowers iAUC compared to MCI DRINK ($p=0.012$) and GEL ($p=0.003$), and intake of H.CHEESE lowers iAUC compared to GEL ($p=0.033$). Results on the other outcomes will be presented at the symposium.

Conclusions: The dairy matrix of cheese seems to induce a lower postprandial lipid response compared with a drink and a gel when served isocaloric and macronutrient matched. Further analyses are needed to verify this.

P39 – Impact of bacterial probiotics on obesity, diabetes, and non-alcoholic fatty liver disease related variables: a systematic review and meta-analysis of randomized controlled trials

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Background: The effectiveness of bacterial probiotics across subjects with different metabolic disorders is underexplored. Therefore, we systematically reviewed the effect of oral intake of bacterial probiotics on fifteen variables related to obesity, diabetes, and non-alcoholic fatty liver disease.

Methods: We conducted a systematic review and meta-analysis of randomized controlled trials (14 days) excluding hypercholesterolemia, alcoholic liver disease, polycystic ovary syndrome and children <3 years. We searched MEDLINE, EMBASE, and the COCHRANE library from 1990 to June 2018. CRD42016033273

Results: One hundred and five articles met inclusion criteria, representing 6826 subjects. In overweight but not obese subjects, probiotics induced improvements in: body weight (BW, n comparisons 25, -0.94 kg, 95% CI: -1.17 to -0.70, I2=0.0%), body mass index (BMI, 32, -0.55 kg/m2, 95% CI: -0.87 to -0.24, I2= 91.9%), waist circumference (WC, 13, -1.31 cm, 95% CI: -1.79 to -0.83, I2=14.5%), body fat mass (BFM, 11, -0.96 kg, 95%CI: -1.21 to -0.71, I2=0.0%), and visceral adipose tissue mass (VAT, 5, -6.30 cm2, 95%CI: -9.05 to -3.56, I2=0.0%). In type 2 diabetics, probiotics reduced fasting glucose (FG, 19, -0.66 mmol/l, 95% CI: -1.00 to -0.31, I2=27.7%), glycated hemoglobin (HbA1c, 13, -0.28 pp, 95% CI: -0.46 to -0.11, I2=54.1%), insulin (INS: 13, -1.66 mU/l, 95% CI: -2.70 to -0.61, I2=37.8%) and homeostatic model of insulin resistance (HOMA-IR, 10, -1.05 pp, 95% CI: -1.48 to -0.61, I2= 18.2%). In subjects with fatty liver diseases, probiotics reduced alanine (ALAT, 12, -10.2 U/l, 95% CI: -14.3 to -6.0, I2=93.5.0%) and aspartate aminotransferases (ASAT, 10, -9.9 U/l, 95% CI: -14.1 to 5.8, I2=96.1%). These improvements were mostly observed with bifidobacterial, Streptococcus salivarius subsp. thermophilus and lactobacilli containing mixtures and influenced by trials conducted in one country.

Conclusions: The intake of probiotics resulted in minor, but consistent improvements in several metabolic risk factors in subjects with metabolic diseases.

P40 – The impact of Personalized Lifestyle Advice as compared to regular care in newly diagnosed type 2 diabetics in Hillegom

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Background: Lifestyle modification can be effectively used to halt disease progression and even normalize symptoms for type 2 diabetes (T2D). Especially interventions aimed at modifying physical activity (PA) and diet are very promising. However, most of these interventions are one-size-fits-all. A more personalized and tailored approach, based on the physical, mental, behavioral and socio-economic health status of a person, might help in optimizing such interventions to better fit the needs of individual patients.

Methods: TNO developed the so-called 360° diagnosis tool for treatment of T2D in the primary care setting. With this tool an extensive assessment of the physical and mental health status, the lifestyle behavior and the socio-economic environment of an individual can be done, using data from online questionnaires and clinical data. Combined, these data provide a holistic view of a patient's health status, which is visualized in the "profile wheel" representing all individual results using traffic light colors based on underlying cutoffs. Additionally, based on the clinical data a personalized diet and PA advice is given. This profile wheel provides a conversation and decision support tool that can be used during a consultation between patient and health care provider. Using motivational interviewing the focus is mainly on setting a realistic goal to change a lifestyle behavior. However, it could be that interventions should first target depressive feelings or financial problems.

Results: At the moment, the tool is applied in a Lifestyle as Medicine program. The first seven patients are included in the pilot. Their 360 degrees diagnosis results are discussed by a multidisciplinary team before they are discussed with the patients. Outcome measures include acceptance by patients and professionals, effect on the patient-nurse communication, health effects, implementation in the organizational process, but also a societal cost-benefit analysis to decide whether scaling up is feasible.

Conclusion: The 360° tool and wheel has the potential to change the consultation between patient and caregiver such that valuable time can be spent on shared decision making and a shared behavioral treatment strategy.

Map of Congress Venue

ABDIJ ROLDUC

hotel restaurant conferentieoord

BEGANE GROND

A Abdijkerk
B Grote Eetzaal
C Brasserie De Kanunnik
D Foyer
E Aula Major (buiten)
F Aula Minor (buiten)
G Fietsenstalling (buiten)
R Receptie

BEGANE GROND

1 Zaal 1
2 Zaal 2
3 Zaal 3
4 Zaal 4
14 Zaal 14

KELDER (-1)

I De Verloren Zoon
J Zwaantje
K Rookruimte
L Kana 1
M Kana 2
N Boerenkelder

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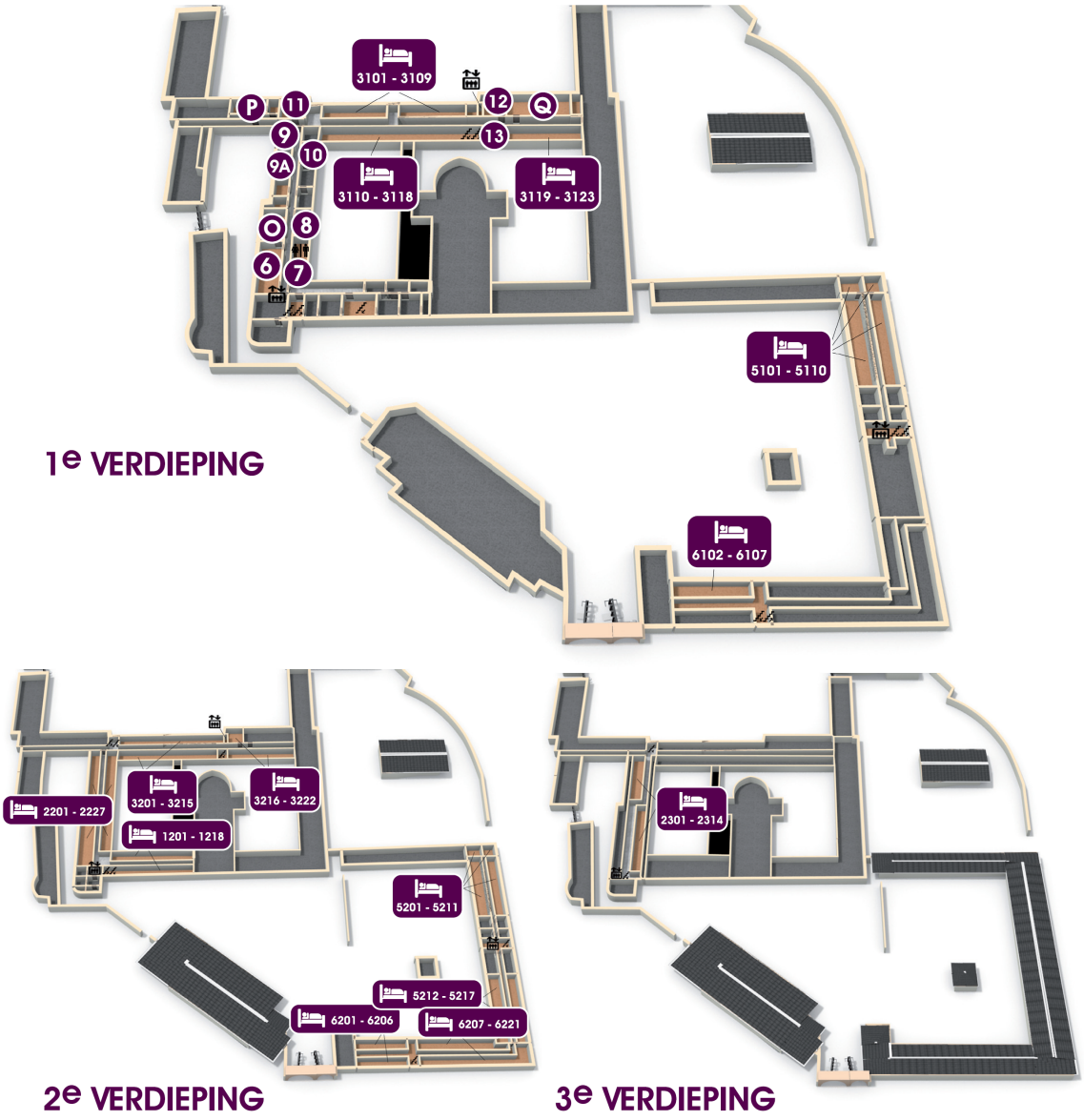

1e VERDIEPING

- 0 Kleine Eetzaal
- P Bisschopszaal
- Q Rococo-bibliotheek

Lift

1e VERDIEPING

- 6 Zaal 6
- 7 Zaal 7
- 8 Zaal 8
- 9 Zaal 9
- 9A Zaal 9A
- 10 Zaal 10
- 11 Zaal 11
- 12 Zaal 12
- 13 Zaal 13

1e VERDIEPING

3101 - 3123 (hoofdgebouw)
5101 - 5110 (Hoeve)
6102 - 6107 (Hoeve)

2e VERDIEPING

1201 - 1218 (hoofdgebouw)
2201 - 2227 (hoofdgebouw)
3201 - 3222 (hoofdgebouw)
5201 - 5217 (Hoeve)
6201 - 6221 (Hoeve)

3e VERDIEPING

2301 - 2314 (hoofdgebouw)

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