The Nutrition Society

# Scottish Section Conference 2024

## Circadian rhythms in health and disease

26-27 March 2024 - Aberdeen, Scotland

CONFERENCE PROGRAMME

## Contents

**Welcome letter**

This year the Scottish Section of The Nutrition Society is hosting the Scottish Section Conference in Aberdeen, at the Suttie Centre, part of the University of Aberdeen School of Medicine, Medical Sciences and Nutrition.

The conference will present the latest advancements in circadian rhythms in health and disease, which is a hot topic in animal and human research. Our daily circadian rhythms and sleep/wake cycle allow us to function optimally and adjust to the demands of the day and night cycle. We will explore the mechanisms that regulate the circadian system in mammals and other models, and how regulation plays a crucial role in people's healthy lives. Thus, circadian rhythms have an important purpose, as they prepare the body for expected changes in the environment, and for example, the time for physical activity, sleep and eating. External cues are important and the strongest is the sun's light/dark cycle. Artificial light also influences the pacemaker.

Disturbance of circadian rhythm is a nonspecific umbrella term to describe a disturbance, dysregulation, or problem that negatively affects circadian function. It is becoming increasingly clear that circadian disruption in humans can result in broad and significant consequences for mental and physical health. For example, changes in circadian function are often accompanied by sleep-wake disturbances, which also in turn, contribute to poor health outcomes. The interrelationship between circadian rhythms and human disease can create a vicious cycle between disease expression and circadian disruption, measured in immunology, cardiometabolic disease, neurodegenerative decline, and changes in mood.

Circadian knowledge from basic science is robust, but less is available in the areas of clinical and population health. We look forward to exploring and debating the implications and translation of evidence to practice to implementation.

This conference consists of presentations from internationally invited speakers followed by live discussions, and poster presentations. The plenary lectures on "Chronobiology for health and disease" and "Time Restricted Feeding" will respectively open and close the conference; we very much look forward to welcoming our guest speakers.

Three exciting symposia take us from, "Nutrient and diet interaction with circadian rhythms" to "Chrono-nutrition for health" and conclude the delegation with issues related to "Circadian systems in disease".

The student-focused session at the end of day one invites a nutritionist to share insights to their academic and commercial journey.

If you use X, please follow the conference at @NutritionSoc and continue the discussion using the hashtag #NSScottish24.

Nutrition Society members can also make use of Member-Connect to network, exchange views and discuss the latest research around the topic of circadian rhythms.

We hope that you will find each session highly stimulating and enjoyable. There will be opportunities to provide feedback and we encourage you to do so, as it will help us improve future conferences.

We look forward to welcoming you to **#NSScottish24**.

Yours sincerely,

Professor Alexandra Johnstone, The Rowett Institute, University of Aberdeen, Scotland,
Scientific Organiser
Dr Brendan Gabriel, The Rowett Institute, University of Aberdeen, Scotland,
Scientific Organiser

**PROGRAMME DAY ONE**
TUESDAY 26 MARCH

**09:50** **Registration**
*Atrium*

**10:25** **Welcome**
*Lecture Theatre 012*
*Professor Alexandra Johnstone, The Rowett Institute, University of Aberdeen, UK*
*Dr Brendan Gabriel, The Rowett Institute, University of Aberdeen, UK*

**Plenary Lecture One**
*Lecture Theatre 012*

**10:30** **Chronobiology for health and disease**
*Professor Frank Scheer, Harvard Medical School, USA*

**Symposium One: Nutrient and diet interaction with circadian rhythms**
*Lecture Theatre 012*

**11:00** **Biological rhythms, nutrient timing and metabolic regulation in humans**
*Dr Harry Smith, ZOE Ltd & King's College London, UK*

**11:30** **Chronotypical influence on appetite control & energy balance behaviours**
*Dr Kristine Beaulieu, University of Leeds, UK*

**12:00** **NutriClock – Clock genes and circadian biomarkers as a novel phenotype of obesity**
*Professor Maria Pedro Sucena Guarino, Polytechnic University of Leiria, Portugal*

**12:30** **Panel Discussion**

**12:45** **Lunch Break**
*Breakout Space, Level One*

**13:30** **Original Communication Session One**
*OC01 – OC08, Lecture Theatre 012*
*OC09 – OC18, Conference Room, Level Four*

**Symposium Two: Chrono-nutrition for health**
*Lecture Theatre 012*

**15:30** **Impact of intermittent energy restriction on women's health**
*Dr Michelle Harvie, Manchester University Hospital Foundation NHS Trust, UK*

**16:00** **Sleep and nutrition for athletes**
*Dr Rónán Docherty, Atlantic Technological University, Sport Ireland Institute, Ireland*

**16:30** **Optimal sleep: a key element of maintaining a healthy bodyweight**
*Professor Wendy Hall, King's College London, UK*

**17:00** **Panel Discussion**

**17:30** **Student Event**
*Lecture Theatre 012*

**The journey of breaking B.A.D. – from academic to entrepreneur**
*Dr Monika Gostic, University of Aberdeen, UK*

**18:00** **Close of Day**

**18:05** **Drinks Reception**
*Breakout Space Level One*

**All delegates are welcome to attend this complimentary reception as part of their registration.*

**ORIGINAL COMMUNICATIONS SESSION - RUNNING ORDER**
**Abstracts are presented as accepted for publication.*

**Oral Session One**
**Room: Lecture Theatre 012**
**Time: 13:30 – 14:30**

**13:30 OC01** **Eating on the Night Shift: A qualitative study to understand what is important to UK night workers when designing nutritional research.** *R. Gibson[1] and C. Fitzhugh[1,2] 1. Department of Nutritional Sciences, King's College London, London UK and 2. Research Institute for Sport and Exercise Sciences, Liverpool John Moores University, Liverpool, UK.*

**13:45 OC02** **Simultaneous plasma and interstitial profiles of hormones and metabolites using U-RHYTHM: a novel ambulatory collection device.** *C.M. Isherwood[1], D.R. van der Veen[1], N.R. Chowdhury[1], S.T Lightman[2], T.J. Upton[2], D.J. Skene[1] 1. Section of Chronobiology, Faculty of Health and Medical Sciences, University of Surrey, Guildford, Surrey GU2 7XH, UK and 2. Henry Wellcome Laboratory, Integrated Neuroscience & Endocrinology, Translational Health Science, University of Bristol, Bristol BS1 3NY, UK.*

**14:00 OC03** **What is the usual eating window for children and adolescents aged 6-20 years: a systematic review.** *J. Townley[1], K. Northstone[2], E.C. Hinton[2], J.P. Hamilton-Shield[2] and A.J. Searle[2], S.D Leary[1] 1. Bristol Dental School, University of Bristol, Bristol, UK and 2. Bristol Medical School, University of Bristol, Bristol, UK.*
**Student Competition**

**14:15 OC04** **Short-term changes in human metabolism following a 5-hour delay of the light-dark and behavioural cycle.** *A. Flanagan[1,2] L.C. Ruddick-Collins[3], B. Fielding[2], B. Middleton[1], J. von Gerichten[2], M. Short[4], V. Revell[5], J. Mendis[6], C.D. Mayer[7], P.J. Morgan[3], A.M. Johnstone[3], J.D. Johnston[1] 1. Section of Chronobiology, Faculty of Health and Medical Sciences, University of Surrey, Guildford, Surrey GU2 7XH, UK and 2. Section of Molecular Medicine, Food and Macronutrients, Faculty of Health and Medical Sciences, University of Surrey, Guildford, Surrey GU2 7XH, UK and 3. The Rowett Institute, University of Aberdeen, Foresterhill, Aberdeen, Scotland, AB25 2ZD, UK and 4. Department of Chemical and Process Engineering, Faculty of Engineering and Physical Sciences, University of Surrey, Guildford, Surrey GU2 7XH, UK and 5. Surrey Sleep Research Centre, Faculty of Health and Medical Sciences, Guildford, Surrey GU2 7XP, UK and 6. Surrey Clinical Trials Unit, Faculty of Health and Medical Sciences, Guildford, Surrey GU2 7XP, UK and 7. Biomathematics and Statistics Scotland, University of Aberdeen, Foresterhill, Aberdeen, Scotland, AB25 2ZD, UK.*

**Oral Session Two**
**Room: Lecture Theatre 012**
**Time: 14:35 – 15:35**

**14:35** **OC05** **Investigating the Longitudinal Bi-Directional Relationship between Restrictive-Type Disordered Eating and Sleep in UK Adolescents within the Millennium Cohort Study.** *M.-C. Opitz[1*], N. Trompeter[2], F. D. Rabelo da Ponte[3], G. Gaggioni[4], N. Micali[2, 5], S. Desrivieres[3], U. Schmidt[3, 6], and H. Sharpe[1] 1. Department of Clinical Psychology, School of Health in Social Sciences, University of Edinburgh, Scotland and 2. Institute of Child Health, University College London, UK and 3. Institute of Psychiatry, Psychology and Neuroscience, King's College London, UK and 4. Division of Psychiatry, Centre for Clinical Brain Sciences, University of Edinburgh, Scotland and 5. Ballerup Psychiatric Centre, Eating Disorder Research Unit, Copenhagen, Denmark and 6. Department of Psychological Medicine, King's College London, UK.*

**14:50** **OC06** **Impact of circadian rhythm disturbance on metabolic parameters: Identification of chronodisruption biomarkers in Wistar rats.** *F. García-Reyes [1,2], R.A. López-Villalba [1,2], F.I. Bravo [1,2], M. Suárez [1,2] and C. Torres-Fuentes[1,2] 1. Universitat Rovira i Virgili, Departament de Bioquímica i Biotecnologia, Nutrigenomics Research Group, Spain and 2. Nutrigenomics Research Group, Institut d'Investigació Sanitària Pere Virgili. C/ Marcel·lí Domingo 1, 43007 Tarragona, Spain.*
**Student Competition**

**15:05** **OC07** **The effect of vitamin D supplementation on muscle strength in community-dwelling postmenopausal Asian women: a scoping review.** *C. Y. Kwan[1] 1. School of Human Sciences, London Metropolitan University, London, UK.*
**Student Competition**

**15:20** **OC08** **Effects of meal timing on human plasma metabolite rhythms.** *C. M. Isherwood, D. R. van der Veen, C. F. Frampas, D. J. Skene* and J. D. Johnston* *Joint senior authors 1. Section of Chronobiology, Faculty of Health and Medical Sciences, University of Surrey, Guildford, UK.*

**Poster Session One**
**Room: Conference Room, Level Four**
**Time: 13:30 – 14:40**

**13:30** **OC09** ***Exploring the Associations between Chronotype, Meal Frequency, and Physical Activity: A Population-based Study in Adults.*** *M.H. Alhussain[1] and A.S. BaHammam[2,3] 1. Department of Food Science and Nutrition, College of Food and Agriculture Sciences, King Saud University, Riyadh, Saudi Arabia and 2. University Sleep Disorders Center, Department of Medicine, College of Medicine, King Saud University, Riyadh, Saudi Arabia and 3. King Saud University Medical City, King Saud University, Riyadh, Saudi Arabia.*

**13:37** **OC10** **Undernutrition levels in Scottish older-adult population: a secondary data analysis of the Scottish Health Survey 2021.** *D. Morecroft[1], D. R. Crabtree[1], and A. M. Johnstone[1] 1. The Rowett Institute, School of Medicine, Medical Sciences and Nutrition, University of Aberdeen, Aberdeen, UK.*
**Student Competition**

**13:44** **OC11** **Food image validation for assessing diurnal patterns of appetite and food reward in individuals ranging in BMI with and without type 2 diabetes.** *K. Beaulieu[1], H. Pedersen[2*], C. S. Søndergaard[2], C. van Elst[2], K. Færch[2*], G. Finlayson[1], J. S. Quist[2,3] 1. School of Psychology, University of Leeds, Leeds, UK and 2. Clinical Research, Copenhagen University Hospital—Steno Diabetes Center Copenhagen, Herlev, Denmark and 3. Department of Biomedical Sciences, University of Copenhagen, Copenhagen, Denmark.*

**13:51** **OC12** **Identification of differentially expressed genes associated to circadian rhythm disruption in rat peripheral blood mononuclear cells: a transcriptomic analysis.** *F. García-Reyes [1,2], R.A. López-Villalba [1,2], F.I. Bravo [1,2], C. Torres-Fuentes [1,2] and M. Suárez[1,2] 1. Universitat Rovira i Virgili, Departament de Bioquímica i Biotecnologia, Nutrigenomics Research Group, Spain and 2. Nutrigenomics Research Group, Institut d'Investigació Sanitària Pere Virgili. C/ Marcel·lí Domingo 1, 43007 Tarragona, Spain.*
**Student Competition**

**13:58** **OC13** **Assessment of motivating factors to follow a time-restricted eating dietary protocol.** *M. Lages[1,2,3,4], S. Carmo-Silva[5,6], R. Barros[2,3,4], M.P. Guarino[1,7] 1. ciTechCare – Center for Innovative Care and Health Technology, Polytechnic University of Leiria, Leiria, Portugal and 2. Faculty of Nutrition and Food Sciences, University of Porto, Porto, Portugal and 3. Laboratory for Integrative and Translational Research in Population Health (ITR), University of Porto, Porto, Portugal and 4.*

*EPIUnit - Institute of Public Health, University of Porto, Porto, Portugal and 5. Polytechnic Institute of Castelo Branco, Castelo Branco, Portugal and 6. Coimbra Health School, Polytechnic University of Coimbra, Coimbra, Portugal and 7. ESSLei, School of Health Sciences, Polytechnic University of Leiria, Leiria, Portugal.*
**Student Competition**

**14:05** **OC14** **Dietary Intake and Snacking Behaviour of Children Aged 3-5 in Urban and Rural Areas of Thailand's Southernmost Border Provinces.** *N. Tayeh[1], C. Wright[1] and A.L. Garcia[1] 1. Human Nutrition, School of Medicine, Dentistry and Nursing, College of Medical, Veterinary & Life Sciences, University of Glasgow, Glasgow, UK.*
**Student Competition**

**14:12** **OC15** **Synchronizer role of flavanols in cafeteria-diet-induced obese rats administered a sweet treat at different times.** *JR. Soliz-Rueda [1,2,3], R. López-Fernández-Sobrino [1], H. Schellekens[2, 3], F.I. Bravo [1], and B. Muguerza [1,2,3]* 1. University Rovira i Virgili, Biochemistry and Biotechnology Department, Nutrigenomics Research Group, Tarragona, Spain and 2. Department of Anatomy and Neuroscience, University College Cork, Cork, Ireland and 3. APC Microbiome Ireland, Cork, Ireland.*

**14:19** **OC16** **Zinc and iron biofortification of crops grown in a vertical farm.** *A. Bucky[1], M. Pičmanová[2], V. Porley[3], S. Pont[2], A. Johnstone[1], and D. Stewart[2] 1. The Rowett Institute, University of Aberdeen, Aberdeen, UK and 2. The James Hutton Institute, Invergowrie, Dundee, UK and 3. Intelligent Growth Solutions, Invergowrie, Dundee, UK.*
**Student Competition**

**14:26** **OC17** **An investigation into parental awareness of the importance of gut health in infancy and of the effect of mode of delivery and gestational age on their infant's gut health.** *E. Lynch[1], J.L. O'Neill[2], K. O'Connor[2], Z. O'Regan[2], and S. Wilkinson[2] 1. Technological University Dublin, Dublin, Ireland and 2. Danone Nutricia Specialised Nutrition, Dublin, Ireland.*
**Student Competition**

**14:33** **OC18** **Exploring protein literacy online: a thematic analysis of YouTube comments on food protein knowledge.** *C.M. Conti[1], E. Nikokavoura[1] and L. Starr-Vaanholt[1] 1. School of Pharmacy and Life Sciences, Robert Gordon University, AB10 7GJ, Aberdeen, UK.*
**Student Competition**

**PROGRAMME DAY TWO**
WEDNESDAY 27 MARCH

**Symposium Three: Circadian systems in disease**
*Lecture Theatre 012*

**10:00** ***Feasibility of time – restricted eating in the prevention and treatment of Type 2 Diabetes***
*Dr Jonas Salling Quist, Steno Diabetes Centre Copenhagen, Denmark*

**10:30** **Timing of eating for weight loss**
*Dr Alan Flanagan, University of Surrey, UK*

**11:00** **Exercise, nutrition, and medicine timing in metabolic health: implications for management of Type 2 Diabetes**
*Dr Brendan Gabriel, The Rowett Institute, University of Aberdeen, UK*

**11:30** **Refreshment Break**
*Breakout Space Level One*

**Plenary Lecture Two**
*Lecture Theatre 012*

**11:45** **Time restricted feeding**
*Professor Satchidananda Panda, Salk Institute for Biological Sciences, USA*

**12:15** **Panel Discussion**

**12:35** **Close of Conference**

**12:40** **Scottish Section Annual General Meeting***
*Lecture Theatre 012*

**The Annual General Meeting is open to all members of the Scottish Section of The Nutrition Society.*

## SPEAKER PRESENTATION SUMMARIES AND BIOGRAPHIES

*Speaker presentation summaries and biographies are published as submitted.

**Chronobiology for health and disease**
*Professor Frank Scheer, Harvard Medical School, USA*

## PRESENTATION SUMMARY

Obesity and diabetes are highly prevalent and contribute significantly to cardiovascular disease and mortality. Most research and clinical attention has focused on the importance of diet and exercise as modern lifestyle factors in these developments and in guiding behavioral interventions. However, in recent years, it has become clear that other modern lifestyle changes such as the (mis)timing of food intake, physical activity, and environmental light importantly impact metabolism and cardiovascular risk factors. This raises the possibility of the circadian system as a novel target in the prevention, management, and personalised treatment of cardiometabolic disease. The objectives of my talk will be to: (a) review evidence for the role of the human circadian timing system in disease severity, including the morning peak in serious adverse cardiovascular events and nocturnal worsening of asthma; (b) discuss the effects of the human circadian system and circadian misalignment on glucose control, metabolism, inflammation, and cardiovascular function; (c) explain the effect of melatonin and its interaction with type 2 diabetes risk variant *MTNR1B* on glucose control; and (d) present evidence for the importance of not just what you eat, but also of when you eat for health and disease (chrononutrition), including the promise of food timing to prevent adverse health effects of night shift work and with relevance for personalised medicine.

## BIOGRAPHY

Dr. Frank A.J.L. Scheer is a Professor of Medicine at Harvard Medical School (HMS), Senior Neuroscientist at Brigham and Women's Hospital (BWH), and the Director of the Medical Chronobiology Program (MCP) at BWH. Dr. Scheer co-founded and currently directs the MCP, an interdisciplinary research program at BWH to foster translational research in sleep and circadian biology. Investigations include the role of the human circadian timing system underlying daily rhythms in disease severity (e.g., morning peak in myocardial infarction, nocturnal worsening of asthma severity), adverse cardiometabolic effects of circadian misalignment and night work, effects of food timing on cardiometabolic function, and their interactions with genetics. The MCP further investigates the development of personalised and time-based behavioral, environmental, and pharmaceutical interventions based on chronobiological concepts, e.g., appropriately timed food intake, exercise, light, or melatonin to prevent, treat, and/or manage diseases, including hypertension, asthma, obesity, and diabetes.

Dr. Scheer obtained a BA in Biology (1995) and a MSc in Neurophysiology (1997), both from Utrecht University, and a PhD from the University of Amsterdam for his graduate studies with Dr. Ruud M. Buijs at the Netherlands Institute for Brain Research (2003). He completed a dual postdoc in the laboratories of Dr. Steven A. Shea and Dr. Charles A.

Czeisler, both at BWH and HMS, where he became a faculty in 2005. Dr. Scheer's awards include the Neal Miller Award; Outstanding Scientific Achievement Award, Sleep Research Society; Pillars of Excellence Award, Mass General Brigham; and the Mrosovsky Keynote Lecture Award, Canadian Society for Chronobiology. Dr. Scheer has an H-factor of 80 and has been cited over 15,000 times in just the last five years.

**Biological rhythms, nutrient timing and metabolic regulation in humans**

*Dr Harry Smith, ZOE Ltd & King's College London, UK*

## PRESENTATION SUMMARY

Biological rhythms in physiological and behavioural processes anticipate regular environmental changes and therefore adjust physiology and behaviour accordingly. These biological rhythms are particular robust within skeletal muscle and appear to coordinate the response of this tissue to variable nutrient supply across the day. The timing and/or distribution of nutrients across the day could therefore conceivably alter biological rhythms in this tissue, which has implications for metabolic health.

This presentation will cover the work focusing on both absolute (i.e., given time of day of meals - clock time), and relative timing (i.e., relative to other related events across the day such as sleep, exercise, and other meals) of meals across the day. This presentation covers the work from Dr Smith's PhD focusing on both absolute and relative timing of meals and their impact on metabolic regulation.

Data will be presented from a novel semi-constant routine protocol employed over 2 studies: 1) studying diurnal rhythms in skeletal muscle gene expression and the temporal relationships with circulating biomarkers of metabolic regulation and 2) investigating the acute effects of divergent patterns on enteral feeding on the 24-h profiles of skeletal muscle transcriptome, circulating metabolic and endocrine markers, appetite, and autophagic flux.

Further work will be presented on the timing of meals relative to other interrelated events across the day. With a particular focus on the first meal of the day this presentation will cover: 1) the effects of sleep fragmentation and the consumption of coffee as a countermeasure to poor sleep on next morning glucose control; 2) the acute (minutes-hours) effect of increasing protein content of breakfast relative to both a typical carbohydrate rich breakfast and extended morning fasting and 3) the medium term (days-weeks) effect of whey protein enriched breakfast on energy balance, and metabolic regulation relative to daily carbohydrate-rich breakfast or extended morning fasting.

## BIOGRAPHY

Dr Harry Smith is currently a Nutrition Research Scientist at ZOE Ltd, and Visiting Research Associate at King's College London. His research to date has taken an integrative approach to examine whole-body physiology alongside molecular, cellular, metabolic, and behavioural factors. Following an integrated Masters in Sport and Exercise Science at the University of Bath he then pursued a PhD in Nutrient timing and metabolic regulation in humans, under the supervision of Professor James Betts in the Centre for Nutrition, Exercise and Metabolism at the University of Bath. In his current role at ZOE Ltd he is working on external dissemination and internal implementation of the PREDICT programme of research, under the supervision of Dr's Sarah Berry and Kate Bermingham. In his role as Visiting Research Associate at Kings College London Dr Smith assists with

complex statistical analyses of data generated from dietary RCT's run in the laboratory group of Dr's Sarah Berry and Wendy Hall.

**Chronotypical influence on appetite control & energy balance behaviours**
*Dr Kristine Beaulieu, University of Leeds, UK*

## PRESENTATION SUMMARY

A person's chronotype reflects individual variability in diurnal rhythms for preferred timing of sleep and daily activities. As such, some individuals have preference for the morning (early chronotypes or 'larks') while others have preference for the evening (later chronotypes or 'owls'). Increasing evidence demonstrates that chronotype is an independent predictor of health risks. Specifically, studies have shown that later chronotype is associated with higher BMI and type 2 diabetes. While the majority of studies don't show differences in total daily energy intake between chronotypes, chronotype appears associated with the distribution of energy intake throughout the day, with intake shifted later and greater prevalence of night eating in later chronotypes. Indeed, a later chronotype may exacerbate the influence of greater evening energy intake on overweight/obesity risk. Furthermore, later chronotypes tend to have worse diet quality and greater intake of unhealthy foods, caffeine, and alcohol. Later chronotypes are also associated with eating behaviour traits that increase the susceptibility to overconsumption and with greater wanting for high-fat relative to low-fat foods. In addition to an influence on diet and eating behaviour, chronotype is also associated with physical activity and sedentary behaviour. Studies have shown lower physical activity levels and greater sedentary behaviour in later chronotypes. Whether an individual's chronotype influences appetite in response to food intake and exercise is also an area of recent interest that has largely been overlooked. In British young adults, we have shown that perceived fillingness to a standardised test meal consumed on separate occasions in the morning and in the early evening was greater in early chronotypes compared to late chronotypes. However, this did not translate to chronotype differences in the 60-min appetite response to the test meal. With regards to exercise timing, our preliminary evidence in Saudi men suggests that hunger may decrease to a greater extent in response to morning exercise in early chronotypes and in response to evening exercise in late chronotypes. More studies examining the potential interaction between an individual's chronotype and diet/exercise are required as this could be of importance to inform personalised dietary and exercise prescriptions to promote better appetite control and weight loss outcomes.

## BIOGRAPHY

Dr Kristine Beaulieu is a lecturer/assistant professor and dietitian in Appetite & Obesity at the University of Leeds (UK). Her PhD investigated the influence of physical activity level on appetite control. In her postdoc at Leeds, she received an ESPEN Research Fellowship to examine the impact of weight loss through continuous or intermittent energy restriction (alternate day fasting) on appetite control and eating behaviour in women with overweight/obesity. She was subsequently awarded an MRC Travelling Skills Award for a visiting fellowship at Steno Diabetes Center Copenhagen to gain new skills and knowledge in clinical diabetes prevention in the context of time-restricted eating in adults at risk of type 2 diabetes. She's currently involved in several projects, including the NovoNordisk-funded TIMEX (meal and exercise timing) project, the EU-funded SWEET project and the EASO Physical Activity Working Group.

**NutriClock – Clock genes and circadian biomarkers as a novel phenotype of obesity**

*Professor Maria Pedro Sucena Guarino, Polytechnic University of Leiria, Portugal*

**PRESENTATION SUMMARY**

Obesity is a public health accounting for a large percentage of the non-communicable disease burden that impacts people's quality of life (1). Data from the World Health Organization (2016) estimates that the prevalence of overweight reached 39% of the adult population, with around 13% of the adults having obesity. These values have almost tripled when compared to the values from 1975 (2).

The guidelines advocate lifestyle changes directed towards improving metabolic homeostasis, such as dietary intervention and physical activity, as the first strategy for the prevention and management of obesity (3). These interventions are crucial for reducing the obesity burden, however, even though there is strong evidence and awareness that these lifestyle changes can help manage this condition or even reduce the risk of developing it, they have faced limited success.

Obesity has various phenotypes associated with different cardiovascular risk profiles and the current classification might not be sufficient to stratify people with obesity either in terms of risk or adequacy of proposed lifestyle interventions. Thus, a new classification of "obesities" is needed to deliver new adjuvant therapies.

In recent years a connection between circadian system disruption and obesity has been gaining attention (4–6). The circadian clock has a central function in several processes of human physiology, including metabolic regulation (7). Previous studies have found that the circadian clock is regulated by a set of clock genes with a recognised part in human physiology, including, CLOCK, BMAL1, REV-erbα, PER1, PER2 and PER3 (8,9). The synchronisation of the circadian cycles is influenced by different factors, including light exposure and food intake (8). Thus irregular sleep patterns or food intake timing can lead to circadian desynchronisation and deleterious effects on health (4). Considering this, it has been debated whether improving circadian rhythm could be an effective co-adjuvant to prevent and treat obesity.

The NutriClock project aims to screen individual circadian variations and clock gene expression and correlate them with the heterogeneous clinical phenotypes of obesity and cardiovascular risk (10). Our team has already developed and tested a customised app and respective web-based platform to assist saliva sample collection and to help collect data about eating, sleep and exercise habits in the study population (11). This exploratory approach will assess if a multidimensional evaluation of the chronotype combining gene expression, serum biomarkers, dietary intake, sleep and lifestyle habits correlates with the severity of obesity phenotypes. The results obtained will shed light on the importance of chronotype assessment when designing lifestyle interventions for obesity, namely through personalised time-restricted eating and chronobiology approaches.

NutriClock emerges as a new method for obesity phenotype identification, and it is expected to generate relevant information to complement traditional and innovative dietary therapies available. The assessment of circadian biomarkers and clock genes is a relatively new area of research, with a great deal still to be exploited, and that could serve to enlighten the relationship between obesity phenotypes, chronotype and chrononutrition, with potential applications.

**References**


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**BIOGRAPHY**

Maria Pedro Guarino is an Associate Professor at the Polytechnic University of Leiria and Director of the FCT R&D Unit – ciTechCare- Center for Innovative Care and Health Technology. PhD in Physiology by NOVA University of Lisbon and post-graduated in Pharmacology and Therapeutics by the University of Manitoba, Canada, her area of research is related to Medical and Health Sciences with an emphasis on Physiology and Pathology. As a PI she is currently dedicated to applying the scientific knowledge gathered in the last 15 years in the field of chronic disease biology to developing novel diagnostic and therapeutic approaches for obesity and type 2 diabetes, including nutritional approaches and medical devices. She collaborated with the Pharma industry, as disease biologist, looking at biomarker profiling of chronic metabolic diseases and its application to develop distinctive signatures for diagnosis and prognosis purposes. Her research within this field originated 1 licensed patent and one spin-off company. Recently she gained insight into the area of chronobiology as an innovative approach to tackle obesity and type 2 diabetes. In 2020 her research group was distinguished with the Emilio Peres Award, attributed by the Portuguese Society of Diabetology in chrononutrition. In 2018 she was appointed member of the Consulting Board of Leiria Hospital by the Ministry of Health and she Coordinated the Health Think Tank to structure the regional response to COVID 19 pandemics. She believes in the importance of applied knowledge and societal commitment, being involved in several outreach activities of Science Dissemination.

**Impact of intermittent energy restriction on women's health**

*Dr Michelle Harvie, Manchester University Hospital Foundation NHS Trust, UK*

## PRESENTATION SUMMARY

Overweight obesity and adult weight gain are increasingly common public health issues for women's health linked to risk of many conditions including 11 cancers most notably breast and endometrial cancer. Weight control is achieved through limiting energy intake. Daily energy restriction can be effective for weight loss but has reduced adherence over time. Also, once weight is reduced and an individual is euenergetic at a lower weight the metabolic effects of weight loss and energy restriction are attenuated. A number of intermittent energy restriction have been developed which aim to promote maintained weight loss and maintained metabolic benefits including the 5:2 diet and time restricted feeding. This presentation will present data for the potential utility of intermittent diets for:

1. Weight loss amongst pre and post-menopausal women.
2. The primary prevention of weight gain in young women.
3. As an adjunct to conventional treatment for the management of primary and metastatic breast cancer
4. Management of gestational diabetes
5. Also potential benefits or harms of intermittent fating for reproductive health and disordered eating

## BIOGRAPHY

Dr Michelle Harvie is a research dietitian at the Prevent Breast Cancer Unit, Manchester University Hospital Foundation NHS Trust has been a state registered dietitian since 1991 and a research dietitian since 2001. Her research involves developing and pioneering intermittent low calorie (5:2) diets. This has primarily focused on the prevention and management of breast cancer including cancer patients receiving chemotherapy. This work has evolved and extended to the management of Type-2, Type–1 and Gestational diabetes.

Dr Harvie has 97 peer review publications and has published 3 self-help guides for the public to follow intermittent diets; The 2-day diet (Ebury, Feb 2013); The 2-day diet cookbook (Ebury, April 2013) and the quick and easy edition (Ebury, Feb 2014). All author proceeds go to the Prevent Breast Cancer www.preventbreastcancer.org.uk.

**Sleep and nutrition for athletes**

*Dr Rónán Docherty, Atlantic Technological University, Sport Ireland Institute,Ireland*

## PRESENTATION SUMMARY

In general, sleep can be promoted either by inhibiting wake-promoting mechanisms or by increasing sleep promoting factors either through nutritional interventions or other means. While the number of studies investigating the effect of nutritional interventions on sleep are increasing, future research needs to focus on specific populations, such as athletes (elite and sub-elite). Given the adoption of a 'food first' approach by many athletes, there is scope for the investigation and development of 'functional food' based interventions designed to promote athlete recovery and/or enhance sleep quality and quantity.

The repetitive demanding nature of an annual training and competition cycle can test athletes' physiological and psychological capacity. Training, competition, work, education, nutrition and other lifestyle factors and exposure to technology (i.e. blue light exposure), can have a detrimental impact on athletes' ability to match their circadian phase with the opportunity for sleep. If the circadian phase and sleep schedule are not matched, the duration and quality of sleep can be negatively affected which can negatively impact training adaptations, increase the risk of maladaption and reduce subsequent performance. Athletes must maintain a balance between stress and recovery and adopt recovery modalities that manage fatigue and enhance recovery. In terms of general health, optimising sleep prevents and/or reduces the risk of illness and benefits energy levels, mood state and cognition, improves immunity and the recovery from illness. Additional benefits for athletes include a reduced risk of overtraining/under recovery and reduced injury risk. Similar to nutrition and physical activity, sleep disturbances and long or short sleep durations are behavioural risk factors for inflammation. For sleep to be truly restorative it must be of adequate duration, of sufficient quality and be well timed. This is especially true for elite athletes who typically high training load and competition demands may have greater physical and mental recovery needs than the general population.

The importance of sleep for not only athletes' recovery but also their performance is clear. When sleep is reduced to < 7 hours cognitive performance (i.e. alertness, reaction time, memory and decision making) and physical performance and injury risk are adversely affected. Adequate sleep including afternoon naps can counteract the negative performance, cognitive, immunity, OS, and pain outcomes that are consequences of sleep debt. Due to the demanding nature of athletes' schedules which can impact sleep, reducing recovery, sleep has previously been recognised as important for optimal training and performance in athletic populations. Indeed, athletes have acknowledged sleep as their most important recovery modality. Sleep is essential to recover from the fatigue accumulated by athletes during both training and competition. Unless an athlete recovers quickly their subsequent training, workload and ultimately performance will suffer.

## BIOGRAPHY

Rónán lectures at the Atlantic Technological University and is also a member of the Sport Ireland Institute, Performance Nutrition team. He currently works predominantly with Irish

Sailing having previously worked across a range of national teams including Hockey, Rowing, Boxing, and Paralympics sports. Rónán was the Performance Nutritionist to Irish Olympic silver medallists Annalise Murphy (Sailing) and Gary and Paul O'Donovan (Rowing). He was Performance Nutrition lead for Donegal GAA from 2015-2019 and the current Performance Nutrition lead for Monaghan GAA.

Rónán has a PhD in sleep, nutrition and athlete recovery from Northumbria University. The research team is made up of academics from Northumbria University (Prof. Jason Ellis), the Sport Ireland Institute (Prof. Sharon Madigan) and the University of Limerick (Prof. Giles Warrington).

**Optimal sleep: A key element of maintaining a healthy bodyweight**
*Professor Wendy Hall, King's College London, UK*

## PRESENTATION SUMMARY

Associations between sleep patterns and the risk of obesity are intricately linked by multiple pathways to various lifestyle behaviours. Weight gain and consequent negative effects on cardiometabolic health are associated with insufficient sleep duration, poor sleep quality, and suboptimal sleep timing. Integrating guidance for optimal sleep health into diet and lifestyle interventions may prove more effective than diet and exercise advice alone, but there are challenges in how to effect multiple behaviour changes. Offering sleep health support through educational institutions and workplaces is a promising approach to support healthy diets and better cardiometabolic and mental health. This talk will review the evidence that the duration, timing and quality of sleep are associated with poorer dietary choices and will put forward the argument that treating suboptimal sleep as a key lifestyle risk factor may facilitating adherence to dietary guidelines and support weight management.

## BIOGRAPHY

Wendy Hall, BA (Hons), MSc, PhD, RNutr, is a Professor of Nutritional Sciences within the Department of Nutritional Sciences at King's College London. She completed her PhD (2001) on amino acids and appetite regulation at the University of Surrey where she stayed for another 2 years to research vitamin E metabolism. Following 3 years as a postdoctoral researcher at University of Reading, Wendy was appointed to an academic post at King's College London in 2005. Wendy's research utilises clinical trials and observational study designs to investigate cardiometabolic disease risk and related conditions such as inflammatory skin disorders (e.g. psoriasis), as well as sleep-diet interactions and health. Ongoing projects include investigation of diet-health associations in menopause; dietary fats and cardiovascular health outcomes; a potassium-rich food-based dietary intervention to investigate e ects on sleep quality, nocturnal glycaemia and blood pressure; a Mediterranean dietary intervention in people living with psoriasis; and investigations into associations between diet/lifestyle and psoriasis severity/incidence using the UK Biobank database and The APPLE Study (NCT05448352, ClinicalTrials.gov). Wendy served as Nutrition Society Theme Lead for Whole Body Metabolism/Nutrition and Optimum Life Course from 2018 to 2023. She is deputy editor for British Journal of Nutrition, section editor for European Journal of Nutrition, and sits on the editorial board for the Nutrition Bulletin. She is a founder member of the NS Workplace Diet and Health Nutrition Society Special Interest Group. Wendy has authored >100 peer-reviewed publications and was awarded the Nutrition Society's Silver Medal in 2016.

**The journey of breaking B.A.D. – from academic to entrepreneur**

*Dr Monika Gostic, The University of Aberdeen, UK*

## PRESENTATION SUMMARY

In this presentation, we will explore the inspiring journey of Dr. Monika, an academic who transitioned into the world of entrepreneurship by establishing her own business in Lifestyle Medicine. We will delve into her academic background, her motivations for pursuing a career in this field, and the challenges and triumphs she encountered along the way.

Recognising a gap in the market for accessible and effective Lifestyle Medicine solutions, Dr. Monika made the bold decision to embark on an entrepreneurial journey. She envisioned a business that would bridge this gap and empower individuals to make sustainable lifestyle changes for improved health outcomes. However, this path was not without its challenges. Dr. Monika had to navigate the complexities of starting a new venture, from developing a business plan to securing funding and overcoming various hurdles.

## BIOGRAPHY

Dr Monika Gostic is a scientist, a lecturer, a mother, an entrepreneur, an aspiring athlete and more! She has been through her own health journey where she developed an intense interest in nutrition and its connection to health and disease. This is why she specialises in helping people with chronic conditions through her B.A.D. Method! Breaking B.A.D. movement (Balanced. Authentic. Deserving.) is designed to help people break the cycle of chronic pain, nutrient starvation, reduced productivity, and frustration!

Dr Gostic is a regular speaker at conferences and events on nutrition and health. She has been featured on BBC Scotland Radio 1 and BBC Scotland TV programme Food Fest. In addition to her academic background in Microbiology, Genetics, and Cancer research, she also holds qualifications in Nutrition, Sports Nutrition, Mental health, and Coaching. Her coaching has resulted in many life-changing results which are reflected in four independent business awards to date.

**Feasibility of time-restricted eating in the prevention and treatment of Type 2 Diabetes**
*Dr Jonas Salling Quist, Steno Diabetes Centre Copenhagen, Denmark*

## PRESENTATION SUMMARY

Maintenance of lifestyle changes is challenging for many people, and there is a strong need for feasible strategies in the prevention and treatment of type 2 diabetes. Time-restricted eating (TRE) has been suggested to be feasible and to improve body weight and cardiometabolic health in individuals with overweight and obesity. TRE limits the time interval for food intake, typically to ≤10 hours/day with an extended overnight fast without dietary restrictions within the interval, and compared to traditional dietary regimens, there are typically no dietary restrictions. During recent years, TRE has received much attention and several studies have investigated effects of TRE on body weight and cardiometabolic health in individuals with overweight and obesity. However, a better understanding of the feasibility of TRE is important in order to design future studies and sustainable initiatives. The presentation will provide an overview of the available evidence on the feasibility of TRE in the prevention and treatment of type 2 diabetes and include results from a recent systematic review and studies conducted at Steno Diabetes Center Copenhagen. The studies include comprehensive qualitative assessment of feasibility and involvement of the target group in the design and evaluation of the interventions. In the two randomised controlled trials (RCT), the RESET study and the RESET2 study, we investigate effects and feasibility of TRE in the prevention and treatment of type 2 diabetes. The RESET study included 100 participants with overweight/obesity and prediabetes who were randomly allocated to a three-months 10-hour TRE intervention or habitual lifestyle. Maintenance was assessed after a three-months follow-up. The RESET2 study comprises three phases 1) a needs assessment study including workshops and interviews with people with type 2 diabetes, relatives, and health care professionals; 2) a 3-months pilot study including 20 people with overweight/obesity and type 2 diabetes, and 3) a one-year RCT including 160 people with overweight/obesity and type 2 diabetes. Results from the needs assessment and pilot study (both completed) and the design of the RCT (start February 2023) will be presented. The presentation will provide information about possible determinants of retention and adherence which can inform the design of future TRE studies.

## BIOGRAPHY

Jonas Salling Quist is a Senior Researcher at Steno Diabetes Center Copenhagen and Assistant Professor at Department of Biomedical Sciences, University of Copenhagen, Denmark. Jonas Salling Quist is BSc in Exercise Science, MSc in Human Nutrition, and PhD in Health and Medical Sciences from University of Copenhagen. He has worked within the field of lifestyle in relation to overweight, obesity, and type 2 diabetes for more than 10 years. In his research, he focuses on circadian rhythm, appetite control, and metabolism in relation to prevention and treatment of obesity and type 2 diabetes. During recent years, Jonas Salling Quist and colleagues have initiated time-restricted eating RCTs in the prevention and treatment of obesity and type 2 diabetes. Involvement of the end users in the design and evaluation of lifestyle interventions in collaboration with qualitative researchers is a central part of his research. Jonas Salling Quist has been a key person in

establishing the CIRCLE-DOME network, an international scientific network within circadian rhythm, metabolism, and lifestyle-related diseases.

**Timing of eating for weight loss**

*Dr Alan Flanagan, University of Surrey, UK*

## PRESENTATION SUMMARY

Maintenance of lifestyle changes is challenging for many people, and there is a strong need for feasible strategies in the prevention and treatment of type 2 diabetes. Time-restricted eating (TRE) has been suggested to be feasible and to improve body weight and cardiometabolic health in individuals with overweight and obesity. TRE limits the time interval for food intake, typically to ≤10 hours/day with an extended overnight fast without dietary restrictions within the interval, and compared to traditional dietary regimens, there are typically no dietary restrictions. During recent years, TRE has received much attention and several studies have investigated effects of TRE on body weight and cardiometabolic health in individuals with overweight and obesity. However, a better understanding of the feasibility of TRE is important in order to design future studies and sustainable initiatives. The presentation will provide an overview of the available evidence on the feasibility of TRE in the prevention and treatment of type 2 diabetes and include results from a recent systematic review and studies conducted at Steno Diabetes Center Copenhagen. The studies include comprehensive qualitative assessment of feasibility and involvement of the target group in the design and evaluation of the interventions. In the two randomised controlled trials (RCT), the RESET study and the RESET2 study, we investigate effects and feasibility of TRE in the prevention and treatment of type 2 diabetes. The RESET study included 100 participants with overweight/obesity and prediabetes who were randomly allocated to a three-months 10-hour TRE intervention or habitual lifestyle. Maintenance was assessed after a three-months follow-up. The RESET2 study comprises three phases 1) a needs assessment study including workshops and interviews with people with type 2 diabetes, relatives, and health care professionals; 2) a 3-months pilot study including 20 people with overweight/obesity and type 2 diabetes, and 3) a one-year RCT including 160 people with overweight/obesity and type 2 diabetes. Results from the needs assessment and pilot study (both completed) and the design of the RCT (start February 2023) will be presented. The presentation will provide information about possible determinants of retention and adherence which can inform the design of future TRE studies.

## BIOGRAPHY

I hold a PhD in nutrition from the University of Surrey, having completed my master's degree in nutrition science at the same institution. My research has focused on energy intake in nightshift workers and their families, and on the influence of biological circadian rhythms and behavioural cycles on metabolic responses to meal timing across the day. Originally a lawyer by background in Dublin, Ireland, I spent a decade practising as a barrister before moving into science.

**Exercise, nutrition, and medicine timing in metabolic health: implications for management of Type 2 Diabetes**

*Dr Brendan Gabriel, The Rowett Institute, University of Aberdeen, UK*

## PRESENTATION SUMMARY

Metformin is the most commonly prescribed anti-hyperglycaemic medication for people with Type 2 Diabetes. Exercise also has many beneficial health effects and is often recommended concomitantly. Although exercise also improves glycaemia, this effect is inhibited when undertaken alongside metformin ingestion.

Our findings suggest that morning exercise combined with pre-breakfast metformin intake may benefit the management of glycaemia in people with T2D. In another randomised-crossover trial, we show that metformin supplementation blunts the skeletal muscle transcriptomic response to exercise. Importantly, the glucose-metabolism regulating transcription factor NR4A3 was upregulated in response to exercise during the placebo trial, but not when participants consumed metformin. These data indicate that NR4A3 response to exercise is inhibited by metformin, and that this is a mechanistic factor inhibiting exercise-induced skeletal muscle glucose uptake. However, our research indicates that it may be possible to optimise nutritional and medicine intake timing recommendations around concomitant exercise and metformin treatment to improve disease management.

## BIOGRAPHY

My research primarily focuses on the role of skeletal muscle in disease pathology, taking into account the principles of chronobiology. In addition, I investigate the potential of physical activity as a treatment or preventative intervention in metabolic disease, considering the influence of circadian rhythms on skeletal muscle metabolism.
I aim to drive improvements in metabolic disease treatment and prevention by conducting ambitious, multimodal research in a supportive and inclusive environment.

**Time restricted feeding**
*Professor Satchidananda Panda, Salk Institute for Biological Sciences, USA*

**PRESENTATION SUMMARY**

**BIOGRAPHY**

**THE NUTRITION SOCIETY WOULD LIKE TO THANK THE FOLLOWING ORGANISATIONS FOR THEIR GENEROUS SUPPORT:**



The Nutrition Society, like many other scientific societies around the world, welcomes support for the work it does. The support the Society raises helps to subsidise fees for delegates to attend the Society events, which directly benefits the Society's members. However, it is important to note that supporters do not have a say in the topics covered at Society events, the people invited as speakers (except in the case of Satellite Symposia), or the way they are run.

The Society is absolutely committed to maintaining its reputation as an independent learned society. As a result, support is kept separate from science. The Society makes this point clearly on its website in the sponsorship policy at www.nutritionsociety.org/sponsorship-policy and very clearly to the Society's supporters.

Additionally, support helps the Society to:

- Invite internationally renowned experts to speak at conferences, so the members benefit from their presentations.
- Hire suitable venues and arrange social functions that allow members to network.
- Support student bursaries allowing the next generation of nutritionists to attend and present abstracts at conferences.
- Support travel grants allowing members to attend events.

As a charity, all the support the Society receives in relation to activities, benefits Society Members.