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Title Page

Editorial

Conference on ‘Getting energy balance right’

Title

Getting energy balance right in an obesogenic world

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Running title

Getting energy balance right

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Abstract

Currently the world is facing an incredibly costly epidemic of obesity. Almost two thirds of UK adults are either overweight or obese and estimated financial costs to the UK economy alone are £27 billion a year. While fundamentally obesity is a disorder of energy balance, several decades of research has demonstrated that maintaining energy balance is much more complex than the 'calories in equals calories out' equation that was once touted. The purpose of the 2018 Nutrition Society Summer Conference, 'Getting energy balance right' was to provide insight into the numerous factors influencing energy balance, considering varying needs across the lifespan, while highlighting advances and gaps in knowledge. Papers presented in this issue illustrate the wide range of factors involved in maintaining energy balance, including: epigenetics, the gut microbiome, physical activity and dietary factors including sugar. Given the complexity of energy balance, systems approaches were highlighted as useful for both understanding metabolism and pathophysiology, and for understanding how public health interventions to treat and prevent obesity should be implemented. The meeting concluded that numerous stakeholders, from individuals, to schools, industry and government, have a role to play in fostering a positive food environment that facilitates the maintenance of energy balance throughout the lifespan.

An obesogenic world undergoing climate change

The last five decades have heralded in a dramatic increase in the prevalence of overweight and obesity throughout the world. Alongside this, global warming and evident climate changes have raised significant concerns for sustainability in food production. It was with these 'grand challenges' of obesity and food security in mind, that the scientific programme of the Nutrition Society Summer Conference 2018, hosted by the University of Leeds, was developed. Fundamentally, disruption of energy balance underpins obesity[1]. Over the course of the 3-day conference entitled 'Getting Energy Balance Right', experts and delegates examined the factors and physiology that determine energy balance, as well as the public health implications and clinical considerations for the management of energy balance. A unique joint session with N8 Agrifood focused on the sustainability of food production and dietary recommendations. In addition, an industry panel addressed the challenges and opportunities presented by government targets for sugar and energy reduction. Although the prevention of obesity and downstream metabolic disease was undoubtedly a focus for the conference; malnutrition was also recognised to often co-exist in obese individuals, be of concern in the elderly, and still be endemic to low- and middle-income populations also effected by severe weather arising from climate change.

Maintaining energy balance, sustaining the environment, optimizing health

A key question addressed in multiple symposia was how energy balance is maintained or disrupted. Papers included in this issue unpick a variety of molecular and physiological mechanisms involved in the regulation of energy balance and whole body metabolism. In particular, several plenary and symposia presentations dissected the roles of epigenetics in determining energy balance. Evidence concluding that a poor intra-uterine environment is associated causally with increased risk of altered energy balance resulting in obesity and metabolic disease in adulthood[2] was reviewed. The role of dietary factors, such as sugar and fat, in the maternal diet and development was emphasized, with new work presented showing that fructose appears in breast milk after the consumption of high fructose corn syrup[3]. A critical role for dietary factors, in particular sugars and lipids, in influencing energy homeostasis and metabolic inflammation was highlighted. Emerging evidence about the roles of the gut microbiota and the gut liver axis in mediating disruptions in energy balance leading to metabolic disease was also described[4]. The liver is critical to metabolism and whole body homeostasis. Disruption of energy balance and metabolic health leads to non-alcoholic fatty liver disease in both children and adults and this topic was addressed by multiple experts. Novel multi-scale computational models of sugar and fat metabolism[5] were presented in the Silver Medal Award lecture. Whereas the critical role of adipose tissue and turnover of stored lipids[6] was addressed in the Blaxter Award Lecture.

Ageing was highlighted by several presenters as a vulnerable time for malnutrition that might stem from multiple causes including alterations in muscle mass. Changes in oral processing leading to changes in appetite and food intake[7] also contribute. An exceptional symposium examined energy balance in the context of environmental and food supply sustainability. Speakers considered the effect of climate change on food production and malnutrition in the developing world.

The last day of the conference emphasized clinical and public health considerations in the management of energy balance, beginning with a plenary that reviewed the role of appetite and behavioral compensation mechanisms in weight regain and the challenge of long-term energy balance after weight loss[8,9]. While the challenges of the maintenance of weight loss were acknowledged as often frustrating to individuals, the data suggest that after a conventional (e.g. 12-week community based) weight loss program, although much of initial weight loss will be regained, a majority will maintain a small amount of weight loss that is likely to be beneficial metabolically; and should be encouraged. A message that the treatment of individuals with severe obesity should not be ignored in discussions of the prevention of obesity was repeated throughout the day; with concerns expressed for pathways of care for individuals with BMIs between 35-40 who generally don't respond to standard weight loss interventions but don't qualify for bariatric surgery. Alongside considering the importance of behavioural change alongside nutrition education at an individual level, the essential need for a whole systems intervention to treat and prevent obesity at local community level was discussed. As has previously been highlighted, truly tackling the health inequalities and health burden associated with obesity requires a systemic, sustained group of initiatives across the community[1] with roles for multiple stakeholders.

In addition to the scientific papers presented the conference hosted a forum discussion with a panel of industry representatives discussing challenges and opportunities presented by the sugar reduction and reformulation. The panellists spoke to strong industry recognition of the consumer need for healthier products and ongoing reformulation activities that have preceded government recommendations for sugar and energy . There was agreement that sugar reduction needs to be gradual in order not to alienate the customer, with previous strategy for salt reduction in the UK considered a successful precedent. Nonetheless, in the context of public health the consensus was that the focus on a single 'bad' nutrient is unhelpful and the emphasis should be on healthy foods and dietary patterns.

Lastly, inspired by both the scientific theme and recent guidelines from the Scottish Cancer Prevention Network, we as conference organizers embraced the concept of healthy meetings that enable delegate's personal energy balance. Participants were provided nutritious, locally-sourced foods and encouraged to move between venue locations and stand in the exhibition hall. In addition, delegates had access to the gym and optional physical activities of both low (art walk, yoga) and high

intensity (running, climbing clock tower, dancing) were championed; along with standing during symposia. In this fashion, we hoped the conference itself might underscore both the additive value of numerous small actions at an individual level and the critical need for systemic environmental changes in order to promote population level energy balance.

Summary

We live in an obesogenic world with co-existing malnutrition in certain populations. As illustrated by the Foresight Obesity System Map[1], energy balance lies is at the center of a myriad of intersecting variables (physical activity, the physical activity environment, food production and consumption, individual physiology, psychology, and social psychology) that determine weight and body mass index. Maintaining individual energy balance throughout the lifespan is challenging and the underlying molecular mechanisms are complex. Energy balance is influenced by a host of individual (genetic, epigenetic, microbiome) and environmental (diet, physical activity, socio-economic and built environment) factors. Systems approaches can be helpful both in understanding the biology of energy balance and in designing community interventions to treat and prevent obesity at a public health level. The papers in this issue highlight significant recent research progress in understanding the physiology underpinning energy regulation and risk of future disease. Undoubtedly, a systemic, sustained group of initiatives, delivered at population levels across the globe, is required to enable individual energy balance and address the health burden associated with obesity, alongside promoting the sustainability of our food supply. The conference concluded that 'Getting Energy Balance Right' for population health will require a wide range of stakeholders to communally play roles in fostering a positive food environment that facilitates the maintenance of energy balance throughout the lifespan. It is hoped the resulting papers presented here are a significant resource to stakeholders at all levels.

References

1. Foresight (2007) Foresight - Tackling Obesities: Future Choices - Project Report.
2. Burdge GC& Lillycrop KA (2014) Environment-physiology, diet quality and energy balance: the influence of early life nutrition on future energy balance. Physiol Behav **134**, 119-122.
3. Berger PK, Fields DA, Demerath EW et al. (2018) High-Fructose Corn-Syrup-Sweetened Beverage Intake Increases 5-Hour Breast Milk Fructose Concentrations in Lactating Women. Nutrients **10**.
4. de Wit NJ, Afman LA, Mensink M et al. (2012) Phenotyping the effect of diet on non-alcoholic fatty liver disease. J Hepatol **57**, 1370-1373.
5. Maldonado* EM, Fisher* CP, Mazzatti DJ et al. (2018) Multi-scale, whole-system models of liver metabolic adaptation to fat and sugar in non-alcoholic fatty liver disease. npj Systems Biology & Applications **In Press**.
6. Arner P, Bernard S, Salehpour M et al. (2011) Dynamics of human adipose lipid turnover in health and metabolic disease. Nature **478**, 110-113.

7. Krop EM, Hetherington MM, Nekitsing C et al. (2018) Influence of oral processing on appetite and food intake - A systematic review and meta-analysis. Appetite **125**, 253-269.
8. Coutinho SR, With E, Rehfeld JF et al. (2018) The impact of rate of weight loss on body composition and compensatory mechanisms during weight reduction: A randomized control trial. Clin Nutr **37**, 1154-1162.
9. Nymo S, Coutinho SR, Eknes PH et al. (2018) Investigation of the long-term sustainability of changes in appetite after weight loss. Int J Obes (Lond) **42**, 1489-1499.