

---

# PNS

## PROCEEDINGS OF THE NUTRITION SOCIETY

---

Volume: 75

---

Number: 1

---

February 2016

---

Available online at  
[www.journals.cambridge.org](http://www.journals.cambridge.org)

**Symposia featured in this issue:**

Plenary Lectures

Macronutrients, gene expression and metabolic disease

Micronutrients, phytochemicals, gene expression and metabolic disease

Nutrition, epigenetics and the foetal origins of metabolic disease

Irish Section Postgraduate Meeting

# Proceedings of the Nutrition Society

Volume 75, 2016 ISSN: 0029-6651

## Aims and Scope

*Proceedings of the Nutrition Society* publishes papers and abstracts presented by members and invited speakers at the scientific meetings of The Nutrition Society.

### Coverage includes

- Cellular and molecular nutrition (including immunology)
- Nutritional genomics
- Nutrition and the food chain
- Clinical nutrition and metabolism
- Obesity and body composition
- Infant nutrition
- Diet selection and control of intake
- Nutrition and behaviour
- Reproduction, growth and development
- Public health nutrition
- Nutrition policy
- Sports and exercise nutrition
- Animal nutrition and metabolism
- Molecular aspects of nutrition
- Functional foods
- Macronutrient metabolism
- Micronutrients and antioxidants
- Companion animal nutrition
- Epidemiology

The *Proceedings of the Nutrition Society* is published four times a year by Cambridge University Press on behalf of the Nutrition Society. Symposium papers are published in February, May, August and November and are available as hard copy or electronically; Original Communications from individual meetings are published electronically only and comprise an OCE issue.

The journal is available on the Internet at: [journals.cambridge.org/pns](http://journals.cambridge.org/pns)

---

### Editor in Chief

M O'Sullivan, *Trinity Centre for Health Science, Dublin, Republic of Ireland*

### Deputy Editor

J E Drew, *Rowett Institute of Nutrition and Health, University of Aberdeen, UK*

### Editorial Board

M Cantwell, *Queen's University Belfast, UK*

A Cross, *Imperial College London, UK*

F Lithander, *University of Canberra, Australia*

C Pedersen, *University of Glasgow, UK*

M Siervo, *Institute for Ageing and Health, Newcastle University, UK*

### Science Committee

K M Younger  
*Chair/Treasurer*

M O'Sullivan  
*Proceedings Editor*

P Trayhurn  
*Publications Officer*

A Gallagher  
*Programmes Secretary*

A Salter  
*Scientific*

B McNulty  
*Irish Section Secretary*

S Athanasiadou  
*Scottish Section Secretary*

B Corfe  
*Cellular and Molecular Nutrition Theme*

A Welch  
*Public Health Nutrition Theme*

B Griffin  
*Whole Body Metabolism Theme*

---

The Nutrition Society has as its objectives the advancement of the scientific study of nutrition and its application to the maintenance of human and animal health.

### Honorary Officers of the Society

C Geissler  
*President*

P C Calder  
*President-Elect*

H J McArdle  
*Secretary*

K M Younger  
*Treasurer*

A Gallagher  
*Programmes Secretary*

F Thies  
*Without Portfolio*

P Trayhurn  
*Publications*

A Salter  
*Scientific*

P Hunking  
*Training and Education*

S Bird  
*Strategic Communications*

P Amuna  
*International Affairs*

Application for membership is open to any person who has a genuine interest in the science of human or animal nutrition and its application to human or animal health. Reduced subscriptions are available to full-time student members within 2 years of graduation and retired members, the unwaged and members who reside in very low income countries.

The Nutrition Society Home Page is at <http://www.nutrition society.org>

© Nutrition Society 2016



**Contents**

**Robert Gordon University, 25–26 March 2015**

**Conference on ‘Diet, gene regulation and metabolic disease’**

**Plenary Lecture**

Impact of dietary fat on the development of non-alcoholic fatty liver disease in *Ldlr*<sup>-/-</sup> mice  
*D. B. Jump, C. M. Depner, S. Tripathy & K. A. Lytle* 1–9

**Symposium 1: Macronutrients, gene expression and metabolic disease**

Dietary carbohydrate and control of hepatic gene expression: mechanistic links from ATP and phosphate ester homeostasis to the carbohydrate-response element-binding protein  
*L. Agius* 10–18

Insulin secretion in health and disease: nutrients dictate the pace  
*R. Regazzi, A. Rodriguez-Trejo & C. Jacovetti* 19–29

Dietary restriction and Sirtuin 1 in metabolic health: connections and divergences  
*C. Cantó* 30–37

**Symposium 2: Micronutrients, phytochemicals, gene expression and metabolic disease**

Vitamin D modulates adipose tissue biology: possible consequences for obesity?  
*J.-F. Landrier, E. Karkeni, J. Marcotorchino, L. Bonnet & F. Tourniaire* 38–46

Polyphenols and non-alcoholic fatty liver disease: impact and mechanisms  
*I. Rodriguez-Ramiro, D. Vauzour & A. M. Minihane* 47–60

Intracellular zinc in insulin secretion and action: a determinant of diabetes risk?  
*G. A. Rutter, P. Chabosseau, E. A. Bellomo, W. Maret, R. K. Mitchell, D. J. Hodson, A. Solomou & M. Hu* 61–72

**Plenary Lecture**

Developmental programming of energy balance regulation: is physical activity more ‘programmable’ than food intake?  
*S. Zhu, J. Eclarinal, M. S. Baker, G. Li & R. A. Waterland* 73–77

**Symposium 3: Nutrition, epigenetics and the fetal origins of metabolic disease**

Transgenerational epigenetic inheritance of diabetes risk as a consequence of early nutritional imbalances  
*J. C. Jimenez-Chillarón, M. Ramon-Krauel, S. Ribo & R. Diaz* 78–89

Maternal folate deficiency and metabolic dysfunction in offspring  
*J. A. McKay & J. C. Mathers* 90–95

**Nutrition Society Irish section postgraduate meeting**

**Ulster University 12–13 February 2015**

**Irish Postgraduate Winners**

Personalised nutrition: the role of new dietary assessment methods  
*H. Forster, M. C. Walsh, M. J. Gibney, L. Brennan & E. R. Gibney* 96–105

Can metabotyping help deliver the promise of personalised nutrition?  
*C. B. O’Donovan, M. C. Walsh, M. J. Gibney, E. R. Gibney & L. Brennan* 106–114



<b>Proceedings of the</b>
<b>Nutrition</b>
<b>Society</b>

**Editor in Chief**  
Associate Professor M. O'Sullivan  
**Deputy Editor**  
Dr J. Drew  
pns.edoffice@cambridge.org  
<http://www.nutrition society.org>

<http://www.journals.cambridge.org/pns>

Forthcoming topics to be featured in *Proceedings of the Nutrition Society* for 2016 (vol. 75):

- Nutrition at key life stages: new findings, new approaches  
(Above proceedings were presented at the NS meeting at University College Cork, 17–19 June 2015)
- The future of animal products in the human diet: health and environmental concerns  
(Above proceedings were presented at the NS meeting at the University of Nottingham, 6–9 July 2015)
- Sustainable diet and public health  
(Above proceedings were presented at the 12<sup>th</sup> European Nutrition Conference in Berlin, Germany, 20–23 October 2015)
- Roles of sleep and circadian rhythms in the origin and nutritional management of obesity and metabolic disease  
(Above proceedings were presented at the NS meeting at the Royal Society of Medicine, London, 8–9 December 2015)

#### **Original Communications**

- Roles of sleep and circadian rhythms in the origin and nutritional management of obesity and metabolic disease  
(Above proceedings were presented at the NS meeting at the Royal Society of Medicine, London, 8–9 December 2015)
- Phytochemicals and health: new perspectives of plant based nutrition  
(Above proceedings to be presented at the NS meeting at the Royal College of Physicians, Edinburgh, 21–22 March 2016)
- New technology in nutrition research and practice  
(Above proceedings to be presented at the NS meeting at University College Dublin, 11–14 July 2016)

For further details, see our website: <http://www.nutrition society.org/events>



# Proceedings of the Nutrition Society

Volume 75, 2016 ISSN: 0029-6651

## Publishing, Production, Marketing, and Subscription Sales Office:

Cambridge University Press  
Journals Fulfillment Department,  
University Printing House,  
Shaftesbury Road,  
Cambridge CB2 8BS,  
UK.

## For Customers in North America:

Cambridge University Press  
Journals Fulfillment Dept  
100 Brook Hill Drive  
West Nyack  
New York 10994-2133  
USA

**Publisher:** Katy Christomanou

## Special sales:

This journal accepts advertisements and inserts. We also provide bulk reprints of suitable papers to meet teaching or promotional requirements. Please contact [ad\\_sales@cambridge.org](mailto:ad_sales@cambridge.org) for further details.

## Subscription information:

*Proceedings of the Nutrition Society* is an international journal published by Cambridge University Press on behalf of The Nutrition Society as four issues per year. Symposium papers are published in February, May, August and November; Original Communications are published online (only).

## Annual subscription rates:

Volume 75, 2016 (4 issues):  
Internet/print package: £724/\$1411 Americas only/  
€1155 EU only  
Internet only: £515/\$1002 Americas only/€804 EU only

*Japanese Agent:* Maruzen Company Ltd, PO Box 5050, Tokyo International, 100-31, Japan.

**Back volumes** are available. Please contact Cambridge University Press for further information.

**Claims** for non-receipt of journal issues will be considered on their merit and only if the claim is received within six months of publication. Replacement copies supplied after this date will be chargeable.

**Despatch:** deliveries outside the UK are by ASP Print-flow Airsaver unless other arrangements are made. Customers requiring airmail delivery should indicate

clearly their requirements and add an additional 10% to the relevant subscription price.

**US POSTMASTERS:** please send address corrections to *Proceedings of the Nutrition Society*, Cambridge University Press at the New York address.

**Directions to Contributors** are available from the Society at the address below or can be found on the Society's website at <http://www.nutritionociety.org> (concise Directions to Contributors can be found inside the back cover).

**Offprints:** The authors (or main author) of an accepted paper will receive a free PDF file of their paper. Paper offprints are available for a fee and should be ordered at proof stage. No page charges are levied by this journal.

**Copyright:** As of July 2000 the copyright of all articles submitted to the *Proceedings of the Nutrition Society* is retained by the authors or their institutions. For articles prior to this date permission for reproduction of any part of the journal (text, figures, tables or other matter) in any form (on paper, microfiche or electronically) should be sought directly from the Society, at: The Publications Office, The Nutrition Society, 10 Cambridge Court, 210 Shepherds Bush Road, London W6 7NJ, UK.

**Disclaimer:** The information contained herein, including any expression of opinion and any projection or forecast, has been obtained from, or is based upon, sources believed by us to be reliable, but is not guaranteed as to accuracy or completeness. The information is supplied without obligation and on the understanding that any person who acts upon it or otherwise changes his/her position in reliance thereon does so entirely at his/her own risk. Neither the Society nor Cambridge University Press accepts responsibility for any trade advertisement included in this publication.

Typeset by Techset Composition India (P) Ltd., Chennai, India.

This journal issue has been printed on FSC-certified paper and cover board. FSC is an independent, non-governmental, not-for-profit organization established to promote the responsible management of the world's forests. Please see [www.fsc.org](http://www.fsc.org) for information. Printed by Bell & Bain, Glasgow, UK.

*Proceedings of the Nutrition Society* is covered in Current Contents®/Agriculture, Biology & Environmental Sciences, SciSearch®, Research Alert®, Current Contents®/Life Sciences, Index Medicus® (MEDLINE®), AGRICOLA®, CAB ABSTRACTS®, Global Health, BIOSIS® Database, EMBASE/Excerpta Medica and Elsevier BIOBASE/Current Awareness in Biological Sciences, CINAHL and Chemical Abstracts Service.