

# Proceedings of the Nutrition Society

ISSN: 0029-6651 Volume 70 May 2011

## Symposia featured in this issue:

**Balancing intake and output:  
food v. exercise**

**Influences of food constituents on  
gut health**

**Nutrition and epigenetics**

**Exercise and protein nutrition**

**Postgraduate Symposium**

**Nutrition Society Silver Medal Lecture**

**Plenary Lecture**

**Nutrition management in  
special populations**

**Irish Section Postgraduate Symposium**

**Antioxidants and the immune system**

CELLULAR AND MOLECULAR  
NUTRITION

NUTRIGENOMICS

FOOD CHAIN, ANIMALS AND  
PLANTS

CLINICAL NUTRITION AND  
WHOLE BODY METABOLISM

NUTRITIONAL EPIDEMIOLOGY  
AND PUBLIC HEALTH

PUBLIC ENGAGEMENT

INTERNATIONAL NUTRITION

REPRODUCTION AND  
CHILD HEALTH

SPORTS AND EXERCISE  
NUTRITION

# Proceedings of the Nutrition Society

Volume 70, 2011 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

K R Westerterp, *Department of Human Biology, Maastricht University, The Netherlands*

### Deputy Editor

A Mostyn, *School of Veterinary Medicine and Science, University of Nottingham, UK*

### Editorial Board

G C Burdge, *Institute of Human Nutrition, University of Southampton School of Medicine, UK*

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

S Gabe, *Department of Surgery & Cancer, Imperial College, London, UK*

C N M Kelly, *School of Health Sciences, National University of Ireland, Galway, Republic of Ireland*

M D Robertson, *Diabetes and Endocrinology, Postgraduate Medical School, University of Surrey, UK*

P Sharp, *Nutritional Sciences Division, King's College London, UK*

### Science Committee

K R Westerterp  
*Proceedings Editor*

D Bender

*Publications Officer*

K M Younger  
*Chair/Treasurer*

A Gallagher  
*Programmes Secretary*  
E Gibney  
*Irish Section Secretary*

C J Seal  
*Scientific Development Officer*  
A Jenkinson  
*Scottish Section Secretary*

### Publications Staff

C Goodstein  
*Publications Manager*

C Jackson  
*Deputy Publications Manager*

C Hughes, L Weeks, S Hui  
*Publications Officers*

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

J J Strain  
*President*

C Summerbell  
*Secretary*

K M Younger  
*Treasurer*

A Gallagher  
*Programmes Secretary*

B Ratcliffe  
*External Relations*

D Bender  
*Publications*

C J Seal  
*Scientific Development*

B Lang  
*Training and Education*

H McArdle  
*Honorary Officer*

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.

For more information about membership benefits and for membership application forms, contact The Nutrition Society, 10 Cambridge Court, 210 Shepherds Bush Road, London, W6 7NJ, UK. Tel: +44 (0)20 7605 6555, Fax: +44 (0)20 7602 1756, Email: [office@nutsoc.org.uk](mailto:office@nutsoc.org.uk)

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

© Nutrition Society 2011

Vol. 70 No. 2 May 2011

## Contents

Proceedings of the
Nutrition
Society

### University of Ulster, Coleraine, 16–18 June 2010

#### Conference on ‘Nutrition: getting the balance right in 2010’

##### Session 1: Balancing intake and output: food v. exercise

**Chairs:** B. Livingstone, *University of Ulster*; M. McKinley, *Queen’s University, Belfast*

- Satiety: have we neglected dietary non-nutrients?  
*R. W. Welch* 145–154
- The control of meal size in human subjects: a role for expected satiety, expected satiation and premeal planning  
*J. M. Brunstrom* 155–161
- Why liquid energy results in overconsumption  
*C. de Graaf* 162–170
- The influence of physical activity on appetite control: an experimental system to understand the relationship between exercise-induced energy expenditure and energy intake  
*P. Caudwell, C. Gibbons, M. Hopkins, E. Naslund, N. King, G. Finlayson & J. Blundell* 171–180
- Balancing exercise and food intake with lactation to promote postpartum weight loss  
*C. Lovelady* 181–184

##### Session 3: Influences of food constituents on gut health

**Chairs:** C. Gill, *University of Ulster*; A. Nugent, *University College Dublin*

- Glucose sensing and signaling; regulation of intestinal glucose transport  
*S. P. Shirazi-Beechey, A. W. Moran, D. J. Batchelor, K. Daly & M. Al-Rammahi* 185–193

### Heriot-Watt University, Edinburgh, 28 June–1 July 2010

#### Conference on ‘Nutrition and health: cell to community’

##### Symposium 1: Nutrition and epigenetics

**Chairs:** M. Symonds, *University of Nottingham*; E. Williams, *University of Sheffield*

- Recent advances in understanding the role of diet and obesity in the development of colorectal cancer  
*E. K. Lund, N. J. Belshaw, G. O. Elliott & I. T. Johnson* 194–204

**Symposium 2: Exercise and protein nutrition**

**Chairs: H. McArdle**, *Rowett Institute of Nutrition and Health*; **D. Sewell**,  
*Heriot-Watt University, Edinburgh*

Efficacy and consequences of very-high-protein diets for athletes and exercisers  
*K. D. Tipton* 205–214

**Postgraduate Symposium**

**Chairs: S. Drummond**, *Queen Margaret University*; **S. Bath**, *University of Surrey*

The differential effects of EPA and DHA on cardiovascular risk factors  
*S. C. Cottin, T. A. Sanders & W. L. Hall* 215–231

**Nutrition Society Silver Medal Lecture**

**Chair: I. Macdonald**, *University of Nottingham*

Development and use of FFQ among adults in diverse settings across the globe  
*S. Sharma* 232–251

**Plenary Lecture**

**Chair: S. Lloyd**, *Nutrition and Wellbeing*

Nutrition in an ethnically diverse society: what are some of the key challenges?  
*A. Szczepura* 252–262

**Symposium 3 (Jointly with the British Dietetic Association): Nutrition management  
in special populations**

**Chairs: J. Gandy**, *British Dietetic Association*; **G. Frost**, *Imperial College, London*

Improving the dietary intake of frail older people  
*W. S. Leslie* 263–267

**University College Dublin, Dublin, Republic of Ireland,  
17–19 February 2010**

**Irish Section Postgraduate Symposium**

**Chair: S. Bannon**, *University College Cork, Republic of Ireland*

The conflicting effects of maternal nutrient restriction and early-life obesity on  
renal health  
*H. P. Fainberg, H. Budge & M. E. Symonds* 268–275

**Platja D'Aro, Girona, Spain, 21–24 October 2009**

**3rd International Immunonutrition Workshop**

**Session 1: Antioxidants and the immune system**

**Chairs: C. Seal**, *University of Newcastle, UK*; **E. Nova**, *National Scientific Research  
Council, Madrid, Spain*

Gold kiwifruit (*Actinidia chinensis* 'Hort16A') for immune support  
*M. A. Skinner, J. M. S. Loh, D. C. Hunter & J. Zhang* 276–280

**Corrigenda** 281–282

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

**Editor in Chief**  
Professor K. R. Westerterp  
**Deputy Editor**  
Dr A. Mostyn  
pns@nutsoc.org.uk  
<http://www.nutritionssociety.org>

[journals.cambridge.org/pns](http://journals.cambridge.org/pns)

Forthcoming topics to be featured in *Proceedings of the Nutrition Society* for 2011 (vol. 70):

#### August issue

- Malnutrition matters  
(Above proceedings were presented at the BAPEN meeting at Harrogate International Centre, Harrogate, 2–3 November 2010)
- Functional genomic biomarkers, nutrition and disease susceptibility  
(Above proceedings were presented at the NS meeting with the Molecular Epidemiology Group at Royal Institute of British Architects, London, 2 December 2010)

#### November issue

- 70th Anniversary: 20th Annual Postgraduate meeting  
(Above proceedings were presented at the NS meeting at the University of Ulster, 17–19 February 2011)
- 70th Anniversary: Nutrition and health: from conception to adolescence  
(Above proceedings were presented at the NS Meeting at the Teacher Building, Glasgow, 5–6 April 2011)

#### OC electronic issue

- 70th Anniversary: Nutrition and health: from conception to adolescence  
(Above proceedings were presented at the NS Meeting at the Teacher Building, Glasgow, 5–6 April 2011)
- 5th International Immunonutrition Workshop  
(Above proceedings were presented at the 5th International Immunonutrition Workshop at Puerto Vallarta, Mexico, 6–8 April 2011)

- 70th Anniversary: Vitamins in early development and healthy ageing: impact on infectious and chronic disease  
(Above proceedings to be presented at the NS meeting jointly with the American Society of Nutrition at University College Cork, Republic of Ireland, 15–17 June 2011)
- 70th Anniversary: From plough through practice to policy  
(Above proceedings to be presented at the NS meeting at the University of Reading, 4–6 July 2011)
- Oskar Kellner Symposium 2011: Metabolic flexibility in animal and human nutrition  
(Above proceedings to be presented at the meeting organised by the Leibniz Institute for Farm Animal Biology jointly with the NS at Warnemünde, Germany, 9–11 September 2011)
- Malnutrition matters  
(Above proceedings to be presented at the BAPEN meeting at Harrogate International Centre, Harrogate, 28–30 November 2011)
- 70th Anniversary: Body weight regulation: food, gut and brain signalling  
(Above proceedings to be presented at the NS meeting at the Royal College of Physicians, London, 6–7 December 2011)

For further details, see our website:

<http://www.nutritionssociety.org/index.php?q=node/17>

# Proceedings of the Nutrition Society

Volume 70, 2011 ISSN: 0029-6651

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

Cambridge University Press  
The Edinburgh Building  
Shaftesbury Road  
Cambridge CB2 8RU  
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

**Editorial Assistant:** Katherine Cameron

## Special sales:

This journal accepts advertisements and inserts. We also provide bulk reprints of suitable papers to meet teaching or promotional requirements. Please contact Katy Christomanou at Cambridge University Press 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 70, 2011 (4 issues):

Internet/print package: £479/\$935 Americas only/  
€765 EU only

Internet only: £388/\$756 Americas only/€606 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.nutrition-society.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 S R Nova Pvt Ltd., Bangalore, 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<sup>®</sup>/Agriculture, Biology & Environmental Sciences, SciSearch<sup>®</sup>, Research Alert<sup>®</sup>, Current Contents<sup>®</sup>/Life Sciences, Index Medicus<sup>®</sup> (MEDLINE<sup>®</sup>), AGRICOLA<sup>®</sup>, CAB ABSTRACTS<sup>®</sup>, Global Health, BIOSIS<sup>®</sup> Database, EMBASE/Excerpta Medica and Elsevier BIOBASE/Current Awareness in Biological Sciences, CINAHL and Chemical Abstracts Service.