BRITISH JOURNAL OF NUTRITION

Volume: 115

Number: 5

14 March 2016

An International Journal of Nutritional Science





British Journal of Nutrition

An International Journal of Nutritional Science

Volume 115, 2016 ISSN: 0007-1145

Aims and Scope

The *British Journal of Nutrition* is an international, peer-reviewed journal publishing original papers, review articles, short communications and technical notes on human and clinical nutrition, animal nutrition and basic science as applied to nutrition. Correspondence is encouraged in a Nutrition Discussion Forum. The Journal recognizes the multidisciplinary nature of nutritional science and encourages the submission of material from all of the specialities involved in research and clinical practice. The Journal also publishes supplements on topics of particular interest.

The *British Journal of Nutrition* is published twice monthly by Cambridge University Press on behalf of The Nutrition Society.

The *British Journal of Nutrition* is available online to subscribers at journals.cambridge.org/bjn Tables of contents and abstracts are available free at the same website.

Editor-in-Chief

G C Burdge, Southampton, UK

Deputy Editors

J Anderson, North Carolina, USA
A E Buyken, Dortmund, Germany
D Hoffman, New Jersey, USA
D N McMurray, College Station, TX, USA
A M Minihane, Norwich, UK
S Proctor, Alberta, Canada
W D Rees, Aberdeen, UK
A J Sinclair, Burwood, Australia
D Topping, CSIRO, Adelaide, Australia

Reviews Editors

P J Aggett, *Parbold, UK* G Lobley, *Aberdeen, UK* Susan Whiting, *Saskatchewan, Canada* D J Millward, *Guildford, UK*

Supplements Editor

J V Woodside, *Belfast, UK* Michelle McKinley, *Belfast, UK*

Statistics Editors

D Greenwood, Leeds, UK M Heo, Bronx, NY, USA C Mayer, Aberdeen, UK I Saunders, Glen Osmond, Australia Sheila Barton, Southampton, UK Sarah Crozier, Southampton, UK

Editorial Board

J Baumgartner, Potchefstroom, South Africa A M Beck, Herlev, Denmark C Berr, Montpellier, France J Beulens, Utrecht, Netherlands J T Brenna, Ithaca, NY, USA J K Cleal, Southampton, UK K A Cockell, Ottawa, Ont., Canada A R Collins, Oslo, Norway Camila Damsgaard, Copenhagen, Denmark Jeanne de Vries, Wageningen, Netherlands S I Duthie Aberdeen UK P Eck. Manitoba, Canada K Erickson, California, USA C Evans, Leeds, UK B A Fielding, Oxford, UK E Forano, St Genes Champanelle, France E Foster, Newcastle-upon-Tyne, UK K Fritsche, Missouri, USA M Fukushima, Obihiro City, Japan I Gabriel Nouzilly, France H R Gaskins, Urbana, IL, USA

K Guelfi, Crawley, Australia

A-L Heath, Otago, New Zealand W Hendriks, Wageningen, The Netherlands T Hill, Newcastle-Upon-Tyne, UK L T Ho, Taipei, Taiwan J Hodgson, Perth, Australia K G Jackson, Reading, UK E J Johnson, Boston, MA, USA C W C Kendall, Toronto, Ont., Canada J P Lallès, Saint-Gilles, France L Lauritzen, Copenhagen, Denmark D Levitsky, New York, USA John Lodge, Newcastle-upon-Tyne, UK C Maloney, Sydney, Australia M Angel Martínez-González, Navarra, Spain C Martins, Trondheim, Norway V Mazurak, Alberta, Canada J P McClung, Natick, MA, USA M M Murphy, Tarragona, Spain K Northstone, Bristol, UK U Nöthlings, Bonn, Germany A Oliva-Teles, Porto, Portugal A Palou, Palma de Mallorca, Spain

E Petherick, Bradford, UK M Plourde, Quebec, Canada K Poore, Southampton, UK M P Portillo, Vitoria, Spain M. Denise Robertson, Surrey, UK E Rush, Auckland, New Zealand S Sahni, Massachusetts, USA Y Sanz, Paterna, Spain U Schwab, Kuopio, Finland T Sheehy, Cork, Ireland R Siddiqui, Virginia, USA L Smithers, Adelaide, Australia A Sneddon, Aberdeen, UK Q Sun, Massachusetts, USA K S Swanson, Urbana, IL, USA C G Taylor, Winnipeg, Man., Canada R Thompson, London, UK D Tomé, Paris, France M R Yeomans, Brighton, UK

J H Y Park, Kangwon-Do, Korea

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

Application of membership is invited from anyone whose work has contributed to the scientific knowledge of nutrition, whether such work has been in the laboratory, the field or the clinic, and whether experimental, clinical, agricultural or statistical in nature. There is also a student membership scheme with reduced subscriptions.

Particulars of The Nutrition Society and application forms for membership are available from The Nutrition Society, 10 Cambridge Court, 210 Shepherds Bush Road, London W6 7NJ, UK. Tel: +44 (0)20 7602 0228, Fax: +44 (0)20 7602 1756, Email: office@nutsoc.org.uk