

Volume 22 Number 2 December 2009

# Nutrition Research Reviews

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

Published on behalf of The Nutrition Society by  
Cambridge University Press  
ISSN 0954-4224

# Nutrition Research Reviews

Volume 22, 2009 ISSN: 0954-4224

## Aims and Scope

*Nutrition Research Reviews* publishes comprehensive and challenging review articles on selected key topics in nutritional science. Authors are encouraged to take a critical approach in appraising the literature while also aiming to advance new concepts and hypotheses. The journal publishes both solicited and unsolicited articles.

*Nutrition Research Reviews* is published twice a year by Cambridge University Press on behalf of The Nutrition Society.

The contents page of this journal is available on the Internet before publication at <http://www.cambridge.org/nrr>

---

## Editorial Board

### Editor-in-Chief

Dr Kate M Younger, *Dublin Institute of Technology, Ireland*

### Address for correspondence

Dr Kate M Younger, *Editor-in-Chief, Nutrition Research Reviews, School of Biological Sciences, Dublin Institute of Technology, Kevin Street, Dublin 8, Republic of Ireland*  
Tel: +353 1 4024662 Fax: +353 1 4024995 Email: [katherine.younger@dit.ie](mailto:katherine.younger@dit.ie)

### US Editor

Professor C M Weaver, *Purdue University, USA*

### Editors

Dr N Binns, *NMB Consulting Limited, Ireland*

Dr D Dardevet, *INRA, France*

Dr M Pufulete, *Kings College London, UK*

### Editorial Advisors

Professor P J Aggett, *UK*

Dr M Ashwell, *Baldock, UK*

Dr D A Bender, *University College London, UK*

Dr J L Black, *Warrimo, Australia*

Professor J Cade, *University of Leeds, UK*

Dr C Edwards, *Glasgow University, UK*

Dr S French, *Sheffield University, UK*

Professor L Hambræus, *University of Uppsala, Sweden*

Dr J Houdijk, *SAC, UK*

Professor J C Mathers, *University of Newcastle, UK*

Professor H J Powers, *University of Sheffield, UK*

Dr P Rogers, *University of Bristol, UK*

Dr B Sivakumar, *National Institute of Nutrition, India*

Professor N W Solomons, *CESSIAM, Guatemala*

Professor J B Ubbink, *University of Pretoria, South Africa*

Professor M Verstegen, *Wageningen University, Netherlands*

### Editorial staff

C Goodstein (*Publications Manager*), C Jackson (*Deputy Publications Manager*),  
J Norton, L Weeks and H Zdravics (*Publications Officers*) C T Hughes (*Sub-editor*)

---

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: [edoffice@nutsoc.org.uk](mailto:edoffice@nutsoc.org.uk)

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

# NUTRITION RESEARCH REVIEWS 2009

---

Volume 22 No. 2 December 2009

---

Editor-in-Chief

K. M. Younger  
Dublin Institute of Technology, Ireland

**CAMBRIDGE**  
UNIVERSITY PRESS

**Nutrition Research Reviews**  
**Volume 22, 2009 ISSN: 0954-4224**

**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 Department  
100 Brook Hill Drive  
West Nyack  
New York 10994-2133  
USA

**Publisher:** Katy Christomanou

*Nutrition Research Reviews* is an international journal published biannually (June and December) by Cambridge University Press on behalf of the Nutrition Society.

**Subscription information:**

Volume 22 2009 (2 issues)  
Internet/print package: £179/\$349 American only/€278 EU only  
Internet only: £147/\$273 Americas only/€221 EU only  
Print only: £168/\$326 Americas only/€257 EU only

**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.

**US POSTMASTERS:** please send address corrections to *Nutrition Research Reviews*, Cambridge University Press, 100 Brook Hill Drive, West Nyack, New York 10994-2133.

**Information for Authors:** The journal publishes both solicited and unsolicited review articles. For unsolicited material, authors are asked to submit a summary of the article to the Editor-in-chief in the first instance:

Dr K. M. Younger  
School of Biological Sciences  
Dublin Institute of Technology  
Kevin Street  
Dublin 8  
Republic of Ireland  
Tel: +353 1 40 24662  
Fax: +353 1 40 24995  
Email: [Katherine.younger@dit.ie](mailto:Katherine.younger@dit.ie)

**Directions to Contributors:** if not printed in this issue, are available from the Editor-in-chief.

**Offprints:** The author (or main author) of an accepted paper will receive a free PDF of their paper and a voucher copy of the issue in which their paper has been published. Additional 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 *Nutrition Research Reviews* are 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.

This journal is printed on acid-free paper from renewable sources. Typeset in Europe by the Alden Group, Oxfordshire.

Subscribers may register for free access to the electronic version of *Nutrition Research Reviews*. For more information visit the website at: [journals.cambridge.org](http://journals.cambridge.org)

*Nutrition Research Reviews* is covered by the Science Citation Index<sup>®</sup>, Current Contents<sup>®</sup> / Agriculture, Biology & Environmental Sciences, SciSearch<sup>®</sup>, Research Alert<sup>®</sup>, Index to Scientific Reviews<sup>®</sup>, EMBASE/Excerpta Medica, Chemical Abstracts Services, CINAHL<sup>®</sup> Database, CAB ABSTRACTS<sup>®</sup>, Global Health, BIOSIS<sup>®</sup> Database, SIIC Databases

## Contents

Vol. 22 No. 2 December 2009

### Editorial

*K. M. Younger*

References

109

### Is the use of resveratrol in the treatment and prevention of obesity premature?

*Wendy J. van der Spuy & Ethersia Pretorius*

Introduction

111

Complications of obesity

112

Inflammation

112

Reduced endothelial function

113

Cardiovascular effects

113

Insulin resistance

114

Energy restriction

114

Multi-faceted effects of resveratrol

115

Conclusion

115

Acknowledgements

115

References

115

### Vitamin D in health and disease: an insight into traditional functions and new roles for the 'sunshine vitamin'

*David Borradale & Michael Kimlin*

Introduction

118

Vitamin D nomenclature

119

UV radiation

119

UV radiation and health

119

UV radiation and skin cancer

119

Mechanisms of UV carcinogenesis and mutagenesis

119

Epidemiological evidence for the role of UV in skin cancers

120

Other health effects of UV radiation

120

UV radiation and vitamin D

120

Required levels of sun exposure for adequate vitamin D synthesis

120

Vitamin D and diet

121

Vitamin D food sources

121

Vitamin D dietary intake in Australia

121

International vitamin D dietary intake

121

Vitamin D food fortification

122

Vitamin D and determinants of health

122

Optimal vitamin D levels for health

123

Vitamin D and osteoporosis

124

Vitamin D's role in bone health

124

Meta-analyses of vitamin D's role in osteoporosis

124

Intervention studies of vitamin D's role in osteoporosis

125

Vitamin D's role in the secondary prevention of fractures

127

Observational studies of vitamin D's role in osteoporosis

127

Summary of vitamin D's role in osteoporosis

127

Vitamin D and muscle strength

127

Vitamin D and studies directly measuring muscle strength

128

Vitamin D and fall risk

128

Summary of vitamin D and muscle strength

129

Vitamin D and cancer

129

Prostate cancer

129

Breast cancer

130

Colorectal cancer

130

Summary of vitamin D's role in cancer

131

Other proposed roles of vitamin D in disease prevention

131

Vitamin D and autoimmune diseases

131

Vitamin D and cardiovascular diseases

132

Conclusion	132
Acknowledgements	132
References	132
Visceral adipose tissue in children and adolescents: a review	
<i>Edyta Suliga</i>	
Introduction	137
The measuring of visceral adipose tissue quantity	138
Visceral fat and metabolic risk factors	138
Genetics of visceral fat levels	139
Ethnicity	139
Sex differences	140
Age and level of development	140
Puberty status	140
Influence of body fat on visceral adipose tissue	141
Hormones and their relationship to fat distribution	141
Stress	142
Physical activity and cardiorespiratory fitness	142
Nutrition	143
Smoking and drinking	143
Conclusions	143
Acknowledgements	144
References	144
The effect of alcohol and nicotine abuse on gene expression in the brain	
<i>Traute Flatscher-Bader &amp; Peter A. Wilce</i>	
Gene expression in the mesocorticolimbic system: implications in alcohol and nicotine dependence	148
Alcohol-related brain gene expression in animal models	149
Genetic predisposition to alcohol preference and to the effects of alcohol	149
Effect of alcohol administration on gene expression in the dopaminergic mesocorticolimbic system	150
Effect of alcohol self-administration on gene expression in the dopaminergic mesocorticolimbic system	152
Sex-specific action of alcohol	153
Nicotine-responsive gene expression in the animal model	153
Effects of nicotine administration on gene expression in the dopaminergic mesocorticolimbic system	153
Effect of genetic predisposition on expression of nicotine-sensitive genes in the dopaminergic mesocorticolimbic system	154
Protective effects of nicotine	154
Common molecular targets of alcohol and nicotine within the dopaminergic mesocorticolimbic system	154
Gene expression profiling of the human prefrontal cortex of chronic alcoholics	154
Comparative gene expression profiling of regions of the dopaminergic mesocorticolimbic system in chronic alcoholics	155
Tobacco co-abuse in chronic alcoholics	156
Protein expression studies	157
Gene expression studies on the human dopaminergic mesocorticolimbic system of heroin and cocaine addicts	158
Future studies	158
Acknowledgements	159
References	159
Molecular mechanisms triggered by low-calcium diets	
<i>Viviana Centeno, Gabriela Díaz de Barboza, Ana Marchionatti, Valeria Rodríguez &amp; Nori Tolosa de Talamoni</i>	
Introduction	163
Effect of dietary Ca <sup>2+</sup> deficiency on Ca <sup>2+</sup> homeostasis and the metabolism of calciotropic hormones	163
Alteration of the intestinal function	164
Low-Ca <sup>2+</sup> diets and bone	165
Alteration of the renal function	166
Relationship between dietary Ca <sup>2+</sup> and lipid metabolism	167
Association between hypertension and dietary Ca <sup>2+</sup> deficiency	168
Nutritional Ca <sup>2+</sup> and risk of colon, breast, prostate and ovarian cancer	168
Concluding remarks	170
Acknowledgements	171
References	171

Intestinal metabolism of sulfur amino acids	
<i>Caroline Bauchart-Thevret, Barbara Stoll &amp; Douglas G. Burrin</i>	
Introduction	175
Isotopic approaches to study sulfur amino acid metabolism	176
Evidence of intestinal sulfur amino acid metabolism	178
Sulfur amino acids and intestinal mucosal growth and function	180
Methionine, cysteine and glutathione	180
S-adenosylmethionine in methylation reactions and polyamine synthesis	180
Sulfur amino acid metabolism and gastrointestinal diseases	182
Conclusion	183
Acknowledgements	183
References	184
Epidemiology of vitamin D in health and disease	
<i>Sihe Wang</i>	
Introduction	188
Measuring vitamin D metabolites	189
Serum levels of 25-hydroxyvitamin D	189
Effectiveness and safety of supplementation	190
Vitamin D <sub>2</sub> and D <sub>3</sub>	190
Vitamin D and all-cause death	190
Vitamin D and bones	190
Vitamin D and muscles	191
Vitamin D and autoimmune diseases	191
Vitamin D and type 2 diabetes	191
Vitamin D and cardiovascular diseases	191
Vitamin D and cancer	192
Colorectal cancer	192
Breast cancer	193
Lymphoma	194
Prostate cancer	194
Ovarian cancers	195
Other cancers	197
Conclusions	198
Acknowledgements	198
References	198
The effect and mode of action of saponins on the microbial populations and fermentation in the rumen and ruminant production	
<i>A. K. Patra &amp; J. Saxena</i>	
Introduction	204
Chemistry of saponins	205
Effects of saponins on rumen microbial population	205
Ciliate protozoa	205
Bacteria and fungi	207
Rumen archaea	208
Explaining the effects of saponins on micro-organisms	208
Microbial adaptation and metabolism of saponins	210
Effects of saponins on rumen fermentation	211
Nitrogen metabolism	211
Digestion of feeds and volatile fatty acid production	211
Methane production	212
Explaining the effects of saponins in modifying digestion and rumen fermentation	213
Effects of saponins on ruminant performance	214
Conclusion	215
Acknowledgements	215
References	216
A systematic review of the effect of breakfast on the cognitive performance of children and adolescents	
<i>Alexa Hoyland, Louise Dye &amp; Clare L. Lawton</i>	
Introduction	220

Contents

Literature search	221
Search strategy and search terms	221
Inclusion and exclusion criteria	221
Participants	221
Manipulations	221
Outcome measures	221
Study selection process	222
Tabulation of studies	222
Quality assessment	222
Results	222
Studies of acute effects of breakfast in well-nourished children	232
Effects of breakfast <i>v.</i> no breakfast	232
Comparisons of different breakfasts	232
Studies of acute effects of breakfast in children of differing nutritional status	237
Studies of long-term effects of school breakfast programmes and breakfast clubs	237
Studies of effects of habitual breakfast quality	237
Discussion	237
Methodological issues	238
Breakfast intervention	238
Cognitive performance testing	238
Cognitive performance testing: design	239
Cognitive performance testing: analysis	239
Mechanisms	239
Mechanisms: physiological	239
Behavioural mechanisms	239
Conclusions	239
Recommendations for future work	240
Acknowledgements	240
References	240
Appendix: Quality assessment tool	243
Functional foods for dyslipidaemia and cardiovascular risk prevention	
<i>Cesare R. Sirtori, Claudio Galli, James W. Anderson, Elena Sirtori &amp; Anna Arnoldi</i>	
Introduction	244
Carbohydrates and fibres	245
<i>n</i> -3 Fatty acids	246
Plant sterols and stanols	248
Nuts	249
Proteins	250
Soya proteins	250
Other vegetable proteins	251
Fish protein	252
Dark chocolate	252
Other functional ingredients	252
Red-yeast rice	252
Guggul gum	252
Fenugreek	253
Evening primrose oil	253
Artichoke	253
Cinnamon	253
Controversial topics	253
Vitamin E	253
Garlic	253
Coffee	253
Tea	253
Policosanols	254
Conclusion	254
Acknowledgements	254
References	254