

**Proceedings of the Nutrition Society of Australia (2004), Volume 28
in conjunction with the Nutrition Society of New Zealand**

and

IUNS & APCNS International Congress of Clinical Nutrition
Supported by the Australian Academy of Science (AAS) National Nutrition Committee

Asia Pacific

Journal of

Clinical Nutrition

Editors

Mark Wahlqvist, Melbourne
Akira Okada, Osaka

Guest Editors

Samir Samman, Sydney
David Sullivan, Sydney



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CURRENT CONTENTS

Proceedings of the Nutrition Society of Australia

The *Proceedings of the Nutrition Society of Australia* is published annually to incorporate abstracts of papers read at the Society's Annual Scientific Meeting. Papers read at plenary sessions and symposia are by invitation. Contributed papers are presented at the meeting as either oral or poster communications.

Every attempt is made to edit all abstracts to conform to the Society's 'Instructions to Authors', subject to the constraints imposed by the necessity to publish the *Proceedings* in time for distribution at the Scientific Meeting.

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Current and past NSA conference abstracts are available at the Asia Pacific Journal of Clinical Nutrition website:
<http://www.healthyeatingclub.org/APJCN>

Full papers from selected Plenary lectures and Symposia from the IUNS & APCNS International Congress of Clinical Nutrition and 28th Nutrition Society of Australia meeting will be published as conference proceedings in the *Asia Pac J Clin Nutr*

Asia Pacific

Journal of

Clinical Nutrition

THE JOURNAL OF THE ASIA PACIFIC CLINICAL NUTRITION SOCIETY

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Asia Pacific Journal of Clinical Nutrition (APJCN) is a peer-reviewed journal published for the Asia Pacific Clinical Nutrition Society (APCNS). The journal publishes original research reports, short communications, reviews, and letters to the editors. Letters to the editors may be either very short articles (500 words) containing new material, case reports, or comments on previous papers or on other topics of current interest. News, book reviews and other items may also be included. All articles are peer-reviewed by at least two researchers expert in the field of the submitted paper. For detailed instructions concerning the submission of manuscripts, please refer to the Instructions to Authors at the back of this issue or visit the journal web page, listed below.

The aims of the *Asia Pacific Clinical Nutrition Society (APCNS)* are to promote the education and training of clinical nutritionists in the region and to enhance the practice of human nutrition and related disciplines in their application to health and the prevention of disease.

The journal is also an organ of *The Nutrition Society of New Zealand* and of *The Nutrition Society of Australia*, whose members receive *APJCN* as part of their society membership.

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The Nutrition Society of Australia
in conjunction with the
The Nutrition Society of New Zealand

Volume 28

Twenty-eighth Annual Scientific Meeting
Brisbane, Queensland, 11 – 13 August 2004

and the

IUNS & APCNS INTERNATIONAL CONGRESS
of
CLINICAL NUTRITION

Optimal Health through Sustainable Nutrition

A conference of the International Union of Nutritional Sciences

*Incorporating the 7th International Symposium of Clinical Nutrition &
4th International Conference of the Asia Pacific Clinical Nutrition Society*

under the auspices of the
Asia Pacific Clinical Nutrition Society
and supported by the
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Brisbane, Queensland, 11 – 13 August 2004

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Asia Pacific Clinical Nutrition Society is established to create links between clinical nutritionists in the Asia Pacific region. The Society seeks thereby to promote the contribution of nutritionists to the health of the populations in Asia Pacific countries. Asia Pacific Clinical Nutrition Society will encourage continuing nutrition and training in the region so as to promote the highest possible level of research and practical innovation. *Asia Pacific Journal of Clinical Nutrition*, along with the sponsorship by Asia Pacific Clinical Nutrition Society of regional and local clinical nutrition meetings, is expected to assist greatly in the achievement of these aims.

Membership of Asia Pacific Clinical Nutrition Society, for which there is a modest annual fee and which includes on-line access to Asia Pacific Journal of Clinical Nutrition, is open to all clinical nutritionists in the region. The Society will consider application for membership based on submission of a *curriculum vitae* and a statement of support from one of the officers and the individuals listed below. The Asia Pacific Clinical Nutrition Society representatives should state: 'On behalf of Asia Pacific Clinical Nutrition Society I support the application of [Name and address] for membership in the Society'. After the applicant has obtained this endorsement from the representative it should be forwarded with the applicant's curriculum vitae for consideration and acknowledgement to: The Secretary, Asia Pacific Clinical Nutrition Society, Asia Pacific Health and Nutrition Centre, Monash Asia Institute, 8th Floor, Menzies Building, Monash University, Wellington Road, Clayton, Victoria 3168, Australia.

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Fellows of The Nutrition Society of Australia

Fellowship is awarded to persons, who in the opinion of Council, have rendered eminent service within the field of interest of the Society.

Ian Wilbur McDonald	elected 18 August	1980*
Eric John Underwood	elected 18 August	1980*
Reginald John Moir	elected 1 December	1986
Michael Vincent Tracey	elected 24 November	1987
Ernest Frank Annison	elected 8 December	1991
Basil Stuart Hetzel	elected 8 December	1991
Paul John Nestel	elected 9 May	1993
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Ingrid Coles-Rutishauser	elected 3 December	2002
Mark L Wahlqvist	elected 3 December	2003
Andrew J Sinclair	elected 3 December	2003

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Graham John Faichney	elected 26 September	1995
Richard Read	elected 3 December	2002
Samir Samman	elected 3 December	2003

Nutrition Society of Australia Medal

The Nutrition Society of Australia Medal is awarded to Australian nutrition scientists with an outstanding track record in the field of animal or human nutrition with the work carried out predominantly in Australia.

Associate Professor Robert A Gibson awarded 3 December 2002



2003 NSA/MEAT AND LIVESTOCK STUDENT PRIZE

The 2003 NSA/Meat and Livestock student prize for oral presentation went to

Tuesday Udell

Department of Paediatrics and Child Health, Flinders University of SA, South Australia
T Udell, M Makrides, RA Gibson. The effect of infant diets supplemented with α -linolenic acid on growth and development: a systematic review and meta-analysis of randomised controlled trials

Proc Nutr Soc Aust 2003; 27:S45.

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WEDNESDAY 11 AUGUST 2004

0730 – 0815	REGISTRATION	Plaza Foyer
0815 – 0830	Conference Opening	Great Hall
0830 – 0900	<i>Responding to the dual burden of nutritional diseases</i> Dr Robert Beaglehole, World Health Organisation	
NUTRITION SOCIETY OF AUSTRALIA		
Nutrition and Cardiovascular Disease		
<i>In Association with The Cardiac Society of Australia and New Zealand and The International Society of Heart Research</i>		
0900	<i>Nutritional trials for the prevention of coronary heart disease</i> Dr Michel de Lorgeril, UFR de Medecine et Pharmacie, France	
0930	<i>Glycemic index in relation to coronary disease</i> Prof Jennie Brand-Miller, Sydney University, NSW	
1000	<i>The hunt for the perfect heart healthy diet</i> Prof Gerald Gau, MAYO Clinic, USA	
1030 – 1100	Morning Tea	Plaza Foyer
1100-1240	Disease-Related Malnutrition	Plaza Terrace Room
1100	<i>The biology of malnutrition-related weight loss: differences between lean and obese adult subjects</i> Prof Marinos Elia, Southampton, UK	
1125	<i>Finding solutions to the nutritional dilemmas in Africa for child health: HIV/AIDS orphans, poverty, and hunger</i> Prof Tola Atinmo, University of Ibadan, Nigeria	
1150	<i>Malnutrition and the burden of disease</i> Prof Nevin Scrimshaw, United Nations University, USA	
1215	<i>Diabetes – The best diet?</i> Professor Lesley Campbell, Garvan Institute, NSW	
1240 - 1330	Lunch and Poster Presentations	Plaza Foyer
1330- 1500	INTERNATIONAL CONGRESS OF CLINICAL NUTRITION Putting Nutrition into Practice <i>Sponsored by National Heart Foundation</i> <i>Chair: Barbara Eden, Executive Officer, National Nutrition Program, National Heart Foundation</i> <i>Co-Chair: Dr Widjaja Lukito, University of Indonesia</i>	Plaza 4 & 5
1330	<i>Letters from the front: improving clinical nutrition practice in primary care settings</i> Dr Lynn Robinson, Med-E-Serve, QLD	
1400	<i>Clinical nutrition decision making – Hospital based</i> Dr Gordon Doig, NSW	
1430	Technologies in Clinical Nutrition Diagnosis <i>Nutrition diagnoses</i>	
1330 – 1500	NUTRITION SOCIETY OF AUSTRALIA CONCURRENT ORAL SESSION 1: Public Health Nutrition	Plaza 1
1330-1345	<i>5+ a day: Are we getting the message across?</i> Ashfield-Watt PAL, <u>Stewart E</u> , Scheffer J	
1345-1400	<i>“Everything in my lunchbox is healthy – except for the spoon ... and the chocolate.”</i> <u>Bell AC</u> , Kremer PJ, Swinburn BA	

WEDNESDAY 11 AUGUST 2004

- 1400-1415 *Effect of iron supplementation in pregnancy on IQ of children at 4 years of age*
Zhou SJ, Makrides M, Gibson RA, Baghurst P
- 1415-1430 *The use of dietary supplements in a group of potentially elite secondary school athletes*
Crowley JJ, Wall C
- 1430-1445 *Making a healthy difference to menus: evaluation of a catering program in New Zealand*
Young L, Bidois A, Mackay S
- 1445-1500 *Process evaluation of the development of the user interface for a self-administered dietary assessment program for use in general practice*
Probst YC, Burden A, McKerrow O, Krnavek C, Skoumbourdis D, Lockyer L, Goodsell C, Bare M, Dalley A, Blackmore L, Lynch K, Harper B, Steel D & Tapsell LC
- 1330 – 1500** **NUTRITION SOCIETY OF AUSTRALIA** **Plaza 2**
CONCURRENT ORAL SESSION 2:
- Energy & Metabolism**
- 1330-1345 *Resting energy expenditure in female children with cystic fibrosis - effect of puberty*
Allen JR, Barclay A, Prior R, Byler E, Gruca MA, Van Asperen P, Cooper P, Gaskin KJ
- 1345-1400 *Effect of bariatric surgery on adipose tissue regulatory peptides and growth hormone secretion*
Holdstock C, Eden Engstrom B, Ohrvall M, Lind L, Sundbom, Karlsson FA
- 1400-1415 *Physiological validation of the concept of glycemic load in mixed meals over 10 hours in overweight females*
Atkinson FS, McMillan-Price JMR, Petocz P, Brand-Miller JC
- 1415-1430 *Ethnicity and diabetes control*
Sanderson L
- 1430-1445 *Girls undergoing early adiposity rebound gain fat at a faster rate than girls with a later rebound*
Taylor RW, Williams SM, Goulding A
- 1445-1500 *A randomised trial of three non-dieting program for overweight women*
Bradshaw A, Katzer L, Horwath CC, Gray A, O'Brien S, Joyce J, Jabs J
- 1500 – 1530** **Afternoon Tea – sponsored by the National Heart Foundation** **Plaza Foyer**
- 1530 - 1700** **First Australian Academy of Science Nutrition**
Award Oration for 2004 **Plazza Terrace Room**
Protein and amino acids: from building blocks to food and health
Prof Wayne Bryden, University of Queensland
- NSA Fellows and Medal Awards**
- 1700-1800** **Molecular Biology for the Novice - A Workshop for Nutritionists** **Plaza 4 & 5**
Genomic strategies in the study of nutrition
Dr Paul Ebert, University of Queensland
- 1800 – 1930** **Welcome Reception** **Plaza Foyer**
held in the Trade Exhibition Area

THURSDAY 12 AUGUST 2004

0730- 0830	REGISTRATION	Plaza Foyer
	NUTRITION SOCIETY OF AUSTRALIA	
0830	<i>The regulatory architecture of the human genome</i> Prof John Mattick, University of Queensland	Plaza Terrace
	The New Nutrition: Molecular Nutrition and Nutriomics	Plaza Terrace
0900	<i>Molecular farming for better nutrition</i> Prof Jim Dale, QUT, Farmacule, QLD	
0925	<i>Genome health nutrigenomics: Nutrition and the science of optimal genome maintenance</i> Dr Michael Fenech, CSIRO Health Sciences & Nutrition, SA	
0950	<i>The interaction of genes and food regarding cardiovascular risk</i> Dr Tai E Shyong, Singapore General Hospital	
1030 – 1100	Morning Tea and Poster Presentations	Plaza Foyer
	Food, the Environment and Health, Econutrition, Paleolithic Nutrition	Plaza Terrace Room
1100	<i>Paleolithic nutrition: What can we learn from the past?</i> Assoc Prof Neil Mann, RMIT, VIC	
1125	<i>"The Mediterranean-style Diet" - is it ideal for the modern world?</i> Dr Michel de Lorgeril, UFR de Medecine et Pharmacie, France	
1150	<i>Environmental change and food production: consequences for human nutrition and health</i> Prof Tony McMichael, ANU, ACT	
1230 – 1330	Lunch and Poster Presentations	Plaza Foyer
1330- 1530	INTERNATIONAL CONGRESS OF CLINICAL NUTRITION Nutrition and Economics	Plaza 4 & 5
1330	<i>Nutrition and health in economic development</i> Dr Joseph Hunt, Asian Development Bank	
1400	<i>The economics of nutrition and the economic burden of chronic disease</i> Dr Steve Crowley, Health Economist, NSW	
1430	<i>Food, aged care and regional economics</i> Dr Greg Walsh, Regional Economic of Australia	
1500	Panel Discussion	
1330 – 1530	NUTRITION SOCIETY OF NEW ZEALAND CONCURRENT ORAL SESSION 3:	Plaza 1
	Micronutrient Nutrition	
1330 – 1400	<i>Efficacy of micronutrient fortification of milk on morbidity in pre-school children and growth – a double blind randomised controlled trial</i> Assoc Prof Sunil Sazawal, Johns Hopkins, USA	
1400-1425	<i>International perspectives on vitamin D and implications for bone health</i> Prof Ian Reid, Department of Medicine, University of Auckland, New Zealand	
1425-1445	<i>Serum 25-hydroxyvitamin D status New Zealand children</i> <u>Green TJ</u> , Skeaff CM, Taylor R, Whiting SJ	
1445-1500	<i>Multiple micronutrients may lead to improved cognitive function in NE Thai schoolchildren</i> <u>Manger MS</u> , Winichagoon P, Pongcharoen T, Gorwachirapan S, Boonpradern A, McKenzie J, Gibson RS	
1500-1515	<i>Sources of calcium in three diets (OZDASH study)</i> <u>Jorna MK</u> , Nowson CA, Worsley T, Margerison C, Frame AG	

THURSDAY 12 AUGUST 2004

- 1515-1530 *Serum 25-hydroxyvitamin D status of New Zealand adolescents and adults*
Skeaff CM, Green TJ
- 1330 – 1530** **NUTRITION SOCIETY OF AUSTRALIA** **Plaza 2**
CONCURRENT ORAL SESSION 4:
- Lipids**
- 1330-1345 *The effect of dietary saturated fat on endothelial function*
 Grieger JA, Keogh JB, Noakes M, Foster M, Clifton PM
- 1345-1400 *Macadamia or olive oil enriched diets induce changes in heart structure and function similar to regular exercise in rats*
 Harrison G, Somerset S
- 1400-1415 *The effect of different plant oils used in preparing tomato sauces on plasma concentrations of lycopene and oxidative status: a dietary intervention study*
Fielding JM, Li D, Stockmann R, Sinclair AJ
- 1415-1430 *Detrimental effect of high dose eicosapentaenoic acid supplementation on bone density in ovariectomised Sprague Dawley rats*
Poulsen RC, Kruger MC
- 1430-1445 Withdrawn: new presentation to be advised
- 1445-1500 *Visual development of preterm infants fed high dose docosahexaenoic acid*
Smithers LG, McPhee AJ, Gibson RA, Makrides M
- 1500-1515 *Development and evaluation of foods enriched with omega-3 (ω 3) fatty acids from fish oil*
Murphy KJ, Mansour J, Patch C, Mori T, Meyer B, Tapsell L, Noakes M, Clifton P, Puddey I, Howe P
- 1515-1530 *Dietary omega-3 fatty acid supply influences mechanisms controlling body weight and glucose metabolism*
Jayasooriya AP, Weisinger RS, Weisinger HS, Mathai M, Puskas L, Kitajka K, Dashti M, Egan G, Sinclair AJ
- 1530 - 1600** **Afternoon Tea and Poster Presentations** **Plaza Foyer**
- 1600 **Asia Pacific Clinical Nutrition Society Award Lectures** **Plaza Terrace Room**
2003 award
Nutritional dilemmas for long-term health
 Dr Noel Solomons, Centre of Studies in Sensory Impairment, Aging and Metabolism, USA
- 1630 **2004 award**
Dietary fat quality: A nutritional epidemiologist's view
 Prof Geok Lin Khor, Universiti Putra Malaysia
- 1700** **NUTRITION SOCIETY OF NEW ZEALAND** **Plaza Terrace Room**
Muriel Bell Memorial Lecture
Strategies for preventing micro-nutrient deficiencies
 Prof Ros Gibson, Otago University, New Zealand
- 1730-1830** **NUTRITION SOCIETY OF AUSTRALIA** **Plaza 1**
ANNUAL GENERAL MEETING
- 1900 – 2300** **Integrated Conference Dinner**
The Australian Woolshed

FRIDAY 13 AUGUST 2004

0730	REGISTRATION NUTRITION SOCIETY OF AUSTRALIA	Plaza Foyer
0900	Food, Pro and Prebiotics : Effects Beyond the Gut <i>Intestinal microflora: negotiating health outcomes with the warring community within us</i> Dr James Chin, NSW Agriculture	Plaza Terrace Room
0920	<i>Food inflammation and the anti-inflammatory aspects of food</i> Prof Les Cleland, Royal Adelaide Hospital, SA	
0940	<i>Effect of diet on E. coli populations in the faeces of cattle</i> Dr Chris McSweeney, CSIRO Livestock Industries, QLD	
1000	<i>Efficacy of milk fortified with a probiotic Bifidobacterium lactis (DR-10™) and prebiotic galacto-oligosaccharides in prevention of morbidity and on nutritional status</i> Assoc Prof Sunil Sazawal, Johns Hopkins University, USA	
1030 – 1100	Morning Tea and Poster Presentations <i>sponsored by Nuts for Health Campaign</i>	Plaza Foyer
1100	Food and the Child <i>"We are what we eat"</i> Prof Geoffrey Cleghorn, Royal Children's Hospital, QLD	Plaza Terrace Room
1120	New Nutrition: Novel Foods in Nutrition and Clinical Practice <i>Epidemiology of food and disease: The Melbourne cohort study</i> Prof Graham Giles, The Cancer Council Victoria, VIC	
1140	<i>Naturally functional foods – Challenges and opportunities</i> Prof Mike Gidley, University of QLD	
1200	<i>Nutraceuticals – Nutrition of the future?</i> Prof Stephen Myers, Southern Cross University, QLD	
1220	<i>Regulating health claims in Australia and New Zealand</i> Dr Bob Boyd, Food Standards Australia and New Zealand	
1250	Panel Discussion	
1300 – 1400	Lunch and Poster Presentations	Plaza Foyer
1400- 1530	INTERNATIONAL CONGRESS OF CLINICAL NUTRITION <i>Sponsored by Nuts for Health Campaign</i> Chair: Prof Linda Tapsell	Plaza 4 & 5
1400	<i>Nuts as food</i> Assoc Prof David Colquhoun, University of Queensland	
1430	<i>Nuts for Cardiovascular Protection</i> Dr Martin Strahan, Bundaberg Specialist Centre, QLD	
1500	<i>Nuts: The American Position</i> Prof Gerald Gau, MAYO Medical Centre, USA	
1400 – 1530	NUTRITION SOCIETY OF AUSTRALIA CONCURRENT ORAL SESSION 5:	Plaza 1
1400-1415	Animal Nutrition & Human Food <i>Carbohydrate rich diets exacerbate postprandial lipaemia in moderately dyslipidemic subjects, whereas red meat protein-enriched diets have no adverse effects</i> <u>Mamo JCL</u> , James AP, Soares MJ, Purcell K, Griffiths D, Schwenke J-L	
1415-1430	<i>Dietary flaxseed improves the fatty acid composition of lamb tissues</i> <u>Collins CL</u> , Davis JJ, Sinclair AJ, McCauley I, Dunshea FR, Linden N	

FRIDAY 13 AUGUST 2004

- 1430-1445 *Levels of n-3 enrichment and Japanese consumer panel ratings for lamb meat from sheep supplemented with protected linseed oil for different number of weeks*
Kitessa SM, Boghossian V, Reynolds J, Williams AJ, Gulati SK
- 1445-1500 *Milk conjugated linoleic and trans-vaccenic acids are highest in Spring in grazing cows*
Ostrowska E, Walker GP, Doyle PT, Dunshea FR
- 1500-1515 *Improving bone health to optimise calcium metabolism in the dairy cow*
Bhanugopan MS, Rankin A, Hyde ML, Fraser DR, McNeill DM
- 1515-1530 *The gluconeogenic potential of *Gliricidia sepium* and *Calliandra calothyrsus**
Widiawati Y, Teleni E

1400 – 1530

**NUTRITION SOCIETY OF AUSTRALIA
CONCURRENT ORAL SESSION 6:**

Plaza 2

Miscellaneous

- 1400-1415 *Dietary supplement use in people being treated for depression*
Silvers KM, Woolley CC, Hedderley D
- 1415-1430 *Alcohol, genome instability and breast cancer*
Benassi B, Fenech M
- 1430-1445 *Evaluation of the use of the CBMN assay to determine inter-individual variation in spontaneous and folate deficiency-induced genome damage in humans*
Furness DLF, Fenech MF, Khong TY, Hague WM, Dekker GA
- 1445-1500 *Dairy calcium and vitamin D stimulate postprandial thermogenesis: effect of sequential meals*
Soares MJ, Chan She Ping-Delfos W, James AP, Cummings NK
- 1500-1515 *Bioavailability of folic acid from fortified rice in humans using stable isotope techniques*
de Ambrosis A, Arcot J, Haber P, Paterson J, Smith G, Guilhaus M
- 1515-1530 *Omega-3 polyunsaturated fatty acid content in different edible portions of Sydney rock oyster*
Su XQ, Mateos HT

1530 – 1555

Afternoon Tea *sponsored by Dairy Australia*

Plaza Foyer

1600 – 1730

Obesity: Does it Matter? *Sponsored by Novartis*
In Association with the Australian Society for the Study of Obesity

Plaza Terrace Room

- 1555 *Obesity: what does it represent?*
Prof Marinos Elia, Southampton
- 1615 *Metabolic complications of obesity*
Prof Paul Nestel, Baker Heart Research Institute, VIC
- 1635 *Dairy, calcium and body composition of multiethnic youth*
Prof Rachel Novotny, University of Hawaii, USA
- 1655 *Fatness in production animals: Using genetic and environmental levers to meet consumer demand*
Dr Greg Harper, CSIRO Livestock Industries
- 1715 *Very low calorie diets – Their role in obesity and clinical end-point trials*
Prof Ian Caterson, University of Sydney, NSW

1745 – 1800

Closing Ceremony

Prof Jennie Brand-Miller, NSA President
Prof Mark Wahlqvist, Congress Chair

Nutrition Society of Australia Poster Presentations
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Wednesday 11 August 2004

- NSA1 *The effect of dietary nucleotide supplementation on growth and immune function in term infants: a randomised controlled trial*
Makrides M, Hawkes J, Robertson D, Gibson R
- NSA2 *Food sources of sodium prior to and during the OZDASH study*
Margerison C, Nowson CA, Worsley T, Jorna MK, Frame AG
- NSA3 *β -Hydroxy- β -Methylbutyrate (HMB) Supplementation of Resistance Trained Men*
Thomson J
- NSA4 *Trends in dietary intake and physical activity level in female students (1988 to 2003) after excluding under-reporters, using six different methods to identify under-reporters*
Warwick PM
- NSA5 *Erythrocyte biomarker-based validation of a diet history method used in a dietary intervention trial*
Patch C, Murphy K, Mansour J, Tapsell LMeyer B, Mori T, Noakes M, Clifton P, Puddey I, Howe P
- NSA6 *Food advertisements during children's and adult's viewing times: a comparative study*
Egberts K, Riley M
- NSA7 *How does dietary advice for diabetes management divide families?*
Foley WL
- NSA8 *Evaluating the short-term impact of nutrition education in outpatient cardiac rehabilitation programs*
Paxton F, Ball MJ
- NSA9 *Practical food-based dietary guidelines developed for 12-24 month old New Zealand toddlers*
Szymlek-Gay EA, Ferguson EL, Heath A-LM, Skeaff S
- NSA10 *How achievable are recommended dietary allowances for 12-24 month old New Zealand children?*
Ferguson EL, Devlin M, Briend A, Darmon N
- NSA11 *Are meal replacements an effective strategy for treating obesity in adults with features of metabolic syndrome?*
Noakes M, Foster PR, Keogh JB, Clifton PM
- NSA12 *Determining the energy requirements of army recruits*
Forbes-Ewan CH, Skiller BJ, Booth CK, Coad RA
- NSA13 *Withdrawn*
- NSA14 *Very low carbohydrate diets for weight loss and cardiovascular risk*
Noakes M, Foster PR, Keogh JB, Clifton PM
- NSA15 *Acute effect of dietary proteins on appetite, energy intake and glycemic response in overweight men*
Bowen J, Noakes M, Clifton P, Jenkins ABatterham M
- NSA16 *Oxidised LDL in newly diagnosed type 2 diabetes mellitus and impaired glucose tolerance*
Garg ML, MacDonald-Wicks L, Gibson LZ, Godfrey DMGreen JM, Horan BP, Monger KL, Wischer RM
- NSA17 *Inhibition of platelet aggregation from people with type 2 diabetes following consumption of tomato juice*
Lazarus S, Garg ML
- NSA18 *Comparative serum cholesterol and glucose responses of rats fed on wheat flour and chickpea composite flour*
Habib K, A Ehsan
- NSA19 *Effect of the combined propolis-ethanol-extract and Shaoyao-Gancao-tang on blood sugar levels of alloxan induced experimental diabetes rabbit*
Wang NZ, Li D
- NSA20 *The effect of short-term altered macronutrient status on acne vulgaris and biochemical markers of insulin sensitivity*
Smith R, Mann N, Makelainen H, Braue AVarigos G

Thursday 12 August 2004

- NSA21 *Relationship between BMI and serum and lipoprotein lipids in Hangzhou populations*
Li D, Yu XM, Zhou XQ, Zhang YHYao T, Sinclair AJ
- NSA22 *Phytosterols decrease the secretion of atherogenic lipoproteins from HepG2 liver and Caco2 intestinal cells*
Ho SSL, Pal S

Nutrition Society of Australia Poster Presentations
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Thursday 12 August 2004

- NSA23 *Lack of effect of sugar cane and sunflower seed policosanols on plasma cholesterol in rabbits*
Murphy KJ, Saint DA, Howe PRC
- NSA24 *The effect of diet standardisation on postprandial chylomicron response*
Slivkoff-Clark K, James AP, Kerr D, Soares MJMamo JCL
- NSA25 *Conjugated linoleic acid suppresses the secretion of atherogenic lipoproteins from human HepG2 liver cells*
Ho SSL, Pal S
- NSA26 *The effect of chickpeas on human serum lipids and lipoproteins*
Pittaway JK, Ahuja KDK, Chronopoulos A, Cehun MRobertson IK, Nestel PJ, Ball MJ
- NSA27 *The effect of red wine polyphenols on cardiovascular disease risk in postmenopausal women*
Naissides M, Pal S, James AP, Mamo JCL
- NSA28 *Acute effects of tea on fasting and post meal blood pressure*
Hodgson JM, Puddey IB
- NSA29 *Antioxidative behaviour of Malaysian plant extracts in model and food oil systems*
Jaswir I, Hassan TH, Said MZM
- NSA30 *Catechins are the major source of flavonoids in a group of Australian women*
Lyons-Wall P, Autenzio P, Lee E, Moss RGie S, Samman S
- NSA31 *Usual intake of isoflavonoids and lignans in association with urinary excretion - evaluation of an Australian dietary tool*
Hanna K, Eaglesham G, Patterson C, O'Neill SRees K, Chang B C-W, Lyons-Wall P
- NSA32 *Intake of phytoestrogen-rich foods and associated lifestyle and sociodemographic characteristics in Australian women*
Hanna K, O'Neill S, Patterson C, Lyons-Wall P
- NSA33 *Phytoestrogen intake and excretion and markers of bone health in Australian women*
Hanna K, Wong J, Patterson C, O'Neill, SLyons-Wall P
- NSA34 *Carotenoid concentrations in asthmatics versus healthy controls*
Wood LG, Garg ML, Blake RJ, Gibson PG
- NSA35 *Effect of dietary sialic acid supplementation on saliva content in piglets*
Wang B, Staples A, Sun Y, Karim M, Brand-Miller J
- NSA36 *Palm fruit extracts protect against oxidative damage in human red blood cells*
Balasundram N, Agar NS, Sundram K, Samman S
- NSA37 *The N-3 polyunsaturated fatty acid status in Hangzhou region*
Li D, Yu XM, Zhang YH, Yao TZhou XQ, Sinclair AJ
- NSA38 *Effects of exposure to grape-seed polyphenols and vitamin C on lipid peroxidation in vivo*
Ward NC, Hodgson JM, Puddey IB, Croft KD
- NSA39 *Metabolic fate of palm tocotrienols in human postprandial plasma model*
Fairus S, Rosnah MN, Cheng HM, Sundram K
- NSA40 *Influence of dietary omega-3 polyunsaturated fatty acid (PUFA) supply on brain gene expression*
Jayasooriya AP, Weisinger RS, Weisinger HS, Mathai MPuskas L, Kitajka K, Chen N, Ackland ML, Sinclair AJ
- NSA41 *Lack of correlation between plasma and prostate tissue alpha-linolenic acid levels*
Attar-Bashi NM, Frydenberg M, Li D, Sinclair AJ
- NSA42 *Docosa-hexaenoic acid (DHA) accumulation is regulated by the polyunsaturated fat content of the diet: Is it synthesis or is it incorporation?*
Gibson RA
- NSA43 *Omega-3 long-chain polyunsaturated fatty acids in plasma phospholipids of 12-month-old infants consuming cow's milk, breast milk or formula: a cross-sectional study*
Udell T, Makrides M, Gibson RA
- NSA44 *Effects of omega-3 fatty acid deficiency on rat intestinal structure and microbiology*
Ralph HJ, Volker DH, Chin J
- NSA45 *Levels of n-3 enrichment and Australian consumer panel ratings of lamb meat from sheep supplemented with protected tuna oil for different number of weeks*
Kitessa SM, Boghossian V, Reynolds J, Williams AJ, Gulati SK
- NSA46 *Effects on plasma lipids when plant sterol enriched fat spread or carbohydrate provide replacement energy for saturated fatty acids*
Skeaff CM, Thoma C, Chisholm A, Mann J, Williams S

Nutrition Society of Australia Poster Presentations

Friday 13 August 2004

- NSA47 *Antioxidant restricted diet reduces plasma non-esterified fatty acids in trained athletes*
Watson TA, Blake RJ, Callister R, MacDonald-Wicks LK, Garg ML
- NSA48 *Bovine colostrum and whey protein supplementation during running training increase intestinal permeability*
Buckley JD, Brinkworth GD, Southcott E, Butler RN
- NSA49 *Acute suppression of spontaneous food intake following dairy calcium and vitamin D*
Chan She Ping-Delfos W, Soares MJ, Cummings NK
- NSA50 *Withdrawn*
- NSA51 *Dairy products consumption and calcium intakes of Chinese urban adolescent girls*
Zhang Q, Ma GS, Zhu K, Zhang CY, Foo LH, Fraser DR, Greenfield H
- NSA52 *Bone mineral accretion and growth in Chinese adolescent girls following the withdrawal of school milk intervention: preliminary results after two years*
Zhu K, Greenfield H, Zhang Q, Ma G, Zhang Z, Hu X, Fraser DR
- NSA53 *Milk selenium concentration varies with time of year & feeding practices in grazing cows*
Walker GP, Doyle PT, Dunshea FR
- NSA53 B *Folic acid fortified milk increases red blood cell folate concentration in women of childbearing age*
JEP Rockell, BJ Venn, CM Skeaff, TJ Green
- NSA54 *Higher intakes of calcium are associated with lower BMI and waist circumference in Australian adults: an examination of the 1995 National Nutrition Survey*
Soares MJ, Binns C, Lester L
- NSA55 *Prevalence of low serum folate, red cell folate, serum vitamin B12 and elevated homocysteine*
Flood VM, Webb KL, Smith W, Rochtchina E, Mitchell P
- NSA56 *Copper intake of a cohort of Victorian women: food sources and age group differences*
 Cleverdon ME, Ball MJ
- NSA56 *Serum selenium concentrations in New Zealand children*
SK Mclachlan, CD Thomson
- NSA57 *Comparison of dairy and non-dairy sources of calcium on thermogenesis and substrate oxidation in humans*
Cummings NK, Soares MJ, James AP, Chan She Ping-Delfos W
- NSA58 *Folic acid deficiency is genotoxic and increases sensitivity to chromosome damage by gamma-radiation*
Beetstra S, Fenech M
- NSA 59 *Effect of sucrose feeding on genes associated with liver fat metabolism*
Lewandowski P, McAnich A, Cameron-Smith D
- NSA 60 *Short term energy restriction (using meal replacements) improves reproductive parameters in polycystic ovary syndrome*
Moran LJ, Noakes M, Clifton PM, Wittert G, Norman RJ
- NSA 61 *Dietary narcoleptics and immunocastration improve growth in group-housed boars*
McCaughey I, Cronin GM, King RH, Hemsworth PH, Barnett JL, Luxford B, Smits RJ, Hennessy DP, Campbell RG, Dunshea FR
- NSA 62 *Less efficient sheep are more responsive to an ACTH induced stress challenge*
Knott SA, Leury BJ, Brien FD, Cummins LJ, Dunshea FR
- NSA 63 *The potential anthelmintic effect of Calliandra calothyrsus in lambs*
 Cresswell KJ, Teleni E, Copeman DB
- NSA 64 *Digestibility of pearl millet in broiler diets*
Singh DN, Trappett PC, Nagle TA, Perez-Maldonado R
- NSA 65 *Cereal grain source, dietary level of lupins and broiler performance*
Li X, Gill RJ, Bryden WL
- NSA 66 *The efficacy of phytase in corn soybean meal based broiler diets*
Mulyantini NGA, Kumar A, Sands J, Bryden WL
- NSA 67 *Level of nutrition and breed can influence basal and stimulated metabolism in lambs*
Ponnampalam EN, Warner RD, Suster D, Kerton DJ, Dunshea FR
- NSA 68 *The role of oligosaccharides and Helicobacter pylori-specific antibodies in disease prevention*
 Campbell MAF, Kolev Y, Stahl B, Boehm G, Butler RN, Stevenson LM
- NSA 69 *Selenised dairy protein and colon cancer inhibition in AOM induced rats*
McIntosh GH, Scherer B, Royle PJ

- NSA 70** *Nutritional and anti-inflammatory strategies in the treatment of advanced colorectal cancer – a pilot study*
Read JA, Clarke SJ, Volker D
- NSA 71** *Lyprinol™: a potential preventive treatment for experimental inflammatory bowel disease (IBD)*
 D Tenikoff, KJ Murphy, M Le, RN Butler, GS Howarth, PRC Howe

International Congress of Clinical Nutrition Poster Presentations

Nutrition and cardiovascular disease

- Food and nutrient intake in relation to cardiovascular disease among rural males of Punjab, India*
K Bains and J Kaur
- The effect of adhesion to recommendations for fish intake on adipose tissue composition and plasma lipids*
LJ Bjerregaard, IV Aardestrup, JH Christensen, E Berg Schmidt
- Clinical studies on the innocuousness of chitosan and its short-chain derivative generated by enzymatic hydrolysis*
R Brzezinski, J-G LeHoux and A Kelly
- Marine n-3 fatty acids and ventricular arrhythmias in patients with implantable cardioverter defibrillators*
JH Christensen, S Riahi, EB Schmidt, H Mølgaard, AK Pedersen, F Heath, JC Nielsen and E Toft
- Calcium status among pregnant women*
N Hashim and ZA Norliza
- Impact of incorporating soya fibre and processed soyabean flours on the glycaemic index of parantha*
M Jain and N Verma
- The health status of hypertensive patients in Hospital Teluk Intan, Perak, Malaysia*
R Jamaluddin and MD Kirubakaran
- Simvastatin not low-cholesterol diet lowers the elevated plasma nitric oxide level in hyperlipidemic patients*
Y Jung-Eun, C Ryo-Won, J Sook-Hyun, J-H Park, K-A Ryu, J-H Chyun, C-S Park, Y-N Cha
- Does body mass index reflect percentage body fat and body fat distribution in low and high birth weight subjects?*
O Kensara, SW Wootton, DI Phillips, M Patel and M Elia
- Elevated blood pressure: emerging health problem in Iran*
K Mohammad, F Kolahdooz and R Sheikholeslam
- Non communicable disease risk factors in Iran*
R Sheikholeslam, A Mohamad, K Mohammad and S Vaseghi
- Used oil consumption impairs peripheral vascular physiology*
N Lai, K Griffiths, J Harmer, M Skilton, I Hue, D Celermajer and D Sullivan
- Antioxidants modulate the nitric oxide system and SOD activity and expression in rat epithelial lung cells*
Z Madar, N Maayan, O Sarit and A Eliraz
- Long-term effects of policosanol on older patients with Type 2 diabetes*
R Mas, G Castaño, J Fernández, R Gamez, J Illnait, L Fernandez, E Lopez, M Mesa, E Alvarez and S Mendoza¹
- Long-term effects of policosanol on obese patients with Type II Hypercholesterolemia*
R Mas, G Castaño, J Fernández, R Gamez, J Illnait, L Fernandez, E Lopez, M Mesa, E Alvarez and S Mendoza
- Effect of a soy supplement on spontaneous atherosclerosis in low density lipoprotein receptor knock out (LDLR^{-/-}) mice*
A Mortensen, K Pilegaard, H Frandsen and V Breinholt
- Study of leek (*Allium porrum*, L) extract on cholesterol plasma levels in hyperlipidemic animals*
A Movahedian, A Ghannadi, H Sadeghi, M Gharavi and S Azarpajhoh
- Estimation of risk for developing cardiac problem in patients of Type 2 Diabetes as obtained by the technique of density estimation*
A Mukherjee, A Mathur, R Mittal and NC Saxena
- Blood lipid and glucose levels of adolescents belonging to upper income group as markers for assessing the risk of CAD/DM*
SJ Passi, SC Manchanda, R Lakshmi, K Paintal and P Kapur
- Educational intervention for modifying the lipid levels of school going adolescents*
SJ Passi, S Suri and SC Manchanda
- The effects of consumption of guava (*psidium guajava*) or papaya (*carica papaya*) on total antioxidant and lipid profile in normal male youth*
A Rahmat, MF Abu Bakar, N Faezah and Z Hambali
- Effects of diet modification on cardiovascular risk: results from the Leipzig wholesome nutrition study*
V Richter, K Purschwitz, F Rassoul, J Thiery, HJF Zunft and C Leitzmann
- Ageing, cardiovascular risk profile and vegetarian nutrition*
V Richter and F Rassoul

International Congress of Clinical Nutrition Poster Presentations

Nutrition and cardiovascular disease

Impact of sesame oil on nifedipine in modulating oxidative stress and electrolytes in hypertensive patients

D Sankar, G Sambandam, M Ramakrishna Rao and KV Pugalendi

Triacylglycerols-induced oxidative stress and necrotic cell death in J774.2 macrophages

O Tirosh, A Aronis and Z Madar

Cardiovascular disease risk factors among a sample of Malay older adults aged 50 to 65 years old

Z Yassin, A Rifia, MT Mohd Nasir, AG Nawalyah and H Zarida

Nutritional risks of hypertensive outpatients in Korea

K Sook Yim

Food, inflammation and the anti-inflammatory aspects of food

In vitro and ex vivo cyclooxygenase inhibition by a hops extract

M Lemay, MA Murray, A Davies, H Roh-Schmidt and RK Randolph.

Assessment of micronutrient antioxidants, total antioxidant capacity and lipid peroxidation levels in liver cirrhosis

S Prakash and YK Joshi

Palm oil tocotrienol mixture is better than alpha-tocopherol acetate in protecting bones against free-radical induced elevation of bone-resorbing cytokines

IN Soelaiman, NS Ahmad and BAK Khalid

Soy protein isolate and isoflavones modulate serum immunoglobulin levels in rats

C Xiao, C Wood, MR L'Abbé, S Gilani, G Cooke and I Curran

Diet, gut microflora and health

The comparison of Haemophilus influenza in the throat of healthy infants with different feeding methods

A Kazemi

Symbiotic containing Bifidobacterium animalis and inulin increases stool frequency in elderly healthy people

H-J Franz Zunft, C Hanisch, S Mueller, C Koebnick, M Blaut and J Doré

Nutrition and economics

Effects of household food expenditure on nutritional status of preschoolers in cassava producing areas of Nigeria

CO Asinobi, FI Nweke and AH Cole

Effects of household food expenditure on nutritional status of preschoolers in cassava producing areas of Nigeria

CO Asinobi, FI Nweke and AH Cole

Examining the aged's nutritional condition in Kermanshah Iran, 2003

R Jalali

The nutritional status of pregnant women in the Vaal Triangle, Gauteng, South Africa

H Kesa

A rapid chromatography procedure for the isolation of lactoperoxidase from acid whey

SZ Samsam and SH Naieri

Prediction of child growth status at birth (a model)

M Shahraki, Z Sargolzaei and T Shahraki

Food and the child

A diversified diet may reduce school age children stunting in North Western Morocco

Y Aboussaleh, AOT Ahami, F-Z Azzaoui, M El Hioui and A Boukhari

Green tea consumption enhances survival of epithelial ovarian cancer patients

CW Binns, M Zhang, AH Lee and C Xing Xie

The relationship between dietary carotenoids and prostate cancer risk in Southeast Chinese men

CW Binns, L Jian and AH Lee

Nutritional profile of preschool children of Gurgaon district of Haryana (India)

P Bishnoi, S Sehgal and A Kwatra

Soy proteins - an ideal functional food for growth promotion

U Chandrasekhar

The use of a putative lactagogue plant on breast milk production in Simalungun, North Sumatra, Indonesia

R Damanik, ML Wahlqvist and N Wattanapenpaiboon

Dietary intake of macro and micronutrients in children: does recurrent illness reduce intake?

A de Silva, S Atukorala and N Ahluwalia

A comparison of the smoking habits of Aboriginal mothers and non-Aboriginal mothers while breastfeeding

R Giglia, D Gilchrist², B Woods, CW Binns, JA Scott and MI Gracey

Increasing breastfeeding rates in Australia

K Graham, J Scott, C Binns and W Oddy

Iron bioavailability of some Cameroon traditional complementary foods

MM Kana Sop, MC Teugwa and PH Amvam Zollo

Breakfast patterns of primary school children in an informal settlement

J Kearney and C Napier

International Congress of Clinical Nutrition Poster Presentations

Food and the child

Junk food consumption: an indicator of changing dietary habit in Iranian children

F Kolahdooz, R Sheikholeslam, M Naghavi and Z Abdollahi

Malnutrition and soil-transmitted helminthiasis among Orang Asli children in Selangor, Malaysia

N Moktar, HMS Al-Mekhlafi, M Azlin, U Nor Aini, M Azlin, A Shaik, A Sa'iah, MS Fatmah,

MG Ismail, MS Ahmad Firdaus, MY Aisah and AR Rozlida

Biochemical measurements and anthropometry as indicators of nutritional status measuring the prevalence of malnutrition in primary school children living in an informal settlement

C Napier and W Oldewage-Theron

The long term effects of soy-based formula on isoflavone concentration of plasma and urine, and growth and recognition development at 10 and 20 months old infants

C Ryowon, J Yoon Lee, H Ok Lee, S Jun Chung, M Ran Cho, J Young Kim and In Hoe Lee

Nutritional Status of 0-36 month old children in the Zabol cities centres

M Shahraki, Z Sargolzaei and T Shahraki

Iron deficiency anaemia as an adjunct to soil-transmitted helminthiasis among Orang Asli children in Selangor, Malaysia

N Aini Umar, HMS Al-Mekhlafi, M Azlin, A Shaik, A Sa'iah, MS Fatmah, MG Ismail, MS Ahmad Firdaus, MY Aisah,

AR Rozlida and M Norhayati

Correlates of children's eating attitude test scores (CHEAT) among a sample of female primary school children

MS Zalilah and MY Zaidah

Factors contributing to academic achievement among a sample of Indian and Malay school children in Malaysia

MS Zalilah, GL Khor, S Sarina and K Mirnalini

Clinical nutrition decision making

Legumes: the most important dietary predictor of survival in older people of different ethnicities

I Blackberry, A Kouris-Blazos, ML Wahlqvist, B Steen, W Lukito and Y Horie

The effect of supermint oil on pain severity after Caesarean section

N Fazel

Novel foods in clinical practice

Total antioxidant capacity and selected flavonols and carotenoids of some Australian and Fijian fruits and vegetables

J Lako, C Trenerry, ML Wahlqvist, N Wattanapenpaiboon, S Sotheeswaran and R Premier

D-Psicose, a rare sugar that provides no energy and additionally beneficial effects for clinical nutrition

T Matsuo and K Izumori

Dietary advice inclusive of walnut supplementation assures adequate intakes of n-3 polyunsaturated fats in the dietary management of type 2 diabetes mellitus

L Tapsell, L Gillen, CS Patch, M Bare, M Batterham and M Owen

Microclustered water and hydration

ZY Wang, ZC Zhou, KN Zhu, X Wang, JG Pan, LH Lorenzen, MC Zhou

Suitable nutrients necessary in early years and its later consequences

M Wanja

The merging of neurobehavioural and nutritional sciences

Knowledge, attitudes and practices (KAP) of diet prescription among university students of Ahwaz, Iran

SMH Mosavi Jazayeri

Effects of breakfast on memory in healthy young adults

SMH Mosavi Jazayeri, R Amani and N Khajeh Mugahi

Evidence based nutrition

Serum and urinary levels of retinol and tocopherol of Japanese women

A Abe, K Hirai, Y Aoki and R Takezoe

Serum levels of amino acids of Nepalese living in the south-central rural region

A Abe, K Hirai, SK Rai and G Rai

Anthropometric measurements of preschool children as effected by socio-economic factors

P Bishnoi, S Sehgal and A Kwatra

The correction of neutrophilic link of immune activity in rats by lipid nutrients

T Chernysheva, T Gerasimenko and T Apukhtina

Physical activity and calcium consumption are important determinants of lower limb bone mass in elderly women

A Devine, SS Dhaliwal, IM Dick, J Bollerslev, RL Prince RL]

Calculation of vitamin A activity from provitamin A carotenoids: what factor should we use?

D Mackerras

Changing dietary patterns of the young: impact of fast foods

R Mahna, S J Passi and K Khanna

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Evidence based nutrition

Nutrition and health status of rural adolescent girls in selected ICDS blocks of Delhi and Rajasthan

A Malhotra and SJ Passi

*Effect of high fibre fruit (Guava - *psidium guajava L.*) on the serum glucose level in induced diabetic mice*

R Mohd Yusof and M Said

The effect of weekly dose of iron supplementation for 16 and 20 week on the iron status of adolescent girls in Iran

K Samadpour, R Sheikholeslam, Z Abdollahi and F Mazandrani Salehi

Technologies in clinical nutrition practice

Developing a self-administered computer assisted dietary assessment tool for use in primary healthcare practice:

perceptions of nutrition and computers in older adults with T2DM

YC Probst, C Krnavek, L Lockyer and LC Tapsell

Obesity

The relationship of plasma leptin to anthropometrical and biochemical markers of overweight primary school students

M Appukutty, S Anuar, M Nagoor, Fatimah, A Norliza, H Zarida and M Rizam

Body mass index is not a significant predictor of survival amongst older people

I Blackberry, A Kouris-Blazos, ML Wahlqvist, B Steen, W Lukito and Y Horie

Impact of exercise on nutritional status and health profile of urban obese women in Hisar City

S Dahiya and C Arora

Mediterranean diet improves lipid profiles over three months

G Flynn and D Colquhoun

Successful long-term weight loss with a Mediterranean style diet in a primary care medical centre

G Flynn and D Colquhoun

Overweight/obesity situation and the relation to lipid disorders and hypertension in women aged 20 to 59 years old in Ba Dinh district, Hanoi City

Le Thi Hop and Tran Thi Xuan Ngoc

Genetic linkage of uncoupling proteins (UCP2 and UCP3) with body weight regulation

E Jaber

Assessing changes in quality of life among obese participants in Kelantan, Malaysia

RA Jalil, WA Manan, WMW Bebakar, R Halim, GS Ooi and R Othman

Gender and ethnic differences of Mexican children's attitudes toward a drawing of an obese peer

A Jiménez-Cruz, M Bacardi-Gascón and J Leon-Reyes

Effects of macronutrients on cardiovascular and metabolic responses in NIDDM (non-insulin –dependent diabetes mellitus) and healthy subjects

F Kaseb, MH Soltani, M Kimiagar, M Hoseini, G G Harrison and A Afifi

The effect of food frequency on serum glucose, triglyceride and total cholesterol in niddm patient

A Keshavarz

Relation between calcium and magnesium intake and obesity

Z Lelovics

Dietary intake, lifestyle factors and nutritional status of Indian adult males in Kampung Indian Settlement, Batu Caves, Selangor

MT Mohd Nasir and B Sabapathy

Prevalence of general and central obesity in Zahedan university of medical sciences students, Iran

Z Mortazavi and Shahrakipoor Mahnaz

Examining effectiveness of Ahmadreza Movahedi's metabolic theory and model for weight control

A Movahedi

Food intake and physical activity patterns of obese children in primary schools in Kuching, Sarawak, Malaysia

AG Nawalyah and HL Bong

A randomised controlled trial of 4 different commercial weight loss programmes in the UK in obese adults: body composition changes over 6 months

H Truby, D Millward, L Morgan, K Fox, MBE Livingstone, A deLooy and I Macdonald

Development of a life-size photo guide to food serves

T Williams

Reduction of the postprandial glucose and insulin response in serum of healthy subjects by an arabinoxylan concentrate isolated from wheat starch plant process water

H-J Franz Zunft, W Lueder, C Koebnick, D Imhof and F Meuser

Clinical nutrition: diagnosis and management

Surveying the absorption level of complexes ethyl and methyl –3-hydroxy-pyran 4- on and its comparison with zinc sulphate available from market, by using the invitro method.

A Badiei, L Saghaei and S Ebrahimiurimi

Efficacy of calcium supplementation and weight-bearing exercise in reducing rate of bone loss in postmenopausal Chinese women – a two-year randomized controlled trial

YM Chan, Y Zaitun, A Rahman Suriah, S Swee Chee, S Pheng Chan, M Kandiah and L Fun Lee

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Clinical nutrition: diagnosis and management

Body composition assessed by impedance changes very early with declining renal graft function

A Coroas, JGG Oliveira, S Sampaio, C Borges, I Tavares, M Pestana and MDV de Almeida

Nutritional status and body composition evolution in early post-renal transplantation - is there a female advantage?

A Coroas, JGG Oliveira, S Sampaio, C Borges, I Tavares, M Pestana and MDV de Almeida

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Invited Speakers

Responding to the dual burden of nutritional diseases

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The dual burden of nutritional diseases encompasses the problems caused by malnutrition and micronutrient deficiencies and the chronic, noncommunicable diseases of adults. The rapidity of the nutritional transition means that many low and middle income countries must now respond to both sets of diseases. Malnutrition caused almost 4 million deaths and contributed to many more in 2000, most of which occurred in Africa and South East Asia. Chronic diseases, especially heart disease, stroke, cancer and chronic respiratory diseases, make up approximately 60% of global mortality and almost 50% of the global burden of disease. These conditions are the leading cause of disease burden in all but the African Region of WHO. The causes of the chronic diseases are well known and are essentially the same in all regions. Population-based interventions are available to reduce the risk of both malnutrition and the chronic diseases. Unfortunately, the global response to these major public health problems have been inadequate despite malnutrition being one of the Millennium Development Goals.

Upon request by its Member States, WHO has, over the past two years, developed the Global Strategy on Diet, Physical Activity and Health. A revised version of the Strategy was endorsed by the World Health Assembly in May 2004. One major criticism of the Global Strategy was its lack of attention to malnutrition and micronutrient deficiencies, despite the fact that it was developed in response to Member States concerns with the chronic diseases of adults. WHO is committed to strengthening its work on malnutrition. The dual burden of nutritional diseases requires a dual response at global, national, community and family levels.

The Global Strategy provides WHO Member States with a comprehensive range of policy options from which to choose. The strategy suggests recommendations for action by all stakeholders: Member States, WHO, NGOs, the private sector and UN agencies. Key principles are proposed to guide the development of strategies to address unhealthy diets and physical inactivity: best available scientific evidence, comprehensiveness, multi-sectoral and multidisciplinary approaches, a life course approach, addressing poverty, gender and culture sensitivities, and the accountability of all stakeholders to achieving success. The strategy sees governments assuming a steering role in changing the environment to support their populations and individuals to improve their nutritional and physical activity patterns. It stresses the importance of building on existing structures and national mechanisms rather than creating new ones. It suggests that effective national legislation and appropriate infrastructure are critical for introducing effective policies. The main policy recommendations of the strategy are for countries to: develop national dietary and physical activity guidelines; provide accurate and balanced information to consumers, in particular with regard to nutrition labeling, nutrition and health claims; address issues related to marketing of foods, especially to children. The strategy recommends that countries review and evaluate their food and agriculture policies to be consistent with a healthy and adequate diet.

WHO's goal is to advance public health worldwide. This goal can only be met through decisive and coherent action which in many countries requires complex interventions addressed to both mal- and over-nutrition. An effective response requires sustained political commitment, and broader, multi-level involvement with all relevant stakeholders worldwide.

*NSA***Nutrition and Cardiovascular Disease****Nutritional trials for the prevention of coronary heart disease**

M de Lorgeril

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Epidemiological studies as well as randomised dietary trials including moderate amounts of omega-3 fatty acids in the experimental diet suggest that these fatty acids, despite their low concentrations in blood and tissues, may be important in relation with the pathogenesis (and prevention) of CHD. Whereas a striking protective effect of an alpha-linolenic acid (ALA)-rich Mediterranean diet was reported with a 50 to 70% reduction of the risk of recurrence after 4 years of follow-up, it is still not known whether ALA is cardioprotective by itself only or also through its conversion into very long-chain omega-3 PUFAs (EPA + DHA) and then into the corresponding eicosanoids and prostaglandins. According to our current knowledge, dietary ALA should represent about 0.6 to 1 % of total daily energy or about 2 g per day in patients following a Mediterranean diet, whereas the average intake in linoleic acid should not exceed 7 g per day. Supplementation with very long chain omega-3 fatty acids (about 1g per day) in patients following a Mediterranean type of diet was shown to decrease the risk of cardiac death by 30% and of sudden cardiac death by 45%. Thus, in the context of a diet rich in oleic acid and poor in saturated and omega-6 fatty acids, even a small dose of omega-3 PUFAs (one gram under the form of capsules) might be very protective. These data underline the importance of the omega-6/omega-3 ratio in the prevention of coronary heart disease.

NSA

Nutrition and Cardiovascular Disease

Glycemic index in relation to coronary disease

JC Brand-Miller

Human Nutrition Unit, University of Sydney, NSW, 2006

In cardiovascular disease, dietary fat and blood lipids have attracted the lion's share of attention. But carbohydrate, the macronutrient that increases when fats are restricted, may not be the totally desirable nutrient that we believe. The findings of the Lyon Heart Study, one of the most important nutrition studies ever carried out, emphasise that the 'prudent' high carbohydrate western diet is not the best choice for reducing cardiovascular events. One explanation is the potential to increase postprandial hyperglycemia, an under-recognised risk factor for cardiovascular and total mortality in the non-diabetic population. In the DECODE study and a host of other large prospective cohort studies, high post-challenge blood glucose was associated with 1.8 to 3 times greater relative risk of death. The glycemic potential of carbohydrates is therefore relevant to both prevention and management of coronary disease. Diets based on high glycemic index (GI) carbohydrate foods have been shown to 1) increase day-long blood glucose and insulin levels 2) exacerbate insulin resistance in predisposed individuals 3) adversely affect markers of the metabolic syndrome (triglycerides and HDL-cholesterol) in intervention studies and 4) increase the risk of coronary disease in a healthy population.

How does high blood glucose increase the risk of CVD? Laboratory studies have shown that high glucose levels even within the normal range adversely affect endothelial function via a multitude of mechanisms including oxidative stress, inflammatory factors, protein glycation, LDL oxidation, pro-coagulatory and anti-fibrinolytic activity.¹ In intervention studies of men with hyperlipidemia, Jenkins et al showed that a low GI diet was associated with lower TG and LDL cholesterol levels compared with an otherwise equivalent diet based on high GI carbohydrates.² In women with a family history of CVD following a low GI diet for 4 weeks, Frost et al found increased insulin sensitivity after a glucose challenge and increased glucose uptake in isolated adipocytes.³ Even in lean young adults, a low GI diet reduced muscle triglycerides, a marker of insulin resistance, despite no effect on insulin-stimulated glucose uptake.⁴

Epidemiological studies provide further support. In the Nurses Health Study, those in the highest quintile of GI and glycemic load (GI x carbohydrate) had nearly double the relative risk of coronary infarct, compared to those in the lowest quintile, after adjustment for known risk factors, including fibre.⁵ In several observational studies of healthy men and women, high GI diets have been consistently associated with lower HDL levels.⁶ In post-menopausal women, high GI diets were associated with higher C-reactive protein levels (a marker of low grade chronic inflammation), high triglycerides and lower HDL levels⁷, all of which increase the risk of CVD.

Low GI diets may also reduce visceral fat deposition. In recent studies, we compared 4 weight loss diets of differing glycemic load (GL). Compared to the conventional low fat diet with a high GL, the reduced GL diets produced greater rates of weight loss but only the low GI diet was associated with significant reductions in LDL-cholesterol (unpublished data). Finally, the STOP-NIDDM study using Acarbose (a drug which slows brush border digestion of carbohydrates) provides direct evidence that reducing the rate of carbohydrate absorption *per se* halves the risk of cardiovascular events and hypertension. The use of naturally-occurring 'slow-release' or low glycemic index (GI) carbohydrates to achieve the same end remains controversial.

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NSA

Nutrition and Cardiovascular Disease

The hunt for the perfect heart health diet

GT Gau

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Obesity and Type 2 diabetes are near epidemic proportions in American children and adults. At present, two-thirds of America adults are overweight (BMI > 25), 30% frankly obese (BMI >30)*, 8% are diabetic, and 24% have the metabolic syndrome.

I have reviewed countless diet books and scientific reports on diets designed to decrease weight and reduce cardiovascular risk. I picture these diets on a pendulum arc from the low fat Ornish diet to the high fat Atkins diet (see diagram). I will discuss these diets and comment on the utility and use in both weight reduction and decreasing cardiovascular risk.

My diet conclusions are:

- Ultra low fat diets are poorly tolerated
- NCEP Step I Diet is largely ineffective
- NCEP Step II Diet, low fat, with Mediterranean features, decreased saturated fat with more monounsaturated and omega-3 fatty acids is effective
- Atkins Diet gives weight loss with some risk and not useful in the long-term, at present – there are concerns
- Common Sense Diet – calorie restricted, relative carbohydrate-restricted
- South Beach Diet – carbohydrate-restricted.
- Mediterranean Diet – ideal, better tasting, proven heart protective with increased longevity
- Diet without exercise does not achieve the goal

Further Reading

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*NSA***Disease-Related Malnutrition****The biology of malnutrition-related weight loss:
differences between lean and obese adult subjects**

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The recent obesity epidemic has revived interest on the effects of body weight and composition on the metabolic response to starvation and semi-starvation. Some of the descriptions of starvation in standard texts do not apply equally to lean and obese subjects. After 3 days of total starvation (water only) the rise in circulating ketone body concentration is up to two-fold greater in lean subjects, whilst their contribution to oxidative metabolism of muscle is up to two-fold greater in the obese. The obese survive longer, lose a smaller proportion of body weight as lean tissue (although they have more lean tissue than thinner individuals), and during prolonged starvation, derive a smaller proportion of energy from protein oxidation. The obese also excrete a smaller proportion of urinary nitrogen as urea (less than half of total N), a greater proportion as ammonia and the kidney contributes to a greater proportion of glucose production (up to about half of total glucose production in the obese). These differences are consistent with a model of survival, in which initial body composition determines metabolic and physiological outcomes. The observations cross species barrier lines, and extend from individuals in good health to those with chronic diseases, such as HIV infection.

NSA

Disease-Related Malnutrition

Finding solutions to the nutritional dilemmas in Africa for child health: HIV/AIDS orphans, poverty and hunger

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Problems related to nutrition are critical constraints to economic growth and these have been exacerbated with HIV/AIDS epidemics, leading to a phenomenal increase in the number of orphans in Africa. There are intertwined linkages between poverty and hunger and these undoubtedly impinge on child survival. Finding solutions to nutritional dilemmas in Africa needs to go beyond non-nutritional divides and it should be realized that improving nutrition in developing countries is both humanitarian and an economic imperative. Sustained poverty reduction will require economic growth centered on labour-intensive, employment creating policies and technologies in the atmosphere of political stability. However, economic growth can be slow process by which to reduce poverty, but there is no guarantee that growth alone will adequately improve the incomes of the poorest in society. Therefore, it becomes necessary to institute strategies, which would not only focus on economic growth indices but also include programs that will better the living conditions of the people, with special consideration for children.

African countries need to identify with the Millennium Development Goals (MDGs) if sincere nutritional care is to be provided for the people to improve their well-being and production capacity. Therefore, it is appropriate for national governments and their development partners to initiate different "better life programs" (BLPs) to facilitate and ensure that citizens have access to the tools that will allow them meet their food and nutritional requirements.

Better life programs, which are forms of social protection services, will provide the necessary support to cushion the excruciating effect of poverty including opportunities for HIV/AIDS risk-reduction and insurance role. The fact that tax system in most African countries are not reliable in terms of collection and management suggests the need for an equity sharing processes, which can easily be linked with BLPs in terms of income and resource redistribution. BLPs may include school-based feeding programs targeted at school-age children, subsidy on basic commodities like food and services including provision of portable water, power supply and agricultural inputs. In addition to these, creating employment opportunities and setting up of social health insurance scheme will complement arrangement to enhance better living condition. It is suggested that introduction of micro-credit and enterprise promotion will also boost the relevance of BLPs.

The individual and private organizations also have roles to play in finding solutions to the nutritional problems militating against child health. Family adoption of birth spacing method will reduce the incidence of unwanted pregnancies and improve caring capacity. This is considered as individual responsibility, which could be facilitated by provision of basic health care services. Private organizations need to design appropriate technology and low cost products that could be sold at affordable prices to marginal income earners in order to facilitate their accessibility and affordability of the product. NGOs and community-based organizations can organize initiatives to provide care for sick parents and orphaned children. They can also assist in monitoring impacts of BLPs and play crucial role in setting up early warning systems and rapid response systems around shocks.

Lastly, the impetus to execute large scale BLPs that will benefit the children is strengthened by availability of resources, organizational structure of the relevant institutions and political support from the home government. Expectedly, the people who are likely to benefit from BLPs interventions tend to be relatively poor. Thus, the interventions, in addition to their intrinsic value in reducing child inadequate nutrition, are likely to provide important gains in terms of reducing current poverty and increasing future productivity.

*NSA***Disease-Related Malnutrition****Malnutrition and the burden of disease**

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Malnutrition is a major cause of disease burden in many developing regions, and is a principal factor inhibiting further rapid declines in child mortality. Almost 50% of children in India and neighbouring countries are clinically underweight (<2 SD weight for age), as are about one-third of children in Africa, and 10-25% of children in other developing countries. The prevalence of specific micronutrient deficiencies (vitamin A, zinc) varies from 20-60% in Africa and South-East Asia to less than 5% in developed countries. Approximately one-tenth of the population worldwide suffer from iron deficiency. The principal impact of underweight on the global burden of disease is through diarrhoea and pneumonia; even mild undernutrition places a child at increased risk. Worldwide, underweight caused an estimated 3.7 million child deaths (out of 10.8 million) in 2002. Of these, 1.8 million were in Africa, and 1.2 million in India and neighbouring countries. In terms of disease burden as measured by DALYs (Disability Adjusted Life Years), underweight caused almost 10% (9.5%) of the entire global burden of disease, making it the leading risk factor worldwide. In addition, iodine deficiency disorders were estimated to cause another 2.5 million DALYs (0.2% of global disease burden), one-quarter of which occurred in Africa. Iron deficiency caused an estimated 0.8 million deaths (2.4% of global DALYs), with one-third of the burden in South-East Asia, 30% in Africa and 15% in the Western Pacific. Another 0.8 million deaths worldwide are attributable to vitamin A deficiency, as are almost 2% of DALYs (4-6% of disease burden in Africa). Zinc deficiency accounted for a similar number of deaths, but a much higher share (2.9%) of global disease burden. Zinc deficiency affects about one-third of the world's population.

Collectively, this cluster of undernutrition and micronutrient deficiencies caused about 6 million deaths in 2000 (11% of the global total) and about 17% of the entire global burden of disease. Much of this disease burden occurs among children. Indeed, these estimates suggest that at least half of all child deaths each year could be prevented if undernutrition and associated micronutrient disorders could be eliminated.

NSA

Disease-Related Malnutrition

Diabetes – the best diet?

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“Diet is the cornerstone of management of diabetes”. Yet this area produces more heated controversy in management than any other in diabetes therapy. An enthusiasm for unnaturally high carbohydrate diets, together with dogma regarding beneficial effects of complex versus simple carbohydrates, has been gradually eroded by the demonstration that larger glycaemic loads elevate blood glucose levels more in the presence of the insulin deficiency, which characterises diabetes. With modern insulin therapy, in type 1 diabetes mellitus, the patient can now eat sucrose and adjust the insulin dosage to the carbohydrate load of the incoming meal as desired. Currently (despite much debate) there is no strong scientific evidence of long-term benefit from avoidance of carbohydrate foods labelled “high” glycaemic index, or even of short term harm from their ingestion, in diabetes. While large amounts of dietary fibre (>50gm) have been shown to benefit glycaemic control and lipids, studies have not yet shown patients undertaking long-term consumption at such levels.

Monounsaturated fats can be utilised to replace saturated fat. Reduction of the latter to <10% of energy intake remains a dietary instruction which hasn’t changed. N-3 fatty acids are best ingested through increased fish and plant sources rather than supplements.

Protein restriction is usually unnecessary and at an average 15-20% of energy intake should not be altered, except in renal failure, as people with diabetes may use more protein than normal. Weight management is of major importance in type 2 diabetes but is now a consideration in some patients with type 1 diabetes, partly reflecting the population incidence of obesity. Despite possible short-term effectiveness of various diet compositional changes to achieve greater weight loss, long-term studies (>1yr) show similar regain without use of medication or bariatric surgery. Diabetic subjects are less able to lose weight on a similar reducing diet than their non-diabetic spouses. Their genetic predisposition and the appetite-promoting diabetic medications are possible contributors to this phenomenon.

Finally, a commitment to a full assessment of the patient as a whole and genuine tailoring of the dietary prescription to the patient may be able to prevent the 50% noncompliance often reported with diabetic diet.

ICCN

Putting Nutrition into Practice

Letters from the Front: Improving Clinical Nutrition Practice in Primary Care Settings

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The experience of providing continuing professional development to general practitioners within an integrated comprehensive primary care curriculum demonstrates that GPs are both interested and able to integrate clinical nutrition into practice. Of a total of 400 educational units offered in the PriMeD program, 16 units are specifically designed to target clinical nutrition skills.

Since 2002, 961 of 4580 participating general practitioners have elected to include clinical nutrition units in their learning programs. Effective educational modalities are case based learning and peer group discussion supported by resource material and a clinical tool kit to take learnings into practice.

Educational outcomes include increased confidence to undertake counseling for weight management, increased used of anthropometric measurements, increased understanding of and use dietary indicators especially the food variety score of which only 10% of general practitioners were aware. Sustained change in clinical practice was measured by the use of clinical nutrition tools with 59% of participants making modifications to practice. A further 34% indicated an intention to review their practice and/or take up the clinical nutrition practice tool kit.

ICCN

Putting Nutrition into Practice

Clinical Decision Making - Hospital based

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Evidence-based decision making is defined as: "The consideration of the evidence when making health care decisions at the level of the process, structure, program or system"(www.EvidenceBased.net). The two core skills required for the practice of evidence-based decision making include: 1) the application of formal rules of evidence when critically appraising the clinical literature and 2) the identification of the available evidence using efficient and effective literature searching. These two core skills can be applied in the domain of clinical nutrition to support decision making with regards to the provision of nutritional support in the hospitalised critically ill patient.

This presentation will provide further understanding with regards resources that support critical appraisal (www.cche.net) and efficient literature searching (www.PubMed.org).

Examples of results obtained when these skills are applied to the domain of clinical nutrition (of critical illness) will be provided and discussed.

*ICCN***Technologies in Clinical Nutrition Diagnosis****Nutrition diagnoses**

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Management of nutritional disorders rests on making a diagnosis. The ICD-10 classification of diseases lists a large number of nutritional diagnoses without suggesting a measurement definition of each disorder. Some areas of clinical acceptance, such as visceral obesity are not listed. Use of the BMI has become ubiquitous to categorize disorders of over- and under-nutrition, but is best suited for epidemiological use, and has significant limitations in categorizing an individual for diagnostic purposes. A variety of body composition tools and models are described in the literature, but are variably available in those areas where patients with these disorders are located. Even so, there are limitations to making nutritional diagnoses associated with lack of ethnic or age-related data. Techniques such as anthropometry, bio-impedance or DEXA, whilst widespread, need validation from current "gold standard" methods such as CT or MRI. Questions such as "How much whole body protein loss constitutes mild, moderate or severe protein malnutrition?" remain difficult to answer. The complementary use of biochemical or functional tests to body composition methods adds to clinical syndromes of nutritional disorders, but brings similar definitional issues.

NSA

First Australian Academy of Science Nutrition Award Oration for 2004

Protein and amino acids: from building blocks to food and health

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Nutrition is an integrative science that brings together many aspects of agriculture, biochemistry, physiology and medicine. In the latter half of the 20th century there has been significant advances in our understanding of the nutrition of all domestic animal species and man; often through comparative studies. This has been particularly true of farm animals, namely poultry, pigs and ruminants, both cattle and sheep. Space and time have necessarily restricted the following review to amino acid and protein nutrition: it seems appropriate to discuss protein at this meeting as this macro-nutrient has been largely forgotten in the fierce debates that have raged over fats and carbohydrates during the last 20 years.

Feed accounts for about 60% of the costs of animal production and this fact has justified the quest for efficiency in the use of feed resources. Protein and energy supply contribute 90% of feed costs and much research effort has been aimed at defining the requirements of animals for these nutrients and the corresponding nutrient attributes of feedstuffs. This has largely been achieved empirically in monogastric species but in ruminants, microbial fermentation in the rumen effectively transforms the nutrition of this species. The extensive fermentation of carbohydrate and protein in the rumen clearly established that the rational assessment of the nutritional needs of ruminants can only be made if the quantity of individual nutrients that are available to the animal post ruminally can be quantified. Isotope dilution techniques linked to arteriovenous difference measurements and blood flow data, have made important contributions to knowledge of cellular metabolism and quantitative nutrition of ruminants.

Protein and amino acid requirements of monogastrics have been defined for different physiological states and attempts to balance nutrient intake with nutrient requirements have centred around detailed studies of the nutritional attributes of feed ingredients. There has been considerable effort recently to develop systems that allow compilation of the available nutrients, especially available amino acids within feedstuffs. Digestibility values of amino acids in the ileum are used widely as an estimate of availability. Various techniques to quantify the endogenous loss of amino acids during digestion and absorption have been developed and evaluated in an attempt to quantify this important aspect of protein metabolism. Strategies to reduce endogenous losses have been developed. Peptide metabolism in, and uptake from the gut is a significant aspect of intestinal amino acid utilisation. Studies in ruminants have quantified amino acid flows to defined tissues, especially muscle and the mammary gland and the uptake and utilisation of these nutrients by these organs. In addition, studies within the rumen have clearly elucidated the interactions of microbes with dietary feed sources and the production of microbial protein. Delineation of the production, absorption and utilisation of volatile fatty acids has largely come from studies in ruminant animals.

The concept of a nutrient requirement which is pertinent only to a unique situation and is essentially a single point on a dose response curve is largely outdated. It is of far greater value to define the entire curve and thus have nutrient responses to different intakes and circumstances. The partitioning of amino acids between different tissues and organs, the effects of different physiological states, stress, disease and toxicological (mycotoxin) insults requires better definition in relation to the efficient use of dietary protein. Greater understanding will increase rates of protein deposition (growth and egg production) and secretion (lactation) in animal products and facilitate the development of functional foods of animal origin.

In parallel with the rapid progress of nutrition over the last 50 years, there have been great developments in the area of genetics and molecular biology. The advancement of nutritional science and its application to human and animal nutrition will rely increasingly on molecular technologies. The application of genomic technology to nutrition (nutrigenomics) will allow the identification of modified gene expression in response to nutrients to be established for thousands of mammalian genes. This will enable the development of a much stronger theoretical and molecular bases for nutrient responses. However, in the post-genomic era, functional genomics will need to be coupled with techniques that allow integration with whole-body metabolism will enable the prediction of phenotypic outputs of metabolic pathways and the implications of amino acid fluxes on metabolism and nutrition.

Molecular biology is likely to fuel major advances in our understanding of nutritional science. This knowledge and the development of efficient technologies for producing food conveys an optimism that a quality food supply will be sustained for an ever increasing human population in the 21st century.

NSA

Molecular Biology for the Novice – A Workshop for Nutritionists

Genomic strategies in the study of nutrition

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Background – The rapid development of high throughput analytical tools and freely available genomic databases promises to transform every field of biology, including studies of nutrition. What, however, is the reality behind the hype?

Objective – I will describe the technologies that are currently available for genomic analysis and mention the benefits and limitations of each. Because nutritional studies will pose unique challenges, I will refer to limitations of the techniques as they apply to studies of nutrition.

Design – I will specifically refer to the application of genomics to toxicology and pharmacology as a model for similar nutritional studies. The nature of the questions to be addressed in toxicogenomics and pharmacogenomics are similar to those of nutrigenomics, but the comparative simplicity of the questions to be asked and the robustness of responses to be measured reduce the challenge immensely.

Outcomes – Research strategies to be discussed will include genome wide expression profiling of genes and proteins as well as profiling of metabolites. Also to be discussed will be the complementary techniques of genetic mapping of metabolic disorders, gene knockout/suppression and transgenesis.

Conclusions – The primary difficulty of the application of genomics to the study of nutrition will be to associate specific components in the complex milieu of the diet to complex changes in gene expression across the genome and relate this to chronic phenotypic changes in an individual. The challenges are not to be underestimated, but the real promise of genomics is to provide a framework for the seamless integration of cognate fields. Thus, by embracing the tools of genomics, the field of nutrition will benefit more directly from the insights of related fields.

*NSA***The New Nutrition: Molecular Nutrition and Nutriomics****The regulatory architecture of the human genome**

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The draft human genome sequence has provided the first detailed view of the landscape of human genetic programming, with the emphasis to date being on identifying protein-coding genes and determining their biochemical and biological function. However, complex dynamical objects cannot be described just in terms of their components, but must rather be addressed in terms of their integrated function, which includes both the assembly and control of the system. It is these (largely hidden) ontological, physiological and metabolic networks that ultimately determine the emergent effects of variation in endogenous genetic programming and its intersection with environmental variables, including nutrition.

Such considerations have motivated the first tentative steps to describe complex cellular and organismal phenomena, including metabolic networks and protein interaction networks, in terms of “scale-free” networks, a concept derived from the connection characteristics of modern electronic networks. However, analysis of integrated systems suggests that regulatory networks which control function are in fact “accelerating” networks, i.e., that regulation must scale non-linearly (usually quadratically) with function. This has been confirmed by analysis of regulatory genes in prokaryotes, which scale quadratically with genome size, the observed upper limit of which (~12Mb) correlates with the extrapolated point at which new regulators are predicted to exceed new functional genes, suggesting that protein-based regulatory systems have reached their limit in these organisms.¹

The current orthodoxy holds that genes are generally synonymous with proteins, and therefore that proteins not only fulfil the structural and functional roles within cells, but are also the main agents by which cellular dynamics are controlled, in conjunction with cis-regulatory elements and environmental signals. This is true in prokaryotes, whose genomes are very largely comprised of contiguous protein coding sequences. It is assumed that this is also true in multicellular organisms, despite the fact the proportion of protein-coding sequences declines as a function of complexity and is only a small minority of the genomic programming of complex organisms like mammals. This assumption has led to several logical extensions and subsidiary assumptions, in particular that the increased complexity of eukaryotes is explained by the combination of regulatory factors intersecting with more complex promoters, with the corollary that the majority of non-protein-coding sequences in eukaryotic genomes are either cis-regulatory elements or evolutionary debris (i.e. junk).¹

This may not be correct. Around 98% of the transcriptional output of the human genome is non-protein-coding RNA (derived from introns of protein-coding genes and from non-protein-coding genes, of which increasing numbers are being discovered), and at least half of the human genome is transcribed.^{1,2} Therefore either the human genome is replete with useless transcription, or these RNAs are fulfilling some unexpected function. In addition it is becoming evident that a significant proportion of the noncoding regions of the human genome is under evolutionary constraint, some of it much more highly conserved than proteins.³ Such observations and the increasing number of complex genetic phenomena being shown to be directed by regulatory RNAs, suggests that the complex organisms may have evolved a more advanced genetic operating system, which occupies the majority of our genome sequence, and in which ncRNA signals constitute a highly parallel network of digital, feed-forward regulatory signals that control differentiation and development.^{1,2} Variation in this regulatory architecture may be equally if not more important than variation in the (protein) components in determining the differences between individuals and species, including quantitative trait variation, sensitivity to environmental parameters and susceptibility to disease.

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NSA

The New Nutrition: Molecular Nutrition and Nutrionomics

Genome health nutrigenomics: nutrition and the science of optimal genome maintenance

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The link between genome instability and adverse health outcomes during the various stages of life, such as infertility, foetal development, cancer and neurodegenerative disease is compelling.¹⁻⁴ This will be reviewed against a background of evidence indicating that genome instability, in the absence of overt exposure of genotoxins, is itself a sensitive marker of nutritional deficiency.¹⁻⁴ The latter will be illustrated with cross-sectional and dietary intervention data obtained using the micronucleus assay, an efficient biomarker for diagnosing genome instability (chromosome breakage, chromosome rearrangement, gene amplification and aneuploidy) and nutritional deficiency.^{1,2,5} The concept of recommended dietary allowances for genome stability and how this could be achieved will be discussed together with the emerging field of nutritional genomics for genome stability.^{2,3} With regards to the latter we have shown that the MTHFR C677T polymorphism and riboflavin (the cofactor for MTHFR) have a significant effect on genome instability, however, the effect is relatively small when compared to folic acid.⁵ In addition this study has shown that excess riboflavin enhances the genome damaging effect of folic acid deficiency indicating the importance of nutrient-nutrient as well as gene-nutrient interaction. It is evident from initial studies that optimal concentration of micronutrients for prevention of genome and epigenome (i.e. CpG methylation in DNA) damage is dependent on genetic polymorphisms that alter function of genes involved directly or indirectly in DNA metabolism and repair.^{2,4} The lecture concludes with a vision for an alternative disease prevention strategy based on the diagnosis and nutritional treatment of genome instability depending on an individual's genetic background i.e. Genome Health Clinics.²

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NSA

The New Nutrition: Molecular Nutrition and Nutrionics

The interaction of genes and food regarding cardiovascular risk

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Lifestyle modification is the cornerstone for the primary prevention of cardiovascular disease. Dietary modifications are an integral part of such lifestyle modifications. Reduced intake of total fat is associated with reduced risk of cardiovascular disease. There is also compelling evidence that the fatty acid composition of foods also significantly influences cardiovascular risk. Based on this knowledge, we prescribe diets to reduce cardiovascular risk. In general, the same dietary recommendations are given to a wide variety of individuals. However, while we are able to make reasonable estimates of the effects of these dietary modifications for groups of individuals, the individual response is variable. This adds a further layer of complexity to the issue of optimal dietary therapy for heart disease reduction. Polymorphisms at various genetic loci that encode proteins involved in lipoprotein metabolism have shown gene-nutrient interactions in relation to the determination of plasma lipid profiles. For example, the -514C>T polymorphism at the *LIPC* locus interacts with dietary fat and plasma lipids. The TT genotype appears to identify a subset of the population who are prone to develop hypertriglyceridemia and low HDL-cholesterol in the setting of a high fat diet. These individuals with the TT genotype may benefit most from a low fat diet. On the other hand, for those with the CC and CT genotypes, a high fat diet may result in a less atherogenic lipid profile. The S447X polymorphism at the *LPL* locus interacts with both cigarette smoking and alcohol consumption in relation to HDL-cholesterol concentration. In terms of raising HDL-cholesterol, Homozygotes for the S447 allele may benefit more from smoking cessation and less from increasing alcohol intake. These observations may provide the first steps in our ability to personalize dietary therapy to maximize the risk reduction achievable.

NSA

Food, the Environment and Health, Ecnutrition, Paleolithic Nutrition

Paleolithic nutrition: what can we learn from the past?

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Background - Anthropologists and some nutritionists have long recognised that the diets of Paleolithic and recent hunter-gatherers (HG) may represent a reference standard for modern human nutrition and a model for defense against certain western lifestyle diseases.

Boyd Eaton of Emory University (Atlanta) has spent over 20 years reconstructing prehistoric diets from anthropological evidence and observations of surviving HG societies, put this succinctly: "We are the heirs of inherited characteristics accrued over millions of years, the vast majority of our biochemistry and physiology are tuned to life conditions that existed prior to the advent of agriculture some 10,000 years ago. Genetically our bodies are virtually the same as they were at the end of paleolithic some 20,000 years ago. The appearance of agriculture and domestication of animals some 10,000 years ago and the Industrial Revolution some 200 years ago introduced new dietary pressures for which no adaptation has been possible in such a short time span. Thus an inevitable discordance exists between our dietary intake and that which our genes are suited to". This discordance hypothesis postulated by Eaton, could explain many of the chronic "diseases of civilisation".¹ But what did hunter-gatherer populations actually eat?

Review - The lines of investigation used by anthropologists to deduce the evolutionary diet of hominids include the study of: (i) changes in cranio-dental features¹, (ii) isotopic chemical tracer methods, including carbon isotope (13C/12C), strontium isotope (87Sr/86Sr) and trace element Sr/Ca ratios in enamel and bone of fossils², (iii) comparative gut morphology of modern humans and other mammals³, (iv) the energetic requirements of a developing a large brain:body size ratio⁴, (v) optimal foraging theory and food selection⁵, (vi) the study of dietary patterns of surviving hunter-gatherer societies.⁶

Findings show clear cranio-dental changes including, a decrease in molar teeth size, jaws/skull became more gracile and front teeth became well-butressed, all indicative of less emphasis on grinding course foliage and more on biting and tearing.¹ Carbon isotope studies indicate the dietary intake of C4 grasses, undoubtedly in the form of herbivorous animals, at a level which increased substantially during the progression of our genus from *A. aferensis* to *H. sapiens*. Even as far back as 3.5 million years, the Sr/Ca ratio falls in between those typical for herbivores and carnivores.² Gut morphology studies indicate a closer structural analogy with carnivores than the folivorous or frugivorous mammals.³ Energetic requirements of a relatively enlarged brain have been balanced by reduction in size and energy requirement of the digestive system, a phenomena requiring a high quality diet.⁴ Investigation of food procurement habits of hunter-gatherer societies indicates the advantage of hunting of game animals compared with plant foraging in terms of energy gain versus expenditure.⁵ Study of macronutrient energy proportions in the diet of HG societies (n=229) show a relatively high protein intake 19-35%, highly variable fat intake 28-47% and low carbohydrate level 22-40%.⁶

Conclusions - It is postulated that changes in food staples and food processing procedures introduced during the Neolithic and Industrial era have fundamentally altered seven crucial nutritional characteristics of our ancestral diet: (i) glycaemic load, (ii) fatty acid balance, (iii) macronutrient balance, (iv) trace nutrient density, (v) acid-base balance, (vi) sodium-potassium balance, (vii) fiber content.⁷

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NSA

Food, the Environment and Health, Ecnutrition, Paleolithic Nutrition

“The Mediterranean-style diet” - is it ideal for the modern world?

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The Mediterranean diet is a non-strict vegetarian diet rich in oleic acid, omega-3 fatty acids, fibre, B-group vitamins and various antioxidants but low in saturated and polyunsaturated fats. Observational and randomized interventional studies have shown that this diet is associated with a low risk of coronary heart disease (CHD) and scientists now agree that the Mediterranean-style diet should be the preferred dietary program in the prevention of CHD.

The definition of the Mediterranean-style diet varies according to the nationality of the authors and to the particular Mediterranean area that is considered. For instance, the Greek version of the Mediterranean diet is dominated by the consumption of olive oil and by a high consumption of vegetables and fruits. Since antioxidants are common in these foods, an antioxidant action may provide a plausible explanation for the apparent benefits of that diet. According to another version, however, the Mediterranean diet is a non-strict vegetarian diet rich in oleic acid, omega-3 fatty acids, fibres, vitamins of the B group and various antioxidants but low in saturated and polyunsaturated fat. With that wider definition, the expected benefits for the prevention of cardiovascular diseases go far beyond an antioxidant effect and include lipid and blood pressure lowering effects, anti-inflammatory effects, the prevention of arterial plaque rupture and thrombosis, as well as protection against malignant ventricular arrhythmias and heart failure.

NSA

Food, the Environment and Health, Ecnutrition, Paleolithic Nutrition

Environmental change and food production: consequences for human nutrition and health

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The debate about supplies of land, food, energy and water in relation to human needs is longstanding. Thomas Malthus is often viewed as having first noted, at the end of the eighteenth century, the mismatch between geometric population growth and arithmetic food production growth. In fact, the debate in general, and that particular observation, go back much further in time – as was pointed out in the 1970s by the pioneering Australian demographer, WD Borrie.

A more contemporary concern has to do with the worldwide degradation of arable land and depletion of fresh water supplies, as part of the constellation of “global environmental changes” that now endanger the stability and productivity of the biosphere. In addition to the manifest problems of erosion, salinisation and desertification, there are emerging concerns about ecosystem disruptions due to biodiversity losses, about the impact of a change in global climate, and about the latitude-dependent increase in exposure to ultraviolet radiation because of stratospheric ozone depletion. Importantly, various of these environmental changes will interact with one another, thereby amplifying the net impact on food yields.

Much of this is a familiar story: one that has afflicted local populations and regional civilizations, over the past 5,000 years or so. Indeed, the Canadian ecologist William Rees argues that, historically, the most rich and powerful societies have been the most likely to squander and destroy their environmental asset base. The distinctive feature today is that, first, this weakening of agroecosystem infrastructure is happening on a worldwide basis, and, second, there are several genuinely new human-induced “global” environmental changes of a kind not previously experienced by humankind – climate change, stratospheric ozone depletion and disruption of the nitrogen cycle being prime examples.

Biodiversity underpins the resilience of the ecosystems on which we depend. Human-induced biodiversity loss is now occurring at an unprecedented rate (faster than in the great prehistorical extinction events), driven by over-exploitation of productive ecosystems, land-use changes, climate change, trans-boundary migration of pollutants and hazardous substances, exotic species and biotechnology. Loss of biodiversity threatens vital ecosystem services, including yields of food, fuel and fibre, cleansed fresh water, nutrient cycling, flood protection, and climate stability.

Despite the great importance of ecosystem services for human health, links between biodiversity loss, nutrient status and human health are difficult to demonstrate epidemiologically. This is partly because biodiversity loss affects health via complex, indirect pathways. Further, local social-economic conditions can modulate, or defer, the nutritional effects of ecosystem disruption.

On the empirical front, international time series data for the past several decades shows that there has been an unusual, sustained, decline in per capita yields of cereal grain over the past six years. There are several contributory explanations, but it is increasingly likely that part of the problem is the decline in harvest yields from damaged or abandoned arable land.

ICCN

Nutrition and Economics

Nutrition and Health in Economic Development

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The interrelationship of health and sustainable development will be discussed in three ways:

- (i) historical evidence that improved health is a precondition for the generation of wealth-spreading growth; (ii) the role of health and nutrition improvement in raising global cognitive performance compatible with knowledge-led globalization; and
(iii) the investment priorities for reducing global poverty, as measured by the millennium development goals for hunger and health.

Food, Aged Care and Regional Economics

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The hallmark demographic feature of the late twentieth century is extended life expectancy. Life expectancy in many countries around the world increased by as much as one in every three years between the 1960s and the 1990s. By 2030, the proportion of people aged 65 years and older in OECD member countries will have almost doubled. The rate of growth in the proportion of older people will be particularly marked for those aged 80 years and more.

The rapid increase in life expectancy since the 1960s has focused the attention of both individuals and governments on the consequences of living longer. For individuals, improved life expectancy is not simply a matter of longevity, but also quality of life. For governments, a key consideration in public policy is the diminished size of the workforce relative to those on social security or retired. Shrinking tax bases in ageing societies mean reduced economic capacity to respond to the public health, housing and transport needs of older persons. Reduced family size and functionality require governments and communities to provide substitute care giving services and facilities, especially to the rising number of dependent, disabled and frail older persons.

A proactive rather than reactive stance to meeting the needs of an ageing society is required. Indeed, trends that may have been perceived as threats to a national economy can be described as opportunities for regional economies. The particular opportunities regional communities can provide older persons seeking to enhance their wellness and quality of life need to be recognized. These include opportunities to participate in a meaningful way in the local economy, to develop healthy food habits, to maintain regular physical activity, to increase mobility and to be housed securely, but less expensively. Food and the food industry have an integral role to play in this scenario.

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Asia Pacific Clinical Nutrition Society Award Lectures for 2003

Nutritional dilemmas for long-term health

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Introduction - The life-span commences at conception and includes fetal life, infancy, childhood, adolescence and stages of adulthood (young, middle, older age). *Long-term health* implies adequate function and lack of debilitating illness through each of the phases.

Evolution of Diet and of Health - As primates, humans are omnivores, and traditional hunter-gatherers included all manner of edible flora and fauna in their diet, aided by the invention of fire to make dietary use of animal flesh and starchy tubers with equal efficiency. Paleo-anthropologists concur that traditional man was free of degenerative illness; but lifespans were short due to infections, childbirth, inter- and intra-clan conflict and predation. With more "stable and secure" systems of food provision such as pastoralist or agrarian forms, dietary options have become progressively narrower while longevity has extended greatly.

Protection from or Promotion of Disability and Disease by Diet - The modern context of long-term health has to consider longevity through 8 decades or more. The consequences of excess weight and insulin resistance for glucose tolerance, vascular patency, arterial pressure, and lipid metabolism (metabolic syndrome) and of altered control of cellular proliferation and immune vigilance (neoplasia), as well as senescent changes in ocular, osseous and muscular tissues, are increasingly incident with advancing age. Practices that optimize performance and suppress pathogenesis in one decade or phase of life may compromise health in subsequent years. Certain patterns of consumption are epidemiologically associated with lower cumulative risks of the aforementioned maladies.

The Limits of Nutrients and Diet - If dietary pattern can be *influential* in protection or aggravation in health matters, they are rarely *determinant* for protection without considerations of physical activity and exercise, environmental exposure and genetic constitution. Application of nutrients in doses higher than occur in human dietaries and in isolated (pure) forms, have limited potential. High-dose vitamin E and calcium do show promise against CVD and colorectal cancer, respectively. Folic acid prevents initiation of colonic dysplasia, but accelerates progression of already dysplastic cells. Beta-carotene has proven neutral regarding colonic adenoma recurrence and noxious for lung cancer.

Stabilizing the Genes and the Genome - Since unrepaired DNA damage is a mechanism for cell mutation and genesis of neoplasia, application of nutrients that "stabilize" the genes have been advocated, such as methylation saturation by folic acid or chromatin stability with high-dose zinc. Since human evolution (natural selection) is a process of "taking advantage of" favorable mutations, what protects the *individual* in a lifetime may be detrimental to the *species* over an evolutionary span.

Policy Questions: Individualization or Collectivization of the Prevention Effort? - Illness and incapacity incur suffering for the individual, and impose social and economic costs on the society. With increasing understanding of diet and lifestyle measures for prevention, and with genomic research revealing gene-lifestyle interactions, the policy dilemma becomes the tension between individualized solutions (based on genetic prescription) or collective redress (based on collective action in lifestyle education and commercial and environmental regulation).

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Asia Pacific Clinical Nutrition Society Award Lectures for 2004

Dietary fat quality: a nutritional epidemiologist's view

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Introduction - Fat intake worldwide has increased substantially, with East and South-East Asia and China among the foremost, having doubled and tripled intake (g/capita/day) respectively in the past three decades. The major dietary source of energy in developing countries is vegetable oils, but their intake of animal fat is increasing, from 8% of total calories in the 1960s to 13% in the 1990s.

Dietary fat quality - The implications of dietary fat in the etiology of chronic diseases, including cardiovascular disease, some types of cancer, type II diabetes, obesity, osteoporosis, osteoarthritis and other inflammatory disorders, have been extensively studied. While debate ensues on whether dietary fat is the primary determinant of excess body fat, the evidence is compelling for the greater importance of types of fat, rather than total amount of fat, as risk of chronic disease.

Total fat, saturated fat - Between-population ecologic studies have demonstrated an association between intake of fat, specifically saturated fat and total cholesterol and coronary heart disease (CHD) mortality. However, results are inconsistent from within-population cohort studies. Likewise, the association between intake of total fat and saturated fat and with risk for stroke remains elusive. The paradox of high stroke risk with low CHD risk among East Asian countries is increasingly attenuated by lifestyle changes including higher intake of animal fat and protein. As for the hypothesis that dietary fat is a key cancer risk, particularly with cancers of the colon, breast and prostate in western countries, case-control and prospective cohort studies have produced mixed results. The pooled analysis of several large prospective studies reported weak or no associations between fat intake and cancer. Probably fat intake in combination with other concomitant dietary factors, as well as other confounding factors (e.g. insulin resistance, method of food preparation) may enhance carcinogenesis.

Saturated fatty acids (SFA) - In metabolic studies different classes of saturated fatty acids (SFA) have different effects on plasma lipid and lipoprotein levels. Specifically, SFA with 12-16 carbon atoms tend to increase plasma total and LDL-cholesterol levels, whereas stearic acid does not have a cholesterol-raising effect, but may lower HDL-cholesterol especially in women, and increase Lp(a) concentration. Among the cholesterol-raising SFA, myristic acid appears to be more potent than lauric acid or palmitic acid, but the data are not entirely consistent.

Monounsaturated fatty acids (MUFA) - Ecological studies indicate an inverse association between intake of MUFA and CHD mortality. Prospective cohort studies that adjusted for intake of saturated and trans fatty acids have found a similar finding. Oleic acid exerts significant beneficial effects on atherosclerosis and thrombosis. Relatively low CHD mortality rates in southern Europe is attributed to the traditional Mediterranean diet that is characterized by, inter alia, high dietary ratio of MUFA/saturated fat.

Polyunsaturated fatty acids (PUFA) - The North American diet is typically high in linoleic acid (n-6) (LA), which has been promoted for its cholesterol-lowering effect. It is now recognized however, that dietary LA favours oxidative modification of LDL cholesterol, increases platelet response to aggregation, and suppresses the immune system. In contrast, alpha linolenic acid (n-3) (ALA) has been found in several studies to exert positive effects in reducing CHD mortality risk. The major effect of n-3 PUFA appears to be anti-arrhythmic rather than anti-atherothrombotic. The emphasis is on the dietary ratio of LA to ALA, rather than the absolute amounts of ALA, that is critical for disease prevention, due to the competition between these two essential PUFAs for their entry into the elongation and desaturation pathways leading to the synthesis of their respective eicosanoids. Increasingly, attention is focused on the long-chain n-3 PUFAs in nonhydrogenated fish oils, particularly eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Studies that have demonstrated the protective effects of fatty fish intake against myocardial infarction outnumbered those that did not. Evidence of an inverted association between fatty fish intake and cancer risk tend to be confined to countries with high fish intake.

Concluding remarks - The main focus of national recommendations on dietary fats is on reduced intake of saturated fat and *trans* fatty acids, and balanced intake of n-6/n-3 essential fatty acids. Importance should also be accorded to the consumption of fat from a variety of sources, both plant and animal. Just as the consumption of a variety of foods is more likely to provide essential nutrients and other biologically beneficial components, the consumption of fat from various foods including fish, nuts, seeds, plant oils and fruits should be encouraged. These and other dietary guidelines, combined with regular physical activity, moderate alcohol consumption and abstinence from smoking, remain the underpinnings of a healthy lifestyle.

*NSNZ: Muriel Bell Memorial Lecture***Strategies for preventing micronutrient deficiencies in developing countries**

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Until recently, strategies for preventing micronutrient deficiencies have focussed on single micronutrients, principally iodine, iron, and vitamin A. The importance of concurrent micronutrient deficiencies in developing countries (DCs) is now recognized, their existence prompted by the often disappointing responses with single micronutrient supplementation programs. Latent deficiencies of other micronutrients can suppress the effect of a single micronutrient, when it is not the first limiting nutrient. The etiology of these multiple micronutrient deficiencies is multifactorial. Inadequate intakes and/or poor bioavailability, induced by predominately plant-based diets and low intakes of animal source foods, are major factors, although non-nutritional factors such as parasitic infections, genetic hemoglobinopathies, malaria, and infectious diseases, play a role. Co-existing micronutrient deficiencies result in impairments in growth, immune, and cognitive function, poor reproductive outcome, and increased morbidity and mortality. Clearly major health benefits could be achieved by choosing appropriate and cost-effective strategies that successfully alleviate concurrent micronutrient deficiencies in developing countries.

Approaches include supplementation to those 'at risk', and food-based strategies involving fortification and dietary diversification/modification with minimal risk of antagonistic micronutrient interactions. Of these, multi-micronutrient fortification of centrally processed staple foods or condiments is now feasible, but inappropriate in subsistence settings. Instead, for the latter, more sustainable approaches involve biofortification of plant-based staples, and promotion of small-livestock production, aquaculture, and consumption of animal source foods. In addition, household dietary strategies involving changes in food preparation and processing can be used to alter the content of micronutrient absorption modifiers in plant-based diets. Practical methods involve consumption of absorption enhancers, and use of germination, fermentation, and soaking to reduce the phytate content of cereal flours by enzyme-induced hydrolysis of phytate and/or passive diffusion of water soluble phytate.

We have applied these dietary strategies among subsistence households in rural Malawi, and evaluated their impact on the dietary adequacy of weanlings and young children through knowledge and practices and interactive 24-h recalls, using a quasi-experimental design. In both groups, intervention diets were of higher dietary quality than controls, supplying significantly more animal source foods, especially soft-boned fish, but less phytic acid. Median intakes of energy, protein, calcium, available zinc, available iron (only for weanlings) were greater, and phytate:zinc molar ratios were lower in intervention compared to controls. In the children, intervention enhanced Z-scores for mid-upper-arm circumference and arm muscle area, but had no impact on weight or height gain. After controlling for baseline variables, mean hemoglobin was higher post-intervention, whereas incidence of anemia and common infections was lower in intervention compared to controls. To enhance effectiveness and sustainability, all micronutrient strategies should be integrated with ongoing national food, nutrition, and health education programs, and implemented using education and social-marketing techniques.

NSA

Food, Pro and Prebiotics: Effects Beyond the Gut

Intestinal microflora: negotiating health outcomes with the warring community within us

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Digestion of food and absorption of nutrients constitutes the primary role of the gastrointestinal tract (GIT) of mammals. An extremely large surface area created by the complex involution of crypts and villi, and lined with epithelial cells has evolved to facilitate these functions. Some of the 400 species of micro-organisms in the GIT that are adherent, have exploited and adapted to particular microniches in different compartments of this vast intestinal real estate while the rest abound as free living entities sequestered in mucus or complexed with digesta in the lumen. Whether localised or in transit, these bacteria are continuously competing for survival¹. The ability to persist and propagate or be ultimately eliminated, is dependent to a large extent upon the armoury of each combatant. Susceptibility or immunity of each strain to the arsenal of bacteriocins or quorum sensing factors produced by another constitutes a community at war.

While only a thin layer of epithelial cells known as enterocytes separates the host from the warring factions, they must form an effective barrier against incursions and introgressions by intestinal microflora. Erosion of this barrier integrity by stress, inflammation or disease would lead to translocation of bacteria into the blood stream. If pathogenic, the host would die from septicaemia unless the micro-organisms are eliminated by the immune system. For this reason, the bulk of cells aligned behind the layer of intestinal epithelial cells are immune cells that include lymphocytes, monocytes, macrophages, polymorphonuclear leukocytes and dendritic cells.² These immune cells form a nexus of innate and acquired immune capability that constitutes a formidable barrier against intending or inadvertent translocators.

Immune responses are not initiated only when barrier integrity is compromised. TOLL receptors on the luminal surface of basolateral enterocytes can signal the presence of "dangerous" or pathogenic microbes and therefore arm the immune system. Alternatively, danger signals including soluble molecules that transgress enterocytes despite a tight barrier junction, can be detected by TOLL receptors on macrophages and dendritic cells. Signalling provides the main pathway of immune activation when the barrier integrity is intact and is the main mechanism for countering a suppressed or tolerized default intestinal immune response. Suppression of immune responsiveness is mandated in the GIT to prevent undesirable responses against dietary antigens that can lead to allergic disorders like food intolerance.³ The GIT has evolved its own hazard analysis and critical control points (HACCP) to balance reactivity with tolerance and this balance can be manipulated by diet, using nutraceutical supplements. Indeed, nutritional strategies can be used to derive health outcomes by manipulating warfare between bacteria and bacteria, as well as preparing defence of the host against intruders.

A mouse model of inflammatory bowel disease initiated by the enterocyte denuding agent dextran sodium sulphate (DSS) was used to explore the intimate tripartite relationship between the host, intestinal bacteria and diet. In this model, DSS reproducibly initiates an inflammatory response in the colon. It is believed that barrier integrity, once compromised by DSS, facilitates an inflammatory response against harmful enteric bacteria populations. Use of antibiotics that target these bacteria significantly reduces the severity of inflammatory pathology. Following the same principle, modulation of the good-bad bacteria balance by administration of probiotic bacteria^{4,5} also significantly reduced the inflammatory response associated with DSS treatment. Another example of dietary manipulation of gut microflora was provided by a series of studies designed to examine the benefits of low glycemic index diets normally recommended for diabetics. In these studies, rats fed a LGI starch supplement for 10 weeks, developed colon pathology associated with an increase in haemolytic bacteria. These animals were also immunologically less responsive than controls not fed the supplement. Shifts in the population dynamics of enteric bacteria can also be modulated by supplements containing decoctions of various mushroom or herbal extracts. Some of these supplements possessed statin-like properties and were capable of changing recipient responses to immunological challenge.

With the advent of sensitive molecular tools such as PCR (Polymerase Chain Reaction) and t-RFLP (terminal-Restriction Fragment Length Polymorphism), both cultivable and non-culturable bacteria populations can be analysed. At the same time, the development of microarrays including PAM (Patterned Antibody Microarrays), will permit accurate dissection of the immune response to dietary change or supplementation. Armed with these tools, it

is now timely to critically re-address the role of diets and dietary supplements in generating desirable health outcomes that are no longer delimited by our perception of the foods we ingest as simply being nutritional.^{3,6}

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My fellow collaborators Drs. B. Boa, D. Volker and G. Denyer and graduate students – J. Patterson, K. Wu, V. Gardos and A. Chandrasekara, must be acknowledged for their zestful spirit in participating in this new adventure into diet, gut bacteria and the immune response.

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Food, Pro and Prebiotics: Effects Beyond the Gut

Food inflammation and the anti-inflammatory aspects of food

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Food can have pro-inflammatory and anti-inflammatory effects. Pro-inflammatory effects can result from irritants and immunoreactive substances. These factors tend to have their effects, within the gut, which can be avoided by specific dietary exclusion. With regard to anti-inflammatory effects of diet away from the gut, altering the balance of dietary polyunsaturated fatty acids (PUFA) in favour of *n*-3 PUFA provides the best documented examples of effective dietary intervention. PUFA are essential macronutrients. There are two non-interchangeable classes of dietary PUFA, *n*-6 and *n*-3. These fatty acids are metabolized to mediators that regulate cardiovascular homeostasis and inflammation. *n*-6 rich diets tend to be pro-inflammatory. Diets rich in *n*-3 PUFA, by comparison, are anti-inflammatory. The difference is explained by the action of *n*-3 PUFA as competitive inhibitors of enzymes that metabolize *n*-6 fats and by the lesser biological activities of some *n*-3 mediators, compared with their *n*-6 counterparts. Dietary enrichment of *n*-3 PUFA has been used with benefit in the treatment of inflammatory diseases of joints, kidney, gut and skin. Long-term studies in rheumatoid arthritis show that this approach, in conjunction with pharmacotherapy, can be sustained in the long term (>5 years). A potential collateral benefit of this approach is reduced risk for adverse cardiovascular events. Long chain *n*-3 PUFA found in fish and fish oil appear to be more potent as anti-inflammatory agents than shorter chain *n*-3 PUFA found in some vegetable oils. The latter can be useful as part of a broader dietary prescription and may have preventive effects.

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Food, Pro and Prebiotics: Effects Beyond the Gut

Effect of diet on *E. coli* populations in the faeces of cattle

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Background - A study on enterohaemorrhagic *Escherichia coli* (EHEC) contamination of beef carcasses at slaughter concluded that faecal and carcass levels of EHEC are positively correlated and that there was a role for control of EHEC in live cattle.¹ In this current study we examined the effect of dietary inclusion of molasses (simple sugars), grain (starch) and roughage (structural carbohydrate) on the shedding of *E. coli* in cattle faeces. Enterohaemorrhagic *E. coli* (EHEC) virulence factors [shiga toxin genes, *stx*₁ and *stx*₂; accessory virulence factors, intimin (*eaeA*) and plasmid-encoded enterohemolysin (*hlyA*)] in cattle faeces were also investigated.

Objective - To determine firstly, whether roughage and/or molasses based diets reduce the population of *E. coli* and EHEC virulence factors compared with grain based feedlot diets, and secondly, if commercial lairage management practices promote or diminish these responses.

Design - Thirty Brahman cross steers (mean LW \pm sem) 329 \pm 3.2kg, were initially fed a high grain (80%) diet. The cattle were then allocated into 3 groups of 10 animals and fed *ad libitum* (a) 50% molasses, 28% Rhodes grass (*Chloris gayana*) hay, 15.0% whole cotton seed, 4.5% cotton seed meal, 1.5% urea and 1% mineral/vitamin premix (M+R); (b) 80% sorghum, 5% peanut shells, 5.5% cotton seed meal (G); and (c) Rhodes grass plus 20g urea/kg DM (R). A fresh faecal sample (100g) was collected from each animal on the baseline grain diet, on 2 separate days during the final week of each dietary treatment (PL), and just prior to slaughter at lairage (L). A multiplex PCR method was used to quantify the virulence genes *stx*₁ and *stx*₂, *eaeA* and *hlyA* in faeces.²

Outcomes - Prior to lairage, faecal *E. coli* numbers were two logs lower (8.1 vs 5.6 log₁₀/g digesta) in the R and R+M diets compared with G fed animals and this difference increased to 2.5 logs at lairage. Analysis of the concentration of EHEC virulence factors in faeces indicated a marked decrease in *hlyA*, *eaeA* and *stx*₁ genes in the R and R+M diets and this trend remained at lairage. VFA patterns were similar in the roughage and molasses diets whereas increased *E. coli* numbers, decreased pH and enhanced butyrate and lactate fermentation pathways were associated with the grain diet. This would indicate a shift in the microbial population of the hindgut. Cluster analysis of predominant *E. coli* serotypes isolated from faeces from each of the three dietary treatment groups showed that the R and R+M groups were similar, but quite distinctive from populations isolated from grain fed animals.

	Diet			SEM
	R	M+R	G	
Faecal pH	7.4 ^a	7.3 ^a	6.3 ^b	0.04
<i>Volatile fatty acids (mg/ml)</i>				
Total	0.42 ^a	0.89 ^a	3.91 ^b	0.31
Acetate	0.32 ^a	0.69 ^b	1.96 ^c	0.14
Propionate	0.06 ^a	0.13 ^a	0.39 ^b	0.03
Butyrate	0.021 ^a	0.05 ^a	1.43 ^b	0.13
Acetate: Butyrate	15.3 ^a	13.8 ^a	1.4 ^b	1.8
Acetate: Propionate	5.3 ^a	5.3 ^a	5.0 ^a	0.2
Lactic acid (μ g/ml)	21.3 ^a	34.7 ^a	122.7 ^b	9.0

Values in rows that do not have a common superscript letter are significantly different ($P < 0.05$).

Conclusions - This study indicates that the type of dietary carbohydrate has a significant effect on the *E. coli* community structure and therefore may determine the level of pathogenic serotypes. Future work is focussed on developing detection methods for quantification of putative EHEC populations in response to diet. These detection methods will be used to determine whether diets based on R or R+M combinations, which have low fermentable carbohydrate reaching the hindgut, have the potential to reduce EHEC populations.

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Food, Pro and Prebiotics: Effects Beyond the Gut

Efficacy of milk fortified with a probiotic *Bifidobacterium lactis* (DR-10™) and prebiotic galacto-oligosaccharides in prevention of morbidity and on nutritional status

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Background - Diarrhoea is still the major cause of childhood morbidity and mortality; estimated to cause more than 3 million deaths among children globally. Any non-invasive easily administrable intervention that may affect these morbidities would have very important implications for child health and survival. In recent years there has been increasing evidence for the role of probiotics in treatment of diarrhoea. There are very sparse data on prophylactic probiotic therapy and its effects.

Objective - To evaluate the impact of milk fortified with pre- and probiotics in prevention of diarrhoea and on iron status and growth.

Design - The study was conducted in Sangam Vihar, a peri-urban population in south Delhi. Healthy children aged 1- 3 years, permanent residents in the area and without any chronic illnesses or severe malnutrition were invited to participate. After informed consent 634 children were enrolled and randomly allocated to either receive a milk formulation containing *Bifidobacterium lactis* HN019 (DR-10™) minimum of 10⁷-10⁸ CFU/100 g and galacto-oligosaccharides 2.5 g/100 g (PP Milk), or the same milk without these two. The milk was provided in sachets of 32 g and children were advised to consume up to 3 sachets per day for 12 months. A blood sample was taken to measure the detailed haemogram, ZPP and retic count at baseline and end study. Twice weekly home visitations were done to collect data on morbidity and compliance. At baseline, six months and one year anthropometric measurements (weight, height) were made.

Outcomes - Baseline characteristics of subjects in the two groups were comparable. Compliance was above 80%, with most children consuming at least two serves per day. Supplementation with PP milk resulted in a significant reduction in the incidence of dysentery OR 0.78 (95% CI 0.61, 1.00) as well as prevalence of dysentery OR 0.85 (95% CI 0.71, 1.01). Reduction in incidence of diarrhoea was 10%, but was not statistically significant. Consistent with improved immunity PP milk supplementation caused a significant reduction in the prevalence of severe illness days OR 0.84 (95%CI 0.74-0.95, p<0.001), days with fever OR 0.68 (95%CI 0.54-0.84) and prevalence of ear infections OR 0.93 (95%CI 0.87-1.00). Data on haematological parameters indicate a significant increase in the proportion of children with Hb levels above 10 g/L in the PP milk group. There was also a 35 % reduction in the proportion of iron deficient children and a significant reduction in stress of bone marrow as observed by a increase in the proportion of children with normal retic count, in the PP milk group. Children fed PP milk had significantly better growth at six month and one year assessments. After 1 year the children in the PP milk group had significantly better z scores for WAZ (mean diff 0.22, 95%CI 0.02-0.41; p=0.03) and WHZ (mean diff 0.18, p=0.05), and higher weight gain (mean diff: 130g, 95%CI 30-230; p=0.02).

Conclusions - *Bifidobacterium lactis* HN019 (DR-10™) and galacto-oligosaccharide fortified milk resulted in better iron status even when both groups were receiving iso-caloric diets with the same iron content. This effect could be either due to better absorption due to effects on gut flora or more likely secondary to morbidity prevention effects. There was a significant reduction in bloody diarrhoea and a non significant 10% reduction in all diarrhoea. The magnitude of significant reduction in non diarrheal morbidity suggests effects are most likely on both viral and bacterial infections.

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NSA

Food and the Child

“We are what we eat”

GJ Cleghorn

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Good nutrition continues to be the cornerstone for survival, health and appropriate development for current and succeeding generations. Well-nourished children perform better in school, grow into healthy adults and in turn give their children a better start in life.

When considering any aspect of nutrition it should be possible to examine both the macro and micronutrient implications. Over the past few years there has been significant advance made in the provision of macronutrients and hence energy in an attempt to improve infant mortality and reduce protein energy malnutrition. Yet the continued lack of food does still result in significant stunting and wasting in many parts of the world.

During the recent World Summit, both the World Health Organisation and UNICEF, have targeted micro nutrient deficiency, in particular, iodine deficiency, vitamin A deficiency and iron deficiency. They have set international goals to reduce and or eradicate these nutritional deficiencies. Each of these will be discussed in some detail in particular in their respective relationships with subsequent neurological development. Evidence will be shown to relate each of these areas to a common thread, namely, to myelin production and its effect on nerve conduction and subsequent development.

There has also been considerable interest over the past few years in the relationship between perinatal and infant nutrition and subsequent adult disease patterns. Studies by Barker & others have shown that small body size at birth and during infancy are associated with increased rates of coronary heart disease and its major biological risk factors:

- raised blood pressure,
- impaired glucose tolerance and
- abnormalities in lipid metabolism and
- Blood coagulation.

These findings led to the fetal origins hypothesis, which proposes that coronary heart disease originates through fetal adaptations to under nutrition.

NSA

New Nutrition: Novel Foods in Nutrition and Clinical Practice

Epidemiology of food and disease: The Melbourne cohort study

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Proving the links between diet and various cancers is not a trivial task. Studies of nutritional epidemiology face major problems including: how and when to measure diet, dietary measurement error(s), problems with dietary recall, ubiquitous, correlated and limited ranges of dietary exposures, and temporal changes in diet. This explains why after decades of research we still lack good evidence upon which to base dietary interventions designed to reduce cancer risk.

Historically, the majority of diet and cancer studies have been small case-control studies with retrospective exposure assessment. These studies, that are extremely prone to bias and to error, have provided much of the public confusion in regard to diet and cancer.

Many of the problems with studying diet and cancer can be addressed by performing prospective studies, measuring diet well in advance of cancer diagnosis, by measuring diet better, and by choosing the study population to have a wider than average range of dietary intakes. The Melbourne Collaborative Cohort Study (MCCS) that was set up in the early 1990s comprises almost 42,000 Melbourne residents aged 40-69, a third of whom are southern European migrants to Australia. By including people from different ethnic groups we wished to increase the range and heterogeneity of intakes in foods and nutrients of interest; e.g. fatty acids and antioxidants.

Preliminary findings from the MCCS will be described and compared with recent findings from other cohort studies in the US and Europe. In contrast to the widely held belief promoted by case-control studies, a protective effect of vegetables and fruit is not clear.

NSA

New Nutrition: Novel Foods in Nutrition and Clinical Practice

Naturally functional foods – challenges and opportunities

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Whilst it is a truism that all foods are functional, the term ‘functional foods’ has come to be associated with those foods that contain specific ingredients with proven physiological effects. These can be particularly useful in providing fortified common foods such as cereals, bread, dairy products and margarine, both to combat potential vitamin and mineral deficiencies and to help in management of e.g. cholesterol levels, blood pressure etc. This molecule-based approach is also followed by the supplement industry and brings with it the benefit of clarity of communication when specific molecules can be linked to useful outcomes.

On the other hand, it is also well established (particularly from epidemiology) that diets rich in e.g. vegetables, fruits, grains and fish, augmented by lean meat, dairy/soy and certain oils are associated with sustained health benefits. A benefit of this whole food approach is that there is a heritage of successful use in diverse communities around the world. In some cases, there are clear connections between the whole food approach and the specific molecule approach e.g. in oil quantity/quality or complex vs simple carbohydrates. However, in many cases it is difficult to be precise about the molecular origins for whole food benefits, as intervention studies with specific molecules have not shown convincing effects e.g. fruits and vegetables vs vitamin/mineral supplements.

Taking fruits and vegetables as a case in point, it could be argued that the failure to reproduce ‘expected’ benefits via intervention with vitamins/minerals is due to some combination of (a) underestimation of the role of as yet unrecognized health-benefiting molecules and/or (b) the importance of the native cellular structure of plants in providing the matrix from which molecules are released during digestive processing. The science is now in place to tackle these possible causes, utilising post-genomic biology of food raw materials to better define molecular composition (“metabolomics”), and exploiting modern spectroscopic and microscopic methods to define the effect of food structure on molecular release.

In order to provide compelling evidence for cause-and-effect relationships between food composition and health outcomes, much more knowledge is needed on the molecular mechanisms of action, not just of individual molecules in isolation but also of complex mixtures delivered from the often hierarchical structures of food matrices. A ‘holy grail’ vision would be to reduce the response to food intake of specific receptors/cells/tissues/organs in the human body into a manageable number of *in vitro* assays. This is not an impossible goal, but depends on the level of validation that can be achieved for specific *in vitro* assays, and the consequent level of predictability when results are taken forward to clinical and other trials. This proposition has some parallels to the advances achieved over the last decade in the *in vitro* assessment of toxicology, where there has been a concerted drive to replace animal models. There is general agreement that a satisfactory assessment of risk can now be obtained from such cellular and molecular assay systems. Can a similar level of credibility be obtained for *in vitro* assessment of nutritional effects? One point of distinction might be the high level of interaction between cellular processes that are affected by nutritional factors. A second could be the molecular (metabolomic) complexity inherent in natural foods. However, the opportunities of (a) carrying out large numbers of experiments and (b) identifying multiple effects of (mixtures of) food components in cellular and molecular assay formats make the approach a highly attractive one. A particular benefit of addressing the complexity of foods and in-body responses at an *in vitro* level is that it provides a potentially tractable way of tackling nutrition for sustained health and well-being through addressing multiple small effects simultaneously. This is in contrast to the pharmaceutical-inspired approach of looking for ‘one molecule – one effect’ that has been successful in specific instances, but is unlikely to succeed where effects are more subtle e.g. in unraveling the molecular mechanisms underpinning the perceived benefits of a ‘balanced diet’ rich in natural foods.

NSA

New Nutrition: Novel Foods in Nutrition and Clinical Practice

Regulating health claims in Australia and New Zealand

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In late May 2004 the Australia New Zealand Food Regulation Ministerial Council (ANZFRMC) finalised its policy guidance on Nutrition, Health and Related Claims, opening the way for the development of a new food standard, applicable in both countries, which will contain permissions for nutrition and health claims and will set out the requirements which must be met. This is a marked departure from the current situation, where there is only one permitted health claim for foods, related to maternal folate consumption and reduced risk of fetal neural tube defects. This permission was introduced as a public health measure by the Health Ministers of all Australian states and territories, the Australian Government and New Zealand. The new standard will come into force in early 2006.

There will be two classes of claim allowed, general level claims and high level claims. Both will need to be substantiated before they can be included on labels or in advertisements. However, the general level claims will not require pre-approval by the regulator, although the manufacturer will be expected to hold the evidence in support of the claim and produce it at any time when requested to by the enforcement agency. General level claims could include content claims (eg high in calcium), function claims (eg calcium is good for strong bones and teeth), enhanced function claims and risk-reduction claims (with reference to non-serious disease).

High level claims, whether they refer to reducing the risk of serious disease or to maintaining or modifying biomarkers, will need pre-approval by the regulator following an evaluation of the scientific evidence provided by the manufacturer in support of the claim.

During the early phases of developing the new standard, the role of scientific nutrition has centred on developing a draft framework for substantiating these high level claims. The primary challenge is to produce a framework incorporating a systematic approach to the totality of the evidence, which grades the quality of the scientific studies provided, demonstrates a causal relationship between consumption and claimed effect, and which has little risk of being invalidated by new emerging science in the subject. A secondary objective is to develop the framework so that it can be used by manufacturers as a guide to the collecting and interpreting the strength of the evidence they will need to hold in support of their general level claims.

This presentation introduces a proposed 5-step process for substantiating claims, which will be the subject of public consultation from August to October 2004 and which will be available on the FSANZ website:

www.foodstandards.gov.au

ICCN

Cardiovascular health

Nuts for Cardiovascular Protection

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Studies of diet and heart disease have shown beneficial effects of vegetarian and Mediterranean dietary patterns. Recent studies have further examined which particular foods contained in these diets may be responsible for the cardioprotective effect observed in epidemiological studies. In vegetarian populations it appears that nuts may be exerting the strongest protective effect. This was an unexpected finding since it was anticipated that the absence of meat eating would be the dominant factor. When other population groups were examined similar findings became apparent demonstrating a strong cardioprotective effect from nut ingestion approaching the level of effect seen with the use of lipid lowering medication. It has been estimated that 1oz of daily nut ingestion may reduce the risk of fatal CHD by 45% when substituted for saturated fat and by 30% when substituted for carbohydrate intake. Studies to date have not identified which particular nuts may be of most benefit although it is possible to speculate that the lipid profile of walnuts may confer the most advantage. Efforts to identify possible mechanisms whereby nuts may be exerting their cardioprotection have led to feeding trials with a wide variety of nuts. These have consistently shown that regular nut consumption can result in a 10% reduction in LDL-C within a few weeks. Other known properties of nuts that have been considered to be of possible benefit include high levels of arginine, vitamin E, folate, fibre, potassium, magnesium, tannins and polyphenols. Although nuts contain approximately 80% fat the nut feeding trials have not shown any associated weight gain in those ingesting nuts suggesting the addition of nuts in the diet may have a satiating effect. It is concluded that the daily ingestion of a small quantity of nuts may be one of the most acceptable lifestyle interventions for the prevention of coronary heart disease.

Nuts: The American Position

GT Gau

Mayo Medical Center, USA

The main concern with nuts in our diet relates to fat content, calories consumed, and allergic risk. I will discuss these issues, as well as, focus on the nutrient content of nuts. The role of nuts in the American diet, as recommended by the American Heart Association, American Dietetic Association, and the National Cholesterol Education Committee, will be reviewed. I will also suggest some general rules for the use of nuts in our diet and conclude with the American position on nuts, as I see it to be.

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NSA

Obesity: Does it Matter?

Obesity: what does it represent?

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Several studies have suggested that obesity has a strong genetic component, with the estimated heritability accounting for about 50% of the variability in body mass index (but with range of 5-90%, depending on the study). Heritability for physical activity has also been estimated to be about 50% and for food intake about 15-35%. The number of genes linked to obesity has grown steadily, and by October 2003 the human obesity gene map included more than 430 genes and chromosomal regions that are associated with obesity. The human gene map for performance and health related fitness has also been growing steadily and includes over 100 genetic loci. Despite strong advocates for the genetic contribution of obesity, the recent obesity epidemic over the last 3 decades has occurred with little or no change in the gene pool. It is generally agreed that it has resulted from behavioural and lifestyle changes. For example, in the UK there has been about a 25% reduction in both walking and cycling during the last 25-30 years. In contrast, sedentary activities, such as computer use and watching TV have increased, especially in children, in whom a relationship exists between amount of TV watched and body mass index. There have also been changes in dietary habits, which have been linked to greater availability of foods, more varied food, often with a high energy density, more food outlets, and greater consumption of soft drinks. Much scientific emphasis has been placed on genetic and molecular investigations, but it seems that this avenue is unlikely to succeed in preventing obesity in the mass of the population, at least in the near future. Many believe that co-ordinated public health policies on health and food supply, aiming to alter lifestyle and behaviour, offer greater hope for a long-term solution.

NSA

Obesity: Does it Matter?

Metabolic complications of obesity

P Nestel

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The metabolic syndrome (MS) is the major adverse consequence of overweight and obesity. The high rate of conversion to diabetes and the high risk of developing clinical coronary heart disease emphasise the importance of identifying such individuals and treating the syndrome. Although recognised several decades ago, its rapid increased prevalence across the globe has elevated MS into a high priority public health issue. Several definitions have been suggested; each includes visceral obesity, insulin resistance, dyslipidaemia and hypertension as the critical cluster of factors. The actual numbers vary according to the region: lower waist circumferences and BMI in Asia in contrast to the USA, since MS develops at lesser visceral obesity among Asians. Additional important metabolic disturbances in MS include pro-thrombogenic factors, evidence of inflammation and vascular dysfunction. Multiple genes contribute some being over-expressed and others polymorphic; as yet no clear major candidate genes have emerged.

Apart from energy a number of other nutrients and patterns of eating influence MS. Hyperinsulinaemia common in MS, is influenced by the amount and nature of carbohydrate and of fatty acids, possibly by dietary fibre and protein. The metabolic abnormalities in plasma lipids and blood pressure are affected by well-recognised nutrients. Three large intervention trials have recently shown that optimising diet together with weight loss and a modest increase in physical activity substantially delay conversion of MS to Type2 diabetes.

Among the abnormalities in vascular and endothelial function commonly observed in MS increased arterial stiffness of large arteries and impaired vasorelaxation in the microcirculation correlate with waist circumference and impaired glucose tolerance. Our studies have shown benefits with a variety of nutritional interventions. Apart from weight loss, fish oil fatty acids and isoflavones have been found to reduce arterial stiffness in MS. By contrast, a large fat meal or raising the plasma homocysteine concentration, rapidly raises arterial stiffness. Thus appropriate nutritional management and increased physical fitness should reduce the metabolic complications of obesity, since the risks for heart attack and diabetes are a function of the number of metabolic dysfunctions stemming from visceral adiposity.

NSA

Obesity: Does it Matter?

Dairy, calcium and body composition of multiethnic youth

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University of Hawaii

Measured body fat and weight of 323 nine to 14 year old girls from Kaiser Permanente Oahu Female Adolescent Maturation (FAM) study were examined in relation to age, ethnicity and physical activity. Ethnicity was derived from a questionnaire and described in percent of NIH classifications of Asian and White. Age, physical activity and dietary intake (a 3-day record at each exam) were obtained by questionnaire, anthropometry was obtained by measurement and Tanner stage by clinical examination. Mean age, calcium intake, weight and iliac skinfold thickness were 11.5 ± 1.4 y, 736.5 ± 370.7 mg/d, 44.6 ± 13.0 kg and 12.4 ± 6.1 mm, respectively. Multiple regression with age, ethnicity, height, Tanner breast stage, physical activity, energy, soda and total calcium intake explained 17% of the variation in iliac skinfold. Dairy intake, age, and physical activity were significantly negatively associated with iliac skinfold while height, Tanner breast stage and Pacific Islander ethnicity were significantly positively associated; substituting total calcium with dairy calcium, and non-dairy calcium in two separate models accounted for 16% and 15% of the variance, respectively. One gram of total and dairy calcium was significantly associated with a 2.5mm and 2.6mm decrease in iliac skinfold, respectively. There was significant interaction of Asian ethnicity and dairy intake. Non-dairy calcium was not significantly associated with weight or iliac. Soda was significantly positively associated with weight in all three models. Increasing dairy among Asians and decreasing soda intake may help maintain body fat and weight during adolescence.

Two years later, 152 FAM girls were re-examined. A DXA measurement was made at the second examination to determine percent body fat and the trunkal:peripheral fat ratio. In multiple regression analysis adjusted for total energy, calories from fat, fiber and physical activity, iliac skinfold best predicted percent body fat, followed by triceps then subscapular skinfold. During this period, trunkal:peripheral fat ratio increased steadily. Trunkal:peripheral fat ratio was negatively associated with calcium intake and positively with Asian ethnicity, in separate multiple regression models adjusted for Tanner stage of maturation, energy intake and physical activity. Asian x calcium from dairy interaction was not significant. These data suggest that girls gain abdominal fat during puberty, especially Asian girls.

In a population of Samoan women age 18-28 years (n=55) in Hawaii, 2 % were underweight, 16% normal weight, 22% overweight and 60% obese using NIH criteria, or 82% overweight and obese. BMI was linearly related to an increase in percent fatness obtained by DXA and inversely related to fat-free mass. Mean BMI was 31.6 ± 6.5 kg/m², body fat was 43 ± 7 % and fat-free mass was 57 ± 7 %. Mean activity level was PAR 2.5 ± 2.1 or 10-60 minutes of moderate activity/wk. These data suggest high BMI among Samoans in Hawaii is due to sedentary lifestyle and excess body fat. Further study examining diet, blood glucose and blood lipid data will help determine healthy BMI for Samoans.

NSA

Obesity: Does it Matter?

Fatness in production animals: using genetic and environmental levers to meet consumer demandGS Harper^{1,2} and DW Pethick^{1,3}¹*Cattle and Beef Quality Cooperative Research Centre*²*CSIRO Livestock Industries, Queensland Bioscience Precinct, 306 Carmody Road, St Lucia, QLD 4067*³*Division of Veterinary and Biomedical Sciences, Murdoch University, Perth, WA, 6150, Australia*

Background - Humans have consumed animal protein and fat for at least 10 millennia and evidence suggests that animal foods, and perhaps the process of hunting food animals, have contributed to our success as a species. Animal protein continues to be an important component of western-style diets, and recommendations against over-consumption of animal fats are well supported. Animal fats have been an important source of dietary energy for human populations, particularly when higher quality nutrients were unavailable. In the modern developed world, people are confronted with a myriad of options and opportunities to consume energy, so much so that the environment has been termed "obesogenic", reflecting the implications of over-consumption.¹ Booth and others² have suggested that it is the lack of physical activity, as much as the excessive energy intake that has contributed to increased prevalence of Syndrome X in our communities.

Animal productionists have worked over hundreds of years to increase growth of muscle relative to fat. Genetic, nutritional and environmental factors have been quantified in terms of their impact on carcass fatness. Several major genes have been defined that significantly contribute to carcass fatness, with or without effects on musculoskeletal growth (myostatin; somatotrophin; leptin and leptin receptor). Physical activity is likely to have the largest environmental effect, accounting to some extent for lotfed cattle being fatter than pasture fed cattle.² Recently, epigenetic effects on muscle growth and development have been exemplified in *Callipyge* sheep.³ Consumerism has played a significant role in determination of the research priorities for animal productionists in the last four decades. Meat has been transformed from a staple product with occasional excellence, to a defined gourmet food ingredient with specified and reproducible attributes. The science underlying this transformation has opened a range of new opportunities to tailor the products of animal development to human taste and preference, though many in the community cannot support unfettered application of genetic modification to food animals. Consumer sentiment is not always logically consistent, and consumer demands for flavour in meat, tend to conflict with demands for whole-someness and low fat. Marbling is the appearance of flecks and streaks of adipose tissue within the connective tissue seams of ruminant skeletal muscle. It is a particularly important trait in beef cattle, because it is linked in some consumers' minds, with more intense flavour and tenderness. Marbling is linked to value in the Japanese beef market, and hence it is high on the research agenda for an export-oriented cattle-producing nation like Australia.

Review - This paper will review studies of the genetic, nutritional, environmental and epigenetic determinants of fatness and fat distribution in production animals. It will draw particularly on recently published, cross- and straight-breeding programs aimed at identifying genes contributing to population variation in the expression of fatness traits like marbling. Drawing on studies in other species, the paper will identify genes and genome regions that are likely to influence development of fat in the major meat production species: cow, sheep, pig, and goat. Interesting examples are the 'TG5' thyroglobulin gene polymorphism, an IGF2 polymorphism, and unexpectedly MMP12. The paper will discuss several nutritional factors that influence the extent and distribution of fat deposition, independently of total energy. Examples include vitamin A.⁴ Fat develops in concert with muscle and bone, and it is artificial to separate development into individual cell and tissue types when seeking to understand the whole animal. The paper will also discuss the interactions between muscle and fat development at the physiological level, by highlighting developmental differences between breeds of cattle that are extreme in terms of fatness, muscularity or energetic efficiency. Good examples include the Tajima strain of Wagyu cattle, and Limousin cattle.⁵

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NSA Concurrent Oral Session 1: Public Health Nutrition

5+ a day: Are we getting the message across?

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Background - Increasing fruit and vegetable intakes is important for promoting health and preventing chronic disease. National 5-a-day campaigns which encourage consumers to eat at least five servings of fruit and vegetables daily have been established in 18 countries. The 5+ a day campaign was launched in New Zealand in 1994.

Design - Nationwide market research involving household shoppers was conducted by independent research consultants for the 5+ a day campaign in 1999 (n=200, at six NZ towns/cities) and 2000 (n=520 at 16 NZ towns/cities). The 1999 questionnaire focused on awareness and understanding of the 5+ a day campaign. The 2000 questionnaire focused on attitudes to health and on intakes of convenience foods, fruits and vegetables.

Outcomes - Information on attitudes to healthy eating obtained by Likert scale responses were converted to a Healthy Attitude Index. Positive attitude towards healthy eating was influenced by educational attainment ($P<0.05$) and occupation ($P<0.001$) and was associated with lower consumption of convenience/takeaway foods of the respondents, their <5 year old children and their 5-15 yr old children (all $P<0.001$). The 5+ a day logo was recognised by 87.5% of respondents, while 70.5% of all respondents identified the five servings a day message from the 5+ a day logo regardless of whether they had seen it before. The meaning of the hand in the logo was less clear with only 2.5% identifying the 'serving size' element of the logo. Television, supermarkets, magazines, GP waiting rooms, school and green grocers were the major sources of 5+ a day information.

Conclusions - The 5+ a day logo is widely recognised and understood in terms of the message to eat more fruit and vegetables. The serving size element is less well understood. In New Zealand the 5+ a day message promotes positive attitudes towards healthy eating which are associated with healthier eating habits.

“Everything in my lunchbox is healthy – except for the spoon ... and the chocolate.”

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Background – In an environment where childhood obesity is increasing, improving the 'healthiness' of school lunches is an important strategy for helping to reverse the epidemic.

Objective - To describe foods and beverages consumed at school in terms of number of serves, contribution to energy intake and frequency in lunchboxes.

Design – Baseline (cross-sectional) data on school food consumption were collected as part of the Sentinel Site for Obesity Prevention in the Barwon South West Region of Victoria. To date, data have been collected from 1001 children aged 4 – 12 years. Food and beverage intake was assessed using a School Food Checklist.

Outcomes – A typical lunch consisted of a meat or cheese filled sandwich (0.9 serves), two biscuits (1.8 serves), a piece of fruit (0.8 serves), a muesli/fruit bar (0.5 serves) and some other snack, and either a fruit drink (0.7 serves) and/or water (0.5 serves). On average school foods provided 3029 kJ and the major sources of this energy were bread (20%), biscuits (14%), fruit drinks (9%), fruit (8%), cakes/buns (8%) and muesli/fruit bars (7%). Biscuits were the most common energy dense snack, present in 59% of lunches. Thirty-nine percent of children had muesli/fruit bars, 36% had packaged snacks (potato, corn chips) and 26% had chocolate/lollies. Fruit drinks were present in 40% of lunches and water in 26%. Most schools offered a canteen service at least 1 day/week and 10% of children reported using the canteen. Fast foods (pies, chips) were the most frequently purchased items.

Conclusions - Not everything in children's lunchboxes was healthy. A reduction in fruit drinks and energy dense snacks such as biscuits, cakes/buns and muesli bars as well as the promotion of healthy sandwiches, fruit and water would improve the 'healthiness' of school lunches.

NSA Concurrent Oral Session 1: Public Health Nutrition

Effect of iron supplementation in pregnancy on IQ of children at 4 years of age

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Background - Evidence from animal studies has consistently demonstrated that inadequate iron nutrition during pregnancy leads to permanent structural and functional changes in the brain of offspring. However, there are no human intervention trials specifically designed to examine the effect of iron nutrition in pregnancy on childhood neurodevelopment.

Objective - To assess the IQ of children at 4 years of age whose mothers had previously participated in a double blinded randomised controlled trial (RCT) of iron supplementation in pregnancy.¹

Design - Families who participated in the RCT¹ during 1997-1999 were invited to participate in a follow up study when the children were 4 years of age. The IQ of the children was assessed using the Stanford – Binet Intelligence Test (4th Ed). Additional information on possible confounders of child development such as home environment and length of breastfeeding was also collected.

Outcomes - Seventy-seven percent (302/391) of the children from the original trial participated (with parental consent) in the follow up study. The mean age and IQ of the children was 4.2 ± 0.2 years and 109 ± 11 , respectively. There was no difference in the IQ scores between children of iron supplemented mothers compared with children of placebo supplemented mothers. Girls had higher mean IQ than boys (110 ± 11 vs 107 ± 11 , $P=0.03$). There was a strong association between IQ and home environment as assessed with the Home Screening Questionnaire. Birth order and the education level of parents were also associated with the IQ scores of children.

Conclusions - Maternal iron supplementation in pregnancy has no effect on IQ of the children at 4 years in this relatively well nourished population.

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The use of dietary supplements in a group of potentially elite secondary school athletes

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Background - Athletes, concerned with goals of maximising performance and fearful of losing their competitive edge, have been targeted as a significant consumer group for vitamin and mineral supplements. The reasons for athletes supplement use fall into three areas: to compensate for less than adequate diets or lifestyles; to meet unusual nutrient demands induced by heavy exercise; and to produce an ergogenic effect.

Objective: To investigate the use of dietary supplements taken by elite secondary school sports students.

Design: One hundred year 9 and 10 students, identified as having potential in their respective sports by their school administrators, were recruited from two decile 10 North Shore secondary schools, Rangitoto College and Takapuna Grammar to complete a questionnaire.

Results: Twenty-eight female athletes (84.8%) and 42 male athletes (62.6%) took dietary supplements. Energy products were taken by 43.1% of the athletes, vitamins by 28.7% and recovery products by 7.1%. Many athletes (52.8%) took more than one product. Multi-vitamins, B-group vitamins and vitamin C were the most commonly consumed vitamins. Parents, coaches and friends (74.8%) were the most important sources of information about dietary supplements and were also the most likely to suggest taking supplements (77.5%).

Conclusions: There was a very high rate of supplement use by athletes in this study. Adolescent athletes are encouraged to consume supplements by parents and coaches. Both parents and the athletes themselves need to be better informed as to the important role good nutrition has in assisting adolescent athletes to achieve their sporting goals.

NSA Concurrent Oral Session 1: Public Health Nutrition

Making a healthy difference to menus: evaluation of a catering program in New Zealand

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Objective - To determine the effect of the Heartbeat Catering Program (HCP) on the provision of healthy menu items by measuring perceptions of caterers and dietitians involved in the program.

Design - A multi methods approach was used involving a postal questionnaire and telephone interviews with caterers, and telephone interviews with dietitians involved in the program.

Subjects - Caterers/food service managers n= 164. Dietitians n=15.

Setting - Food services in residential institutions (boarding schools, universities hostels, prisons, rest homes), workplace cafeterias, cafes and lunch bars.

Outcomes - While not the sole source of information and motivation for menu development, it was clear that for most participants information learnt through contact with the Heart Foundation was incorporated into recipes and food preparation techniques. Program resources and services of particular value to caterers were the mailed information packs and food demonstrations. Dietitians reported a high level of satisfaction with the program and agreed that the program was assisting caterers to offer nutritious menus to customers. Both groups recommended changes to the program resources to improve their usefulness.

Conclusion - The Heartbeat Catering Program appeared to be improving the nutritional value of food served in food service outlets. Program resources require updating in line with comments from caterers and dietitians. The program should be expanded to increase influence.

Process evaluation of the development of the user interface for a self-administered dietary assessment program for use in general practice

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Background – Increased involvement of the General Practitioner (GP) in the area of nutrition is vital for the growing population of persons with metabolic syndrome within Australia, as GPs are still the most trusted source of nutrition advice.¹ Nutrition software may assist this process, but at present has limited capacity to provide individualized advice despite the broad range of programs available.²

Objectives – To evaluate the early stages of development of the user interface component of a nutrition software program for self administration in the Primary Healthcare context.

Design – Process evaluation based on review of key components of interface development: statistical analysis of NNS data to identify core foods, multimedia questionnaire design, outputs for nutrient analysis software interface, dietary prescription protocols and responses from focus group discussion sessions with potential users. Design features of the program were addressed through in depth discussion sessions of the multidisciplinary team.

Outcomes - Outcomes of focus group discussion sessions saw a modification from a desktop based to web based interface. The core foods were collapsed from 106 to 98 groups and names were changed to simplify the interface design and reduce the speed required for completion of the dietary assessment.

Conclusions - Development of a self-administered dietary assessment program must ensure needs are met whilst upholding simplicity of the interface design. Evaluation of this development demonstrated how a greater collaboration between GPs and dietitians could be achieved, in delivering dietary advice as a factor of disease management.

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NSA Concurrent Oral Session 2: Energy and Metabolism

Resting energy expenditure in female children with cystic fibrosis - effect of puberty

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Background- The female gender has been shown to be one of the contributing factors to elevated resting energy expenditure (REE) in children with cystic fibrosis (CF), but it is not known if this effect is influenced by pubertal development.

Objective- The aim of this study was to determine the effect of puberty on REE, in females with CF.

Design- Children with CF were recruited from the CF clinic at the Children's Hospital at Westmead and controls were recruited through families and friends of hospital staff. All children were aged 5-18 years and were generally well. REE, anthropometry and self-reported pubertal staging were measured in 38 children with CF (27 pre-menarche, 11 post-menarche) and 63 controls (42 pre-menarche, 21 post-menarche) in an outpatient setting. The post-menarche group were all measured in the follicular stage of their menstrual cycle.

Outcomes- Females with CF had a higher REE than controls ($108.4 \pm 11.1\%$ of predicted from controls $P < 0.001$). However this increase in REE was only significant for pre-menarche females ($109.7 \pm 12.1\%$ of predicted from controls, $P < 0.005$) compared with a median 104.0% (92.1, 116.6%) of predicted from control data ($P = 0.06$) for post-menarche females. There was no significant difference in REE (% predicted from controls) between pre- and post-menarche children with CF ($P = 0.12$).

Conclusions- Pre-menarche females with CF had raised REE in contrast with post-menarche females but this finding must be confirmed with further numbers of post-menarche females. This study implies that young females with CF may need more intensive dietary management, due to raised REE, in order to maintain growth, nutritional status and possibly improve survival.

Effect of bariatric surgery on adipose tissue regulatory peptides and growth hormone secretion

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Background - Obesity is associated with hyperinsulinaemia, hyperleptinaemia, suppressed levels of ghrelin and growth hormone (GH), and conflicting observations for IGF-1 levels.

Objective - To examine the effects of massive weight loss following bariatric surgery on the serum levels of adipose tissue regulatory peptides in obese humans.

Design - Serum ghrelin, growth hormone, IGF-1, insulin and leptin levels were analysed in 12 male and 54 female subjects with mean age 39 years (range 24-50), mean weight 127kg (range 96-195) and mean BMI 45 kg/m^2 (range 33-64) prior to and after Roux-en-Y gastric bypass (RYGBP) surgery at 6 and 12 months. All differences shown in Outcomes are significant at $P < 0.05$.

Outcomes - RYGBP resulted in 22% and 30% weight loss at 6 and 12 months, respectively. Ghrelin increased from 55 (25-81) fmol/ml to 75 (27-132) fmol/ml (40%) at 6 months and 85 (30-156) fmol/ml (58%) at 12 months after surgery. GH also increased significantly from 0.6 (0.1-2.8) to 1.8 (0.4-8.9) mU/l (69%) at 6 months and 1.9 (0.4-9.2) mU/l (69%) at 12 months IGF-1 levels increased significantly from 155 (102-208) to 165 (108-222) $\mu\text{g/l}$ (5.5%) at 6 months and to 173 (117-229) $\mu\text{g/l}$ (10%) at 12 months. Insulin and leptin decreased at 6 months by 57% and 62% respectively, and at 12 months by 60% and 64%. The changes were all related to the reduction in BMI, except for IGF-1. Ghrelin and insulin were inversely correlated at all time-points, as were their changes at 12 months, independent of the BMI change.

Conclusion - RYGBP surgery was associated with marked changes in ghrelin, GH, IGF-1, insulin and leptin towards their normal ranges, as well as a large reduction in weight. The profound changes in these adipose tissue regulatory peptides reflect the new state of energy balance achieved. The close inverse association between ghrelin and insulin supports an important role for ghrelin in glucose homeostasis.

NSA Concurrent Oral Session 2: Energy and Metabolism

Physiological validation of the concept of glycemic load in mixed meals over 10 hours in overweight females

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Background - In the science of weight loss, the value of diets with a low glycemic index (GI) or glycemic load (GL) is controversial. GL remains an unproven concept without evidence that the calculated GL predicts blood glucose and insulin responses to mixed meals.

Objective - To compare day-long glucose and insulin responses to four isoenergetic reduced fat diets, varying in GL, carbohydrate and protein content.

Design - A randomised, four-intervention, crossover study was conducted in 11 overweight or obese females (age: 26.5 ± 4.4 yr, BMI: 30.0 ± 4.3 kg/m²). The four diets were: a conventional low-fat high-GI diet (55% CHO, 15% protein, 30% fat, GL 116); a low-GI diet (55% CHO, 15% protein, 30% fat, GL 65); a high protein-high GI diet (45% CHO, 25% protein, 30% fat, GL 84); and high protein-low GI diet (45% CHO, 25%-protein, 30% fat, GL 43). Subjects consumed 3 mixed meals and 1 snack at intervals over 10 h. Fingerprick capillary blood samples (n = 14) were collected at 30-60 min intervals and analysed for glucose and insulin.

Outcomes - Incremental area under the curve (AUC, mean ± SE) was calculated (table).

GL	Glucose AUC (mM•min)	Insulin AUC (pM•min)
43	196 ± 30	4.4 ± 0.8
65	223 ± 45	6.4 ± 1.0
84	230 ± 35	5.3 ± 0.8
116	315 ± 36	7.9 ± 1.2

Using regression analysis, GL was significantly correlated with glucose AUC ($r = 0.35$, $P = 0.022$) and insulin AUC ($r = 0.35$, $P = 0.021$). Varying the GI had a stronger effect ($P = 0.026$) on glucose response than varying the carbohydrate ($P = 0.046$) but only carbohydrate amount had a significant effect on insulin response ($P = 0.002$).

Conclusions - Dietary GL has a predictable effect on day-long glucose and insulin responses in overweight and obese females. Diets with lower GL may be helpful for weight control.

Ethnicity and diabetes control

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Background Type 2 diabetes mellitus has reached epidemic proportions in New Zealand. There has also been a dramatic rise in numbers from different ethnic groups attending the Auckland Diabetes Centre.

Objective To investigate socio-cultural and psychological issues which may be barriers to lifestyle and dietary modification for optimal diabetes control in women from 5 ethnic groups attending the Auckland Diabetes Centre.

Design A total of 232 women took part in this study: Maori (44), Pacific Island (53), Chinese (34), Indian (48), and European (53). All answered a questionnaire designed to obtain views on diabetes, how it affects lifestyle and perceptions of food and health at a routine clinic visit. Demographic, co morbidity and socioeconomic data were also collected. Differences across groups were compared using ANOVA.

Outcomes The mean age of the group was 56 years and the median duration of diabetes was 6 years (interquartile range 2 to 11). 192 (83%) of the study participants were taking some form of diabetic medication. Significant differences were found across the ethnic groups in age ($P=0.033$), HbA1c ($P=0.032$) and Body Mass Index ($P<0.001$). There were strong differences in attitude across the groups especially in terms of how they are treated ($P=0.011$) and frustration ($P=0.007$). Some ethnic groups felt having diabetes cost them more for food ($P=0.006$) and stopped them from going out to eat with friends ($P=0.016$). Nutrition knowledge varied across groups ($P=0.02$), as did the importance placed on physical fitness ($P=0.02$). Future health was important to all ethnic groups.

Conclusions This study is one of the first in New Zealand to look at socio-cultural and psychological issues across the 5 ethnic groups with the highest prevalence of Type 2 diabetes. Significant differences found across the ethnic groups suggest that a more holistic approach and a wider knowledge of cultural and physiological issues are required for successful diabetes education. With only 8% of New Zealand's practising dietitians coming from minority ethnic groups effort needs to be placed on making sure all health professionals are cognizant of individuals health beliefs and cultural practices.

NSA Concurrent Oral Session 2: Energy and Metabolism

Girls undergoing early adiposity rebound gain fat at a faster rate than girls with a later rebound

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Background - Although several studies have shown that an early adiposity rebound (AR) is associated with an increased risk of adult obesity, it is not clear whether the rebound in body mass index (BMI) is actually attributable to changes in body fat.

Objective - To determine the changes in body composition occurring in girls during AR.

Design - Body composition was measured using dual-energy x-ray absorptiometry (DXA) at baseline, year one, year two and year four in 40 girls aged 3-6 years at baseline. Dietary intake was estimated by four-day diet records and physical activity by questionnaire. Age at AR was determined by modelling. The velocity of change (% per year) in height, weight and fat and lean tissues was estimated for each subject using random coefficient models. Early AR was defined as less than five years of age and late AR as five or more years of age.

Outcomes - Early and late rebounders did not differ in age, height, weight, body composition, dietary protein intake or physical activity participation at baseline. Although height velocity was similar, weight velocity was significantly higher in early compared with late rebounders (13.5% vs 10.7, $P < 0.001$). Differences in weight velocity were entirely due to change in body fat stores; early rebounders gained body fat at more than twice the rate of late rebounders (17.1 vs 6.5%, $P < 0.001$) whereas no differences were observed in lean mass velocity. By the age of 9 years, girls with an early AR were more than 4 kg heavier than girls with a late AR, with considerably more body fat and a greater percentage classified as overweight.

Conclusions - Our study demonstrates that the differences in BMI during AR are due specifically to alterations in body fat and not to alterations in lean mass or height.

A randomised trial of three non-dieting programs for overweight women

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Background - Since traditional treatments for overweight/obesity that focus on energy restriction show poor long-term maintenance of weight loss, 'non-dieting' approaches are increasingly advocated. Non-dieting approaches encourage the adoption of eating in response to physiological hunger and satiety cues, rather than cognitive control of eating. Few randomised trials of non-dieting programs have been reported.

Objective - To evaluate the effects of non-dieting programs in overweight and obese women at high risk of coronary heart disease.

Design - 225 obese/overweight women (BMI > 28 ; 25-65 years) with at least one other cardiovascular risk factor took part in a randomised trial of three different non-dieting programs (P1, P2, P3). P1: ten weeks of weekly group intervention focusing on training in eliciting the relaxation response and cognitive restructuring. The other two programs (P2: ten week group intervention; P3: mail-delivered intervention) focused on healthy eating and activity patterns.

Outcomes - Measures were obtained at baseline, 10 weeks and 4 months. For participants in all three non-dieting programs, depression, anxiety and other psychological distress, perceived barriers to physical activity and to reducing dietary fat, self-reported medical symptoms, and diastolic blood pressure showed significant reductions at 10 weeks and 4 months; while stage of readiness for regular exercise, eating self-efficacy, dietary quality scores and "Health-Promoting Lifestyle Profile" scores all improved significantly ($P < 0.01$). At four months, 44% of all participants had lost weight, 22% had maintained weight and 34% had gained weight. P1 participants showed significantly greater improvements in stress management ($P < 0.0001$).

Conclusions - Findings suggest that non-dieting interventions can enhance psychological wellbeing and lifestyle habits for overweight/obese women.

NSNZ Concurrent Oral Session 3: Micronutrient Nutrition

Efficacy of micronutrient fortification of milk on morbidity in pre-school children and growth – a double blind randomised controlled trial

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Background - Given the high prevalence of micronutrient deficiencies and infectious diseases in children of developing countries, interventions to reduce infant and pre-school morbidity are a public health priority. With failure of iron supplementation programs for prevention of anaemia, fortification has been suggested as potential strategy for delivery of micronutrients that would reduce interactions and have multiple health benefits.

Objective - To evaluate the efficacy of micronutrient fortification of milk in prevention of diarrhoea, acute respiratory infections, iron deficiency and other childhood morbidity, and its impact on growth.

Design - The study was undertaken in peri-urban Delhi. Children aged 1-3 years, resident in the area and without any chronic illness or severe malnutrition were invited to participate. After informed consent 633 children were randomly allocated to either receive a milk formulation (MN milk) with a blend of micronutrients ('Nutri-careTM') including per 100 g powder: zinc 10 mg, iron 10 mg, vitamin A 350 µg, vitamin E 8.3 mg, vitamin C 50 mg, selenium 7 µg and copper 0.3 mg, or the same milk without the fortification. The milk was provided in sachets of 32 g and children were advised to reconstitute and consume 3 sachets per day for 12 months. A field assistant delivered the milk weekly to the homes. At baseline and end study a blood sample was collected and a detailed haemogram, plasma zinc, ferritin and zinc protoporphyrin were measured. Children were visited twice weekly in the home to record compliance and morbidity. At baseline, six months and one year anthropometric measures were made.

Outcomes - Compliance was above 80% with most children consuming at least 2 serves of milk per day. MN milk fed children had significantly lower incidences of diarrhoea (OR 0.78, 95% CI 0.66-0.9; $p < 0.001$), days of diarrhoea (OR 0.80, 95% CI 0.74 -0.84; $p < 0.001$), severe illness (OR 0.85, 95% CL 0.76-0.96, $p = 0.01$), high fever (OR 0.93, 95%CI 0.90-0.98; $p = .003$), measles (OR 0.12 $p = .02$) and acute lower respiratory infection (OR 0.72 95% CL 0.60-0.87; $p = .01$). They also had a significant increase in both height velocity (diff mean: 0.51; 95% CI: 0.27, 0.75, $p = 0.00$) and weight velocity (diff mean: 0.21; 95% CI: 0.12, 0.31, $p = 0.00$). There were also greater changes in height for age (HAZ) Z scores (mean diff 0.19 95%CI 0.12-0.26, $p < 0.001$), weight for age (WAZ) Z scores (diff mean 0.24, 95%CI 0.11-0.36; $p < 0.001$), and weight for height (WHZ) Z scores (diff mean 0.16, 95% CI 0.03-0.30; $p = 0.02$) in the MN milk fed group. There was a significant change in mean Hb of 1.26 g (95%CI 1.11-1.60; $p < 0.001$) in the MN milk group. As well as a significant increase in the proportion of non anaemic children with Hb levels above 10 g/L (OR 3.42, 95% CI 2.43-4.83; $P < 0.001$) there was also an 87% decrease (95% CI 44%-99%; $p = 0.001$) in children with severe anaemia, an increase in mean hematocrit 3.34 (95% CI 2.68, 3.99; $p = 0.00$), MCV, 6.97 (95% CI 5.53, 8.42; $p = 0.00$), mean RDW -2.49 (95% CI -2.92,-2.05; $p = 0.00$) and retic count -0.19 (95% CI, -0.27, 0.11; $p = 0.00$) in the MN milk group.

Conclusions – This study is the largest double blind trial showing fortified milk can reduce morbidity from diarrhoea, respiratory infections and other illnesses, as well as improve iron status and growth. Improvements in anaemia and iron status were greater than that documented with therapeutic iron supplementation in most trials.

This study was funded by New Zealand Milk Ltd, who also provided the milk products

NSNZ Concurrent Oral Session 3: Micronutrient Nutrition

International perspectives on vitamin D and implications for bone healthSA Rahman¹, IR Reid², WSS Chee³, Z Yassin⁴, SP Chan⁵¹Food Science, Universiti Kebangsaan Malaysia, Malaysia²Department of Medicine, University of Auckland, New Zealand³Department of Nutrition & Dietetics, National University of Malaysia, Malaysia⁴Department of Nutrition & Health Science, Putra University, Malaysia⁵Department of Medicine, Universiti Malaya, Malaysia

Background - Vitamin D is a fat-soluble compound, synthesised in the skin as a result of sunlight exposure. It is found in fish oils, but an unsupplemented diet provides little vitamin D. There is evidence of significant reductions in nonvertebral fractures from replacement regimens particularly if vitamin D is combined with calcium therapy. Vitamin D deficiency is common among institutionalised elderly and recent data suggests that vitamin D status may also be inadequate among younger adults for optimal bone health.

Objective – To assess the vitamin D status in a population of healthy postmenopausal women living in Malaysia, and identify influencing factors.

Design – Cross-sectional study of 276 randomly selected healthy Chinese and Malay women aged 50 between and 65 yr, and more than 5 yr postmenopausal. Serum 25-hydroxyvitamin D (25 (OH) D), parathyroid hormone (PTH), diet, anthropometry and physical activity were assessed.

Outcomes – Serum 25 (OH) D was significantly lower in Malay women (44.4 ± 10.6 nmol/L) compared to Chinese women (68.8 ± 15.7 nmol/L) ($P < 0.05$). Hypovitaminosis D (serum 25 (OH) D between 50-100 nmol/L) was present in 27% of Malay and 87% of Chinese women. Vitamin D insufficiency (serum 25 (OH) D between 25-50 nmol/L) was present in 71% of Malay and 11% of Chinese women. Serum 25 (OH) D was significantly correlated to BMI, fat mass and PTH.

Conclusions – A high prevalence of vitamin D inadequacy exists amongst healthy postmenopausal women living in Malaysia, which may have considerable implications for public health.

NSNZ Concurrent Oral Session 3: Micronutrient Nutrition

Serum 25-hydroxyvitamin D Status New Zealand children

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Background – New Zealand children may be at risk for poor vitamin D status due to low vitamin D intakes, decreased sun exposure, and the country's location (35-46°S). Further, Māori and Pacific Children may be at greater risk because of their darker skin.

Objective - To determine 25-hydroxyvitamin D concentrations in New Zealand children (5-14 y) who participated in the 2002 National Children's Nutrition Survey.

Design - The survey aimed to recruit 3000 participants with 1000 children each of Māori, Pacific, and New Zealand European and other (NZEO) ethnicity. The nationally representative sample was recruited using a two-stage process involving random selection of schools followed by random selection of children within each school. Serum 25-hydroxyvitamin D concentrations were measured using a radioimmunoassay kit (DiaSorin, MN).

Results - Serum 25-hydroxyvitamin D concentration [mean (95%CI)] in Māori children (n=485) was 44 (39 to 48) nmol/L; in Pacific children (n=675) it was 37 (32 to 42); and in NZEO (n=499) it was 53 (48 to 58). Pacific females 11-14 y (n=160) were the group with the lowest serum 25-hydroxyvitamin D concentrations, 32 (26 to 38) nmol/L. The prevalence of serum 25-hydroxyvitamin D deficiency (<17.5 nmol/L) was 5% (3 to 10) amongst Māori children, 8% (6 to 12) amongst Pacific children, and 3% (1 to 5) amongst NZEO children. The prevalence of insufficiency (<37.5 nmol/L) was 41% (32 to 50) amongst Māori children, 59% (46 to 70) amongst Pacific children, and 25% (18 to 33) amongst NZEO children. Multiple regression analysis revealed that vitamin D concentration was lower in the winter [38 (35, 41) nmol/L] than summer [53 (49, 57) nmol/L], lower in females [42 (39, 44) nmol/L] than males [47 (44, 49) nmol/L], was highest in NZEO [53 (50, 57) nmol/L] followed by Māori [44 (41, 48) nmol/L] and lowest in Pacific Children [37 (35, 40) nmol/L].

Conclusion - Ethnicity and season are major determinants of serum vitamin D status in New Zealand children. Serum 25-hydroxyvitamin D concentrations in New Zealand children are lower than in countries of similar latitude where vitamin D fortified foods are consumed. The potential consequences of this lower vitamin D status, particularly amongst Pacific children, are not clear but should be investigated.

An Otago Research Grant funded the vitamin D analysis. The Ministry of Health funded the 2002 National Children's Nutrition Survey.

Multiple micronutrients may lead to improved cognitive function in NE Thai schoolchildren

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Background - Deficiencies of iron, iodine and zinc can affect the learning abilities and cognitive function of children. In a study in rural NE Thai school children, 31% were anaemic, 44% had moderate iodine deficiency, based on urinary iodine <0.40 µmol/L, and 57% had serum zinc levels indicative of zinc deficiency.

Objective – To determine the efficacy of a seasoning powder fortified with iron, iodine, vitamin A and zinc served with noodles or rice consumed for school lunch on biochemical status and cognitive function in 567 rural NE Thai children.

Design – Randomized controlled trial of children 6-12 yr recruited from ten rural schools in Ubon Ratchanthani province. Children were stratified by age and gender, and then randomly assigned to receive either the placebo or a fortified seasoning powder containing 1/3 of the Thai RDA for iron, iodine, zinc and vitamin A per serve. Initial and final non-fasting blood samples were taken for complete blood count, haemoglobinopathy assessment (baseline only) and biochemical analysis. Cognitive function was assessed after 31 weeks by a visual recall test where 15 objects were displayed for one minute, covered for one minute and then recalled by the child, and the digit span subtest from the Wechsler Intelligence Scale for Children (WISC) III.

Outcomes - There was a significant treatment effect on haemoglobin, serum zinc and urinary iodine. Children in the treatment group had significantly higher visual recall scores compared with placebo (10.01 vs. 9.45 items, 95% CI for difference 0.15, 0.99, P=0.008). This finding was independent of age, gender, estimated annual family income and haemoglobin type. There was no significant effect on the digit span test.

Conclusion - Seasoning powder fortified with four micronutrients reduced the incidence of zinc and iodine deficiency and increased haemoglobin concentration over 31 weeks, while at the same time improving short term memory and attention, and thus may contribute to improved overall cognitive functioning over time. Supported by Micronutrient Initiative Fund and University of Otago.

NSNZ Concurrent Oral Session 3: Micronutrient Nutrition

Food sources of calcium in three diets (OZDASH study)

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Objective - To assess sources of calcium (Ca) in four diets with different dairy components (OZDASH study).

Design - The OZDASH diet (OD) was a moderate Na, high potassium (K), high calcium (Ca), low-fat diet, specifying a minimum of 3 serves of reduced-fat dairy/d. The high calcium diet (HC) was high in reduced-fat dairy products (at least 4 serves/d), and the low sodium, high potassium diet (LNAHK) had no dairy requirement. Ninety-four participants completed a 4-week OD, and 48 of these also completed a 4-week HC, and 43 a 4-week LNAHK. An average of two 24 hr recalls was used to assess Ca intake at baseline and during each diet.

	% Total daily Ca from food source					Total daily Ca (mg)	Total daily milk (g/d)
	Milk	Yoghurt	Cheese	Other dairy	All dairy		
Baseline (n=94)	25	6	16	5	52	920	177
LNAHK (n=43)	30	7	3	3	44	916	207
OZDASH (n=94)	34	15	8	4	60	1275	330
HC (n=48)	38	22	12	5	76	1778	503

Outcomes - Initially participants consumed an average of 1.7 serves of dairy/d. After dietary education, this intake increased to 2.7 serves/d on OD and 4.5 serves/d on HC ($P < 0.05$). Whilst on LNAHK, participants had an average of 1.4 serves of dairy/d. During OD, participants made up the 3 serves of dairy/d by increasing reduced-fat milk and yoghurt. On HC, participants additionally increased reduced fat cheese (>25% reduction). Milk intake on the LNAHK was maintained, and as instructed participants reduced intake of hard cheese with a high salt content.

Conclusion - A recommendation of 3 serves of dairy/d as part of the OD (total dietary approach) resulted in an average total daily Ca of more than 1200mg/d through an increase in reduced-fat milk and yoghurt. There was no change in total dietary Ca on LNAHK, but a decrease in Ca from dairy products other than milk.

Serum 25-hydroxyvitamin D status of New Zealand adolescents and adults

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Background - Suboptimal vitamin D status has been associated with lower bone mineral density and may increase the risk of osteoporosis later in life. New Zealand adolescents and adults may be at risk of suboptimal vitamin D status because of low vitamin D intakes, decreased sun exposure, and the country's location (35-46°S).

Objective - To determine 25-hydroxyvitamin D concentrations in New Zealand adolescents and adults 15 y or older who participated in the 1997 National Nutrition Survey.

Design - The nationally representative sample was recruited using an area based sampling frame with a three stage stratified design consisting of a selection of primary sampling units (PSU), households within a selected PSU, and a single randomly selected respondent within a household. Serum 25-hydroxyvitamin D concentrations were measured using a radioimmunoassay kit (DiaSorin, MN).

Outcomes - Serum 25-hydroxyvitamin D concentration [geometric mean (95%CI)] of the population (n=3008) was 50 (48, 51) nmol/L. Serum 25-hydroxyvitamin D concentration in Māori (n=379) was 42 (39 to 45) nmol/L; in Pacific People (n=138) it was 37 (33 to 41); and in NZEO (n=2491) it was 51 (49 to 52) nmol/L. Overall, the prevalence of vitamin D deficiency (<17.5 nmol/L) and insufficiency (<37.5 nmol/L) was 3% (2 to 4) and 28% (25 to 30), respectively. The prevalence of vitamin D deficiency was 3% (1 to 5) amongst Māori, 5% (3 to 7) amongst Pacific People, and 3% (2 to 4) amongst NZEO. The prevalence of insufficiency was 41% (34 to 48) amongst Māori, 50% (40 to 60) amongst Pacific People, and 25% (23 to 28) amongst NZEO. Multiple regression analysis revealed that mean Vitamin D concentrations were lower in females [46 (45,48)] than males [51 (49,53) nmol/L], lower in the winter [45 (44, 47) nmol/L] than summer [45 (50, 55) nmol/L] and lower in Māori [41 (38, 44) nmol/L] and Pacific People [36 (33, 41) nmol/L] than NZEO [51 (49, 52) nmol/L].

Conclusions - Serum 25-hydroxyvitamin D concentrations are low in the New Zealand adolescent and adult population. The potential consequences of this lower vitamin D status, particularly amongst Māori and Pacific People, are not clear but should be investigated.

The NZ Food Safety Authority funded the vitamin D analysis. The Ministry of Health funded the 1997 National Nutrition Survey.

NSA Concurrent Oral Session 4: Lipids

The effect of dietary saturated fat on endothelial function

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Background - The impact different dietary fatty acid profiles have on endothelial function is not well understood.

Objective - To determine whether diets high in unsaturated fats induce greater endothelial vasodilation compared to diets high in saturated fat (SFA) or carbohydrate (CARB).

Design - Cross-over design of 40 healthy subjects (19 men; 21 women) stratified by high or low (1.22mmol/l women; 0.9mmol/l men) high-density lipoprotein cholesterol (HDL-C) concentrations. Subjects were randomly assigned to 4 diets of 3 weeks duration which were isocaloric and enriched with approximately 20% energy as polyunsaturated fat (PUFA), monounsaturated fat (MUFA), SFA or CARB. Flow Mediated Dilatation (FMD) and fasting lipids were measured following each intervention.

Outcomes - FMD was impaired following the SFA diet ($5.41 \pm 2.45\%$ vs $10.80 \pm 3.69\%$ for all other diets, $P < 0.01$). LDL cholesterol concentrations were elevated after SFA compared to all the other diets ($P < 0.005$). Triglyceride concentrations rose in the low HDL-C group following CARB (High HDL-C group 1.20 ± 0.58 vs Low HDL-C group 2.90 ± 1.67 , $P = 0.008$).

Conclusions - Diets high in saturated fat impair endothelial function assessed by FMD compared to diets high in PUFA, MUFA or CARB. Subjects with low HDL-C had an increase in triglyceride on CARB but this had no impact on FMD.

Macadamia or olive oil enriched diets induce changes in heart structure and function similar to regular exercise in rats

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Background- Previously, we found that the hearts of rats fed olive oil as a sole fat source developed non-pathological hypertrophy, characterised by larger left ventricular volumes, increased cardiac outputs, and a greater resistance to ischaemic stress. These changes are similar to those observed in 6-week exercise trained rats on a standard rat chow (SRC) diet.

Objectives- to determine if dietary macadamia and olive oil (oleic acid rich), generate similar adaptations in heart physiology, and to test if such changes translate into an endurance advantage.

Design- Rats were divided into 3 groups of 12 rats. Each group received one of three diets differing only in oil source. One group received a control diet (SRC), one group received a diet containing extra virgin olive oil, and one group received a diet containing macadamia oil. Each diet group of rats was further divided into two subgroups of 6 rats, one subgroup being run-trained for 30min/day run at 0.8km/h for 5 days on a treadmill. The other subgroup was left untrained. All rats were run challenged to exhaustion on the 6th day and rested on the 7th. After 7 weeks of diet with or without exercise training, rats underwent *in vivo* echocardiography to calculate cardiac function. Hearts were then isolated and perfused to examine tolerance to 20 min of ischemia followed by 30 min of reperfusion.

Outcomes- Improved cardiac structure, endurance performance *in vivo* and recovery after ischaemia in animals fed macadamia or olive oil, compared to the control diet. Exercise did not appear additive to diet although macadamia fed animals had the highest exercise endurance times.

Conclusions- These findings suggest macadamia oil confers similar beneficial effects on the cardiovascular system to those seen with olive oil. These favourable events resemble (but are not amplified by) those evoked by regular exercise in rats.

NSA Concurrent Oral Session 4: Lipids

The effect of different plant oils used in preparing tomato sauces on plasma concentrations of lycopene and oxidative status: a dietary intervention study

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Background - Consuming tomatoes with oil can increase the bioavailability of lycopene.

Objective - To investigate the effect of different oils on lycopene bioavailability and/ or the oxidative status in humans.

Design - A cross-over dietary intervention study was employed, with eleven healthy subjects, with a 2 wk washout period between each of the four dietary treatments. Each treatment involved the subjects consuming two meals consisting of tomato sauce (500 g tomatoes plus 25 mL of oil) and pasta in one day. Blood samples were collected at baseline, 5 h after the lunchtime meal and 12 h after the evening meal. The tomato sauces were prepared with four different oils; high phenolic olive oil, low phenolic olive oil, high oleic-safflower oil or safflower oil. Plasma carotenoids, vitamin E, fatty acids, 8-isoprostanes F₂, oxidised and total LDL, cholesterol and triacylglycerols were measured.

Outcomes - Carotenoid concentrations were measured in the tomato sauces and it was found that tomatoes cooked with high phenolic olive oil contained at least a two-fold higher concentration of lycopene, than when tomatoes were cooked with low phenolic olive oil (p = 0.025), high-oleic safflower oil (p = 0.013) and safflower oil (p = 0.009). There was a significant increase in plasma lycopene concentrations after consuming one tomato sauce meal containing high phenolic olive oil (p = 0.018). There was a significant decrease in the oxidised LDL to total LDL ratio after two tomato sauce meals prepared with safflower oil. There was no effect of the treatments on the other parameters measured.

Conclusions - The present study found that the type of oil present during cooking significantly affected tomato sauce lycopene concentrations. This result has widespread implications for food processors such as the preparation of high lycopene tomato sauces.

Detrimental effect of high dose eicosapentaenoic acid supplementation on bone density in ovariectomised Sprague Dawley rats

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Background - Estrogen deficiency results in disruption of the normal bone remodeling cycle leading to a loss of bone mineral and, in many cases, the development of osteoporosis.¹ Various studies have demonstrated a beneficial effect of essential fatty acids (EFAs) in reducing the loss of bone density as a consequence of estrogen deficiency.¹⁻³

Objective - The aim of the present study was to examine the specific effects of the n-3 EFA, eicosapentaenoic acid (EPA) on bone density and strength in ovariectomised female rats.

Design - 60 Sprague-Dawley rats were randomized into four groups and either ovariectomised (n=45) or sham operated (n=15). Ovariectomised animals were fed calcium adequate diets containing either corn oil (OVX control, n=15), corn oil + 0.1 g/kg body weight EPA (low dose, n=15) or corn oil + 1.0 g/kg body weight EPA (high dose, n=15) for a period of nine weeks. Sham rats were fed the corn oil diet as per the OVX control group. Serum type 1 collagen c-telopeptide concentration, bone density, bone ash and bone breaking strength were measured. Plasma fatty acid composition was also determined.

Outcomes - Femur bone density was significantly lower in the high dose group compared to sham, OVX control and low dose EPA groups (P<0.001, P=0.0096 and P=0.0047 respectively). No significant differences in serum concentrations of type-1 collagen c-telopeptide or bone breaking strength were evident with either dose of EPA compared to unsupplemented, ovariectomised controls. EPA supplementation resulted in significant decreases in the levels of n-6 EFAs and increases in the levels of n-3 EFAs except docosahexaenoic acid in plasma lipids.

Conclusion - 1.0 g EPA/kg body weight had a detrimental effect on bone density in ovariectomised rats. It is proposed that high intake of the highly unsaturated EPA resulted in significant lipid peroxidation. This inhibited intestinal calcium absorption thereby stimulating PTH-mediated bone resorption.

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NSA Concurrent Oral Session 4: Lipids

Visual development of preterm infants fed high dose docosahexaenoic acid

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Background - Preterm infants fed breast milk or docosahexaenoic acid (DHA) supplemented formula have better visual responses than infants fed formula with no DHA.

Objective - To determine the optimal intake of DHA for infant visual development of preterm infants.

Design - Infants born at <33 weeks gestation were enrolled in a double-blind randomised controlled trial of DHA supplementation. Enrolments were stratified for gender and birth weight (<1250 g and ≥1250 g). Mothers providing breast milk consumed 3 g of oil in capsules containing either soy oil (no DHA), or tuna oil (900mg DHA) that resulted in milk with either a standard (0.3%) or high dose (1.0%) of DHA. Infants requiring supplemental formula feeds were fed a formula with a matching fatty acid composition. Infants were fed the test diets from enrolment until their due date. VEP acuity and latency were assessed at 2 and 4 months corrected age (CA).

Outcomes - Of 143 infants enrolled, 139 were invited to attend visual assessment appointments (4 withdrawals and 1 infant died). Infants ranged in gestational age from 24 to 32 weeks at birth, 658 g-2620 g birth weight, and 66 were born <1250 g. At 2 months CA, 66 female and 58 male infants attended follow up appointments, and 68 female and 58 male infants at 4 months CA. VEP latency and acuity was found to be age dependent and there were small effects of gender and diet.

NSA Concurrent Oral Session 4: Lipids

Development and evaluation of foods enriched with omega-3 (ω 3) fatty acids from fish oilK Murphy¹, J Mansour², C Patch³, T Mori², B Meyer³, L Tapsell³, M Noakes⁴, P Clifton⁴, I Puddey², P Howe¹¹Nutritional Physiology Research Group, University of Adelaide & University of South Australia, Adelaide, SA 5000²School of Medicine & Pharmacology, University of Western Australia, Perth, WA 6000 ³Smart Foods Centre,University of Wollongong, Wollongong, NSW 2522 ⁴CSIRO Health Sciences & Nutrition, Adelaide, SA 5000

Background- Consumption of fish or fish oils rich in very long chain (VLC) ω 3 reduce cardiovascular (CV) disease by acting on risk factors such as blood clotting, hypertension, blood triglycerides or loss of compliance in blood vessels.

Objectives- To determine whether a 1g/d target intake for VLC ω 3 can be sustained using ω 3 enriched processed foods; and if regular consumption of these foods can improve CV health.

Design- Overweight volunteers with high blood lipids were enrolled in a dietary intervention trial in Adelaide (n=50) and Perth (n=44) and were randomised to eat 8 serves/day from a selection of ω 3 enriched foods (~125mg/serve) or matching control foods, which were substituted for equivalent foods in their regular diet.

Outcomes- VLC ω 3 intake estimated by food compliance questionnaires was slightly below target (750mg/day) but DHA and total VLC ω 3 content of erythrocytes increased by 45% and 35% respectively at 3 months and by 70% and 53% at 6 months. The increases were not accompanied, however, by changes in CV or inflammatory markers and there were no significant effects attributable to the ω 3 enriched foods versus the control foods.

(n)	Control foods			Omega-3 enriched foods		
	Initial (44)	0 to 3m (44)	0 to 6m (36)	Initial (42)	0 to 3m (42)	0 to 6m (38)
Small artery compliance ¹	6.8±0.6	-0.06±0.3	-0.52±0.3	7.29±0.5	0.06±0.3	-0.46±0.3
Systolic blood pressure ²	128±1.9	3.6±2.5	1.5±2.6	128±1.9	-0.15±2.5	1.4±2.1
Diastolic blood pressure ²	74±1.3	-3.2±3.3	-2.7±3.5	76±1.4	-0.42±1.1	0.03±1.6
Plasma Triglycerides ³	1.9±0.1	0.07±0.1	0.09±0.1	1.8±0.1	0.2±0.1	-0.02±0.1

Values are Mean± SEM; Repeated measures ANOVA; ¹mL/mmHg \times 10; ²mmHg; ³mM

Conclusion- Although regular consumption of ω 3 enriched processed foods increased erythrocyte VLC ω 3 to levels comparable to fish oil supplementation, the increase was insufficient to improve selected health parameters.

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Dietary omega-3 fatty acid supply influences mechanisms controlling body weight and glucose metabolism

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Background - Omega-3 polyunsaturated fatty acids are known to influence crucial membrane functions, eicosanoid metabolism and gene expression mechanisms.

Objective - To determine the influence of dietary omega-3 fatty acid supply on ingestive behaviour, body weight, adiposity and glucose tolerance.

Design - Female rats were fed with a α -linolenic acid (ALA) sufficient (CON) or deficient (DEF) diet throughout gestation and lactation. Three groups of male offspring were studied: (1) pups maintained on CON diet, from mothers on CON diet, CON (n=11); (2) pups maintained on DEF diet, from mothers on DEF diet, DEF (n=11); (3) pups maintained on CON diet from weaning (3 weeks of age), from mothers on DEF diet, DEF-CON (n=11). Food intake, body weight, fat and oral glucose tolerance were assessed in adult offspring. Brain gene expression of 3-week old and adult offspring was evaluated. Fatty acid profile of mothers' milk was also analyzed. Statistical analysis by ANOVA; P<0.05 was considered significant.

Outcomes - CON-mothers showed a 15-fold increase of ALA content in milk compared with DEF-mothers. Relative to CON offspring, adult DEF-CON offspring consumed more food (P<0.05), were heavier, had a greater proportion of body fat and showed impairment in glucose tolerance; adult DEF animals had similar food intake, body weight, proportion of body fat, but showed impaired glucose tolerance. Two genes coding for proteins involved in glucose homeostasis (Pttg1; Pituitary tumor-transforming 1, Exoc7; exocyst complex component 7) were under-expressed in DEF weanlings but not in adult animals. The expression of genes coding for glucose transporter 4, insulin and leptin receptors and neuropeptide Y were not altered due to omega-3 deficiency.

Conclusions - Deficiency of omega-3 fatty acids from conception adversely affected glucose tolerance, assessed in adulthood. Exposure of DEF offspring to CON diet from weaning, however, caused more severe disruption of physiological mechanisms, possibly initiated by changes in the mechanisms controlling food intake.

NSA Concurrent Oral Session 5: Animal Nutrition & Human Food

Carbohydrate rich diets exacerbate postprandial lipaemia in moderately dyslipidemic subjects, whereas red meat protein-enriched diets have no adverse effects

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Background - Hypocaloric high protein diets are increasingly advocated for weight management, however their effect on cardiovascular risk factors, particularly postprandial lipaemia is not well understood. Low energy, high carbohydrate diets have also been utilized for weight loss, but have a tendency to exaggerate plasma triglyceride levels, an independent cardiovascular disease risk factor. Delineating the effects of macronutrients on plasma lipids is confounded by concomitant weight reduction, because the latter has effects independent of diet.

Subjects with, or considered at risk of coronary artery disease frequently have greater plasma concentrations of chylomicron remnants and exaggerated lipaemic responses, following the ingestion of fats.

Objectives - In this study, we investigated post-prandial lipaemia in moderately hypertriglyceridemic subjects following a standard high fat mixed meal before and after a dietary intervention.

Design - Subjects were randomised to consume a six week weight maintenance diet equal in fat content but enriched in either carbohydrates (53% of total energy intake), or protein (24% of total energy intake). Protein enrichment was achieved by increasing consumption of lean beef and lamb.

Outcomes - Subjects were moderately hypertriglyceridemic but had normal concentrations of total, LDL and HDL-cholesterol. Consumption of the protein-enriched diet had no adverse effects on fasting lipids, glucose or insulin levels. Moreover, the postprandial response indicated by the incremental area under the triglyceride and apolipoprotein B48 curves were similar before and after intervention with the high protein diet. Subjects who consumed the high carbohydrate diet had no significant changes in fasting plasma lipids, glucose or insulin, however showed a doubling in the apolipoprotein B48 incremental area under the curve.

Conclusion - Chronic consumption of carbohydrate-enriched diets substantially increased arterial exposure to pro-atherogenic chylomicrons during the post-prandial state in moderately hypertriglyceridemic subjects.

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Dietary flaxseed improves the fatty acid composition of lamb tissues

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Background - Consumers are becoming more aware of the importance of the types of fat in their diet, leading to increased interest in producing 'healthier' meat, by manipulating the fatty acid (FA) profile of meat.

Objective - To determine the effect of dietary inclusion of flaxseed oil on the FA profile of lamb tissues.

Design - Thirty-two individually-housed crossbred ewe lambs were randomly allocated to one of four barley/cereal hay feedlot rations containing either no oil (NO), 5% flaxseed oil (FO), 2.5% FO plus 2.5% palm oil (PO), or 5% PO. Another eight lambs remained on pasture as positive controls. Lambs were fed the diets for an eight-week period, after which they were commercially slaughtered. Subcutaneous fat and *M. longissimus thoracis* were collected 24 hrs postmortem for FA analyses.

Outcomes - Feeding FO increased the concentrations of both α -18:3 n-3 (1.14 vs 2.65 g/100g FA for NO and FO treatments, respectively, $P < 0.001$) and γ -18:3 n-6 (0.148 vs 0.298 g/100g FA, $P < 0.001$) and the ratio of polyunsaturated FA (PUFA):saturated FA (SFA) (0.087 vs 0.128, $P < 0.001$) in muscle lipid. Overall the n-6:n-3 fatty acid ratio was higher in muscle lipids from lambs fed NO compared to those fed either FO or pasture (4.61 vs 2.44 and 2.83, $P < 0.001$). Similar trends were observed in the subcutaneous fat samples.

Conclusions - Supplementing rations with FO is a viable means of improving the FA content of tissues from lambs finished in feedlots. In this context, the n-6:n-3 fatty acid ratio was reduced, while the PUFA:SFA ratio was increased in both muscle and subcutaneous fat from lambs supplemented with FO.

NSA Concurrent Oral Session 5: Animal Nutrition & Human Food

Levels of n-3 enrichment and Japanese consumer sensory panel ratings for lamb meat from sheep supplemented with protected linseed oil for different numbers of weeks

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Background- Most Australian export lambs spend a certain number of weeks in feedlots. This practice provides opportunity for value-adding lamb meat through the use of ingredients known to be beneficial for human health, eg n-3 fatty acids.

Objective- To determine the optimum period of supplementation required to enrich lamb meat with linolenic acid through dietary linseed oil supplementation and the consequent effect on the sensory characteristics of lamb meat as perceived by a Japanese taste panel.

Design- Forty-eight weaner lambs of similar liveweight and condition were drafted from the Yalanbee Research Station (Bakers Hill, WA) flock. They were randomly divided into 4 groups and assigned to the treatments of 0, 3, 6 or 9 weeks of protected linseed oil (PLO) supplementation (3% dry matter). The trial was arranged to have all sheep slaughtered on the same day. All sheep were fed indoors. Those assigned to the 9-week treatment were offered hay-grain mix plus PLO from Day-1. Every three weeks after that, the next group of 12 lambs was shifted to the hay-grain plus PLO diet. At slaughter, both back straps (*Longissimus dorsi*) from each animal were obtained; one was used for total fat and fatty acid analysis and the other for sensory evaluation using a 48-member consumer panel at Food Science Australia, Werribee. All the Japanese panellists had been in Australia for less than 12 months.

Outcomes- The concentration of linolenic acid (18:3n-3) in muscle was tripled after 3 weeks of supplementation (0.41 versus 1.22% total fatty acids) and continued to increase up to nine weeks (1.87%). Consumer panel acceptability ratings for most sensory attributes were not different ($P>0.05$) between muscle from unsupplemented sheep and those supplemented with PLO for the number of weeks used in this study.

Conclusions- This study suggests that there is an opportunity to significantly value-add to lamb in as little as three weeks of indoor feeding. The Japanese panellists gave similar ratings for juiciness, tenderness, flavour, odour and aftertaste for meat from all groups of lambs.

Milk conjugated linoleic and *trans*-vaccenic acids are highest in Spring in grazing cows

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Background – Conjugated linoleic acid (CLA) and *trans*-11 18:1 (vaccenic acid; VA) from dairy products are purported to confer health benefits. Concentrations of CLA and VA are particularly high in milk from cows grazing at pasture but little is known about seasonal and management impacts on these fatty acids (FA).

Objective – To determine the effect of season and farm management practices on milk CLA and VA concentrations.

Design – Milk was sampled from cows every 13 wk over 12 mo on 24 farms in northern Victoria. All farms had Spring and Autumn calving herds. Sampling of 12 farms commenced ca. 7 wk after the initial 12 farms so samples were obtained ca. every 7 wk. Farms were selected to reflect a range in input of concentrates (<15-50% of energy to support lactation) with most of the remaining energy from pasture and conserved forage. Methylated CLA and *trans* 18:1 FA isomers were separated using Ag²⁺ reverse-phase HPLC and data were analysed by REML.

Outcomes – The mean total CLA concentration was 9.1 mg/g milk FA (range 1.1-35.4 mg/g) with the *cis,trans* 9,11 accounting for about 84% of the total CLA. The mean total *trans* 18:1 concentration was 60.2 mg/g milk FA (range 13.6-268 mg/g) with VA accounting for about 54% of total *trans* 18:1 FA. Total CLA and VA were highest in August/September (Spring) (15.1 and 76.3 mg/g FA) and lowest in November to March (5.6 mg/g FA) and May to July (9.53 mg/g FA), respectively. For every MJ increase in pasture ME/kg DM there were increases in *cis,trans* 9,11 CLA and VA contents of 1.61 ($P<0.001$) and 5.6 mg/g FA ($P=0.028$), respectively. For every mg/g increase in *cis,trans* 9,11 CLA and VA contents milk fat decreased by 0.013 ($P=0.046$) and 0.004% ($P=0.002$), respectively. Other minor *trans* 18:1 and CLA isomers, particularly *trans,trans* isomers, were also inversely related to milk fat %.

Conclusions - Seasonal factors appear to be major drivers of variation in CLA and VA in milk fat produced in northern Victoria. Some CLA and *trans*-18:1 FA isomers may be involved in the regulation of milk fat content.

NSA Concurrent Oral Session 5: Animal Nutrition & Human Food

Improving bone health to optimise calcium metabolism in the dairy cow

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Background- Parturient paresis or milk fever in dairy cows results when the calcium (Ca) homeostatic mechanisms fail to adequately replace the Ca lost from the blood at the onset of lactation. Ca lost from the blood has to be replaced by improved absorption from the diet and also from the degradation of bone tissue. Most of the recent researches on bone with regard to milk fever focus on the use of anionic supplements to alter the dietary cation- anion difference (DCAD) of the diet, which in turn alters the metabolic status in the animal promoting bone loss. **Objective-** The purpose of the following experiment is to examine the possibility that manipulating the diet by addition of potassium (K) in late lactation alters the DCAD of the diet thereby preventing bone loss in the dairy cows which maybe useful in improving bone mineral density in older cows, such that by calving their bone tissue is better able to mobilise calcium in response to hypocalcaemia and subsequently reduce the risk of milk fever. **Design-** Twenty Four Holstein Friesian cows, 6 months pregnant and in their third or more parity were allocated to two groups and fed a diet comprising a low K hay with a pelleted concentrate containing either 1.25% K or 2.55% K as dry matter (DM). The K content of the diet of the treatment group was increased by the addition of potassium carbonate (400g/cow/day) to the concentrate portion of the diet. The cows were fed their respective diets from the beginning of their sixth month of pregnancy until two weeks prior to parturition. Thereafter, all cows will be returned to the commercial herd and fed their normal commercial diet until six weeks after calving. Bone biopsies, blood and urine samples were collected throughout the experiment.

Outcomes - The animals were gaining weight satisfactorily from the start to the end of dry period and supplementation of Potassium Carbonate did not affect the overall weight gain. The urine pH was markedly higher in the cows supplemented with K than that of the control group, following supplementation with K the urine pH averaged 0.25 ± 0.10 units higher than that of the control group. The average urine pH at calving for the control and the treatment groups were 8.21 ± 0.04 and 8.03 ± 0.20 respectively. There was no significant difference in the average daily milk yield between the two groups in the first six weeks of calving. **Conclusion -** It is evident from the results on urine pH that the addition of K to the diet has led to a change in the acid - base status of the animal, which may possibly benefit the bone mineral status of the cow. This should be confirmed by the soon to be performed analysis of the bone biopsies.

The gluconeogenic potential of *Gliricidia sepium* and *Calliandra calothyrsus*

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Background - The high susceptibility of *Leucaena leucocephala* (*Leucaena*) to *Heteropsyla cubana* (psyllid) has given some urgency to the examination of *Gliricidia sepium* (*Gliricidia*) and *Calliandra calothyrsus* (*Calliandra*) as potential alternative sources of high quality protein and energy for ruminant animals.

Objective - This study was undertaken to examine the gluconeogenic potential of the two legumes.

Design - Twenty-four, 6-month-old sheep, divided into four even groups, were fed fresh leaves of *Leucaena*, *Gliricidia* or *Calliandra* or the control diet of Rhodes-grass hay mixed with urea at 1.4 %. Animals were offered feed at a level equivalent of 150g crude protein/head/day. Glucose flux rates were estimated using the classical isotope dilution technique.

Outcomes -	Leucaena	Gliricidia	Calliandra	Rhodes grass	±SE
OM intake (g/d)	693 ^a	690 ^a	709 ^a	520 ^b	55
OM digestibility	62 ^a	62 ^a	50 ^c	63 ^a	2.6
Plasma glucose (mM)	3.7	3.5	3.1	3.2	0.36
Glucose flux (mmole/h)	40 ^a	38 ^{ab}	27 ^c	32 ^{bc}	3.7
(mmole/g OM intake)	1.39 ^a	1.31 ^a	0.92 ^b	1.50 ^a	0.14

Means, within a row, with different superscripts differ significantly (P<0.05)

While organic matter (OM) intakes were similar among animals fed legumes, the proportion of OM intake apparently absorbed was lowest (P<0.05) in animals fed *Calliandra*. This difference was not reflected in concentrations of plasma glucose. However, glucose flux rates clearly reflected the differences in the amounts of OM apparently absorbed from the gut. Animals on the *Leucaena* and the *Gliricidia* diets had higher total glucose flux rates, as well as glucose flux/g OM absorbed, than those fed *Calliandra*.

Conclusion - Dietary *Gliricidia* might be better than *Calliandra* at promoting an increase in glucose supply in ruminant animals. *Calliandra* appears to be limited not only by a lower rate of absorption of its OM from the gut but also by a lower gluconeogenic potential of its OM.

NSA Concurrent Oral Session 6: Miscellaneous

Dietary supplement use in people being treated for depression

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Background - Dietary supplement use has increased over the last 10 years, but information about characteristics associated with their use and possible interactions with prescription drugs is lacking.^{1,2} Up to 50 % of adults have been reported to take dietary supplements, and while the taking of supplements has been found to be related to some physical morbidities², there is no information about supplement use in people being treated for depression.

Objective - To determine dietary supplement use in people being treated for depression.

Design - Participants were recruited for a clinical trial to determine the effect of fish oil on mood in the treatment of depression. Exclusion criteria included any co-existing psychiatric disorder (except anxiety disorders), blood clotting disorders, unstable medical conditions, and those already taking fish oil supplements. Demographic information, details about the participants' depression and current therapies, use of dietary and herbal supplements in the previous 12 months, and physical activity were collected at baseline. Characteristics of supplement users were compared to non-users using either chi-squared tests or Mann-Whitney U-tests.

Outcomes - Forty-five of 72 participants (63%) who provided dietary supplement information had taken at least one dietary supplement within the previous 12 months. On average, supplement users were found to have taken 2.8 ± 1.6 dietary supplements during the assessment period. Women were more likely to be taking supplements than men ($P < 0.001$).

Conclusion - Dietary supplements are used frequently in people being treated for depression. This has important implications for treatment as little is known about supplement-drug interactions.

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Alcohol, genome instability and breast cancer

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Background - Alcohol abuse is associated with an increase in risk for a variety of cancers.^{1,2} The specific association between alcohol consumption and increased risk of breast cancer has been a consistent finding in numerous studies to date however the biological mechanism remains unknown.³

Objective - One possibility is that alcohol induces genome instability including specific pathological events commonly seen in breast cancer, such as chromosome 17 aneuploidy and/or HER2-neu gene amplification.

Design - The cytokinesis block micronucleus (CBMN) assay was used to assess the ability of alcohol to induce genome damage in two cell lines; one containing a mutation of the BRCA1 gene, treated chronically with alcohol for a period of 6 weeks. It was demonstrated that in these cell lines, chronic treatment with physiological concentrations of alcohol (0.36%, 1.36%) induces micronuclei, nucleoplasmic bridges and nuclear buds, indicative of the various genome damaging events of chromosome loss and breakage, chromosome rearrangement and gene amplification respectively.

Outcomes - Using the technique of chromogenic in situ hybridisation (CISH), it was possible to assess the occurrence of the specific genome instability event of chromosome 17 aneuploidy in these cell lines. Results from this assay indicate chronic treatment of alcohol induces chromosome 17 aneuploidy in both cell lines.

Conclusion - The results from this study support the hypothesis that alcohol induces genotoxic events that are relevant to cancer risk including breast cancer risk.

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NSA Concurrent Oral Session 6: Miscellaneous

Evaluation of the use of the CBMN assay to determine inter-individual variation in spontaneous and folate deficiency-induced genome damage in humans

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Background – Folate deficiency causes genome and developmental defects in the fetus. However, the extent to which individuals vary in their sensitivity to the genome damaging effects of folate deficiency remains unknown. The cytokinesis-block micronucleus (CBMN) assay, one of the best validated and sensitive cytogenetic techniques for measuring chromosome breakage and chromosome malsegregation, appears to be sensitive enough to detect the genotoxic effects of moderate folate deficiency.

Objective - To test the capacity of the CBMN assay to detect inter-individual variation in base-line genome damage rates and sensitivity to the genome damaging effects of folate deficiency in the physiological range.

Design - Base-line and folate-deficiency induced micronuclei (MNi) in lymphocytes were measured in one individual on six different occasions and in six different individuals on single occasions. Other biomarkers within the CBMN assay such as nucleoplasmic bridges (NPB, a marker of chromosome rearrangement), nuclear buds (NBUD, a marker of gene amplification), necrosis and apoptosis were also measured. The effect of folate deficiency was investigated in long-term lymphocyte cultures in medium containing either 12nM or 120 nM folic acid.

Outcomes - MNi, NPB, NBUD and apoptosis were all significantly increased in 12nM folic acid cultures compared to 120nM folic acid cultures (all $P < 0.0001$). Inter-individual variation was significantly greater than intra-individual variation for MNi ($P = 0.0049$) and apoptosis ($P = 0.0208$) only.

Conclusions – The CBMN assay is a robust and reproducible method for measuring genome damage caused by folate deficiency within the physiological range; however only the MNi and apoptosis measures are reliable enough for measuring inter-individual variation in spontaneous and folate-deficiency induced genome damage.

Dairy calcium and vitamin D stimulate postprandial thermogenesis: effect of sequential meals

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Background – Recent evidence suggests that an increase in dietary calcium may reduce adiposity. Breakfast meal composition has a significant influence on insulin sensitivity following lunch.

Objective – (i) To determine the acute effects of increasing calcium and vitamin D in breakfast meals on diet induced thermogenesis (DIT) and fat oxidation, (ii) to examine whether such changes had carry-over effects on a subsequent lunch meal.

Design – 11 subjects (mean \pm SEM, age 54 ± 1.2 yr, weight 84.6 ± 5.39 kg, and BMI 31 ± 2.4 kg/m²) participated in a single blind, cross over study with a sequential-meal design. Volunteers were randomised to high dairy calcium (543 mg), high vitamin D (349 IU) breakfast (HCB) or a low dairy calcium (248mg), low vitamin D (12 IU) breakfast (LCB). Both breakfasts were followed by a very low calcium (48 mg), low vitamin D (25 IU) standard lunch (SL). Breakfast meals were isocaloric, with similar macronutrient profiles and identical volumes. Energy expenditure was assessed by indirect calorimetry and postprandial responses were calculated as the change from fasted values. Data was analyzed by a 2 x 2 repeated measures ANOVA with diet (HCD vs. LCD), meal (lunch vs. breakfast) and diet x meal interaction.

Outcomes – Non-esterified fatty acids (NEFA) were less suppressed following HCD compared to LCD: $-18.2 \pm 5.9\%$ vs. $-30.1 \pm 4.7\%$; diet effect $P < 0.02$). DIT was significantly higher on the HCD diet ($6.8 \pm 0.42\%$ vs. $4.4 \pm 0.71\%$, diet effect $P < 0.01$). Fat oxidation was less suppressed on the HCD diet (-1.6 ± 1.49 g/4h vs. -4.3 ± 1.04 g/4h, diet effect $P < 0.05$). Glucose and insulin responses were significantly higher at lunch compared to breakfast. This was accompanied by significantly higher carbohydrate oxidation at lunch (16.8 ± 2.7 g/4h vs. 11.5 ± 3.4 g/4h; meal effect $P < 0.03$).

Conclusions- Higher calcium and vitamin D acutely stimulated postprandial thermogenesis and fat oxidation. Overall, the rank order of effects established at breakfast, were maintained over lunch.

Acknowledgement – The study was funded by Dairy Australia.

NSA Concurrent Oral Session 6: Miscellaneous

Bioavailability of folic acid from fortified rice in humans using stable isotope techniquesA de Ambrosis¹, J Arcot¹, P Haber², J Paterson¹, G Smythe³ and M Guilhaus³¹Food Science and Technology, University of NSW; ²Royal Prince Alfred Hospital, NSW³Bioanalytical mass spectrometry facility, University of NSW

Background – In order to retain water-soluble vitamins on a fortified rice grain, coating of the rice grain with an edible coating has become popular. Preliminary studies by Shrestha¹ show pectin to give reasonably good protection against processing losses in the rice. Pectin, being an indigestible fibre, may have the ability to entrap or bind with the added folate decreasing its absorption efficiency.²

Objective - The aim of this study was to measure the relative bioavailability of folic acid from fortified rice *in vivo*; to study the effect of the edible coating material on absorption of folic acid in comparison with a pharmaceutical dose.

Design - Healthy volunteers (n=22 f, n=5 m, aged 18-39 years) received three test meals in three randomized short-term cross-over trials as follows: TRIAL 1: aqueous 400 µg ¹³C₅-PteGlu TRIAL 2: 200g cooked white rice + aqueous 400 µg ¹³C₅-PteGlu TRIAL 3: 200g fortified white rice with pectin coating containing 400 µg ¹³C₅-PteGlu. Blood samples were drawn at 0, 1, 2, 5 and 8 hours postprandial. For 24 hours prior to the baseline level and during the AUC study, the subjects were placed on a low-folate diet (100 µg/day). The relative bioavailability of the folic acid following meal 3 was measured by taking the area under the curve relative to meals 1 and 2. The levels of metabolized ¹³C₅-5methyl-THF appearing in plasma were quantified using HPLC-MS/MS.

Results - Preliminary analysis of the results (n=10) show the relative bioavailabilities of trial 2 and trial 3 to be 85.3 ± 36.5 % and 77.0 ± 29.0 % respectively.

Conclusions – Based on the preliminary observations, it appears that the pectin coat reduces folic acid bioavailability in pectin coated rice.

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Omega-3 polyunsaturated fatty acid content in different edible portions of Sydney rock oyster

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Background - Previous studies showed that n-3 polyunsaturated acid (PUFA) content might vary between different edible portions of seafood. However, there are no data available on the variation of fatty acid content between different edible portions of Sydney rock oyster, *Saccostrea commercialis*.

Objective - To compare the fatty acid contents of muscle, gonads and gills of Australian commercial oyster species, *Saccostrea commercialis*.

Design - Eight samples of oysters were analysed. The total lipid was extracted with chloroform-methanol (2:1, v/v) containing butylated hydroxytoluene. The fatty acid methyl esters were prepared by saponification using KOH followed by transesterification in BF₃ in methanol. The fatty acid methyl esters were separated by gas liquid chromatography.

Outcomes - Gonads contained significantly higher levels of total n-3 PUFA, 20:5n-3 and 22:6n-3 than muscle and gills (P<0.01). Higher levels of total n-6 PUFA, saturated fatty acids (SFA) and monounsaturated fatty acids (MUFA) were also recorded in gonads than in muscle and gills (P<0.05) while total lipid content did not vary significantly between the three edible portions.

	Muscle	Gonads	Gills
20:5n-3(mg/100g)	47.1 ± 14.8	349.9 ± 23.3	123.8 ± 21.7**
22:6n-3 (mg/100g)	96.4 ± 25.1	507.9 ± 35.9	217.2 ± 46.1**
Total n-3 PUFA (mg/100g)	190.5 ± 47.9	1101.2 ± 186.6	442.4 ± 80.3**
Total n-6 PUFA (mg/100g)	64.2 ± 21.2	155.5 ± 32.2	62.2 ± 13.5*
Total SFA (mg/100g)	157.8 ± 49.0	516.2 ± 48.4	310.3 ± 44.3**
Total MUFA (mg/100g)	63.7 ± 18.8	340.1 ± 96.6	114.5 ± 39.5**

Values are mean ± SD. *P< 0.05, **P<0.01.

Conclusion - Gonads of commercial oysters are a better source of long chain n-3 PUFA than muscle and gills.

Consumption of oysters with well-developed gonads will provide a good source of long chain n-3 PUFA and will have beneficial effects on health.

NSA Poster Presentations: Wednesday 11 August 2004

The effect of dietary nucleotide supplementation on growth and immune function in term infants: a randomised controlled trial

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Introduction - Nucleotide (NT) supplemented infant formulas have been commercially available for a number of years despite the fact that clinical efficacy of NT supplementation has not been well established in randomised controlled trials.

Objective - Our aim was to assess the effect of NT-supplemented formula on infant growth and biochemical indices of immune function.

Design - This was a randomised controlled double blind trial of NT-supplementation in formula fed infants. Eligible infants were healthy, born at term and had a birth weight greater 2500g. Study outcome measures included lymphocyte subsets (CD4, CD8, NK), NK cell activity and cytokine production at 7 weeks of age, and plasma antibody concentrations of tetanus, diphtheria and haemophilus influenzae B at 7 months of age. Growth was assessed at 7 weeks, 4 and 7 months of age. An unblinded reference group of breastfed infants was also included.

Primary comparisons were made between the infants in the randomised groups. Secondary analyses included comparisons with breastfed infants.

Outcomes - 89/98 formula fed infants allocated to the NT-supplemented formula, 98/102 infants allocated to the control formula and 116/124 breastfed infants completed the trial to 7 months of age. Growth of NT-supplemented and control formula fed infants did not differ. There were no differences in the proportion or absolute number of lymphocyte subsets, NK cell activity, or cytokine production between any groups. IgG antibody concentrations to diphtheria (median 0.36 [0.09, 1.22] vs 0.27 [0.08, 1.65], n=138) and tetanus (median 1.57 [0.42, 3.43] vs 1.01 [0.41, 4.66], n=138) were higher in infants fed NT-supplemented formula compared with control infants. There were no differences between the formula fed groups and the breastfed group.

Conclusions - NT-supplementation of infant formula does not alter the growth of formula fed infants but may improve antibody responses to diphtheria and tetanus vaccines in comparison with control formula. The clinical significance of this change in plasma antibody concentrations is yet to be elucidated.

Food sources of sodium prior to and during the OZDASH study

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Objective - To assess the main food sources of sodium (Na) whilst on three different diets (OZDASH Study).

Design - The OZDASH diet (OD) was a moderate Na, high potassium (K), high calcium (Ca), low-fat diet. The high calcium diet (HC) was high in reduced-fat dairy products. The low Na, high K diet (LNAHK) was high in fruit and vegetables, low in salt and no-added-salt (NAS) bread was provided. Ninety-four participants completed OD, 48 HC and 43 LNAHK. An average of two 24-hr recalls at baseline (B) and during each 4-wk diet was used to estimate dietary Na intake. Foods were classified into 20 groups; the 4 groups providing most Na at B are shown in the table.

	B %	B (mg)	% Na and total daily Na (mg) from each food group					Na (mg)
			OD %	OD (mg)	HC %	HC (mg)	LNAHK%	
Breads/cereals	38	1093	39	822 †	33	960	21 ‡	233 ‡
Bread only	8	224	10	208	6	183	2 ‡	19 ‡
Meat products/dishes	17	479	9 ‡	180 ‡	16	467	15	170 ‡
Milk products/dishes	11	301	21 ‡	429 ‡	25 ‡	732 ‡	18 ‡	201 †
Sav sauce/condiments	9	264	7	152	6	178	5	57 ‡
Total Na (mg/d)		2864		2088 ‡		2913		1098 ‡

‡P<0.001 †P<0.01 compared to baseline

Outcomes - Breads/cereals provided the most Na both at B and on each diet, but the total Na provided reduced significantly from B to LNAHK by 30% (P<0.001) and OD by 9% (P<0.01). Only when NAS bread and low salt education was provided (LNAHK), did the amount of Na provided by bread alone fall significantly (7%, P<0.001).

Conclusion - Breads/cereals provide a large proportion of total dietary Na. Changing regular bread to NAS bread, and including low-sodium cereals/biscuits, can decrease total sodium intake by one-third.

NSA Poster Presentations: Wednesday 11 August 2004

β-Hydroxy-β-Methylbutyrate (HMB) supplementation of resistance trained men

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Background: Several studies of HMB supplementation with resistance trained individuals have been carried out previous to this study, however results have been indeterminate, and there have been concerns regarding the methodology of previous studies.

Objective: The purpose of this study was to validate or dispute claims of increased strength, increased fat free mass, and decreased fat mass with HMB supplementation during a period of resistance training, in trained men.

Design: A randomised double-blind, placebo controlled study was used to investigate the effects of supplementing 34 resistance trained men with 3g/d of β-hydroxy-β-methylbutyrate or cornstarch placebo on strength and body composition over 9 weeks of supplementation. During the study period; questionnaires were completed by participants; anthropometric measurements taken; body composition measured using bioelectrical impedance analysis; strength assessed using 1 repetition maximum strength testing; and food intakes assessed using 3-day dietary records. During the study period all participants completed the same resistance-training program.

Outcomes: Following supplementation there was no significant change found in anthropometric measurements ($P > 0.095$), however percent change in leg extension strength increased significantly more in the HMB-supplemented group than the placebo (LE: HMB $14.7 \pm 3.6\%$; Placebo $4.84 \pm 2.8\%$, $P = 0.041$). In addition, there were some significant differences found between dietary intakes of the supplementation groups. The HMB group consumed a greater percent of energy from carbohydrates, had a higher maltose intake, consumed less energy from fats, and had lower average cholesterol intake, than the placebo group ($P < 0.047$). Several study participants failed to meet the recommended dietary intakes for adult New Zealanders for energy from carbohydrates, and intake of vitamin A, vitamin E, niacin, vitamin B6, potassium, magnesium, calcium, and selenium.

Conclusions: This study found no effect of HMB supplementation on body composition, however there was a significant increase in leg extension strength with HMB supplementation in response to resistance exercise.

Trends in dietary intake and physical activity level in female students (1988 to 2003) after excluding under-reporters, using six different methods to identify under-reporters

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Background – Exclusion of under-reporters (UR) have affected conclusions in some studies.

Objective - To investigate trends in non-under-reporters (NUR) using different methods to identify/exclude UR.

Design - Analysis of recorded energy (EI) and macronutrient intakes and activities in 887 female university students, 1988 to 2003. Physical activity level (PAL) and energy expenditure (EE) were determined using a factorial method. Methods used to identify UR were; (A) EI:EE < 0.76 ; (B) Goldberg method (1) using subjects classified into three activity categories (low, PAL=1.56; medium, PAL=1.64; high, PAL=1.82); (C) Goldberg method (1) using PAL=1.55; (D) EI:BMR < 1.1 ; (E) EI:BMR < 1.27 ; (F) EI:EEp < 0.70 , where EEp was EE predicted from an equation. Trends were determined using linear regression of median data for NUR for each year.

Outcomes – The number of NUR using each method (A-F) and the statistical significance of trends (P value) in dietary intake and PAL between 1988 and 2003 are shown in the table.

	No. NUR	EI	PAL	% Alcohol energy	% Protein energy	% Fat energy	% CHO energy	Alcohol (g)	Protein (g)	Fat (g)	CHO (g)
A	440	0.017	0.663	0.138	0.329	0.011	0.190	0.180	0.042	0.209	0.003
B	598	0.077	0.666	0.213	0.038	0.000	0.042	0.216	0.020	0.032	0.184
C	679	0.459	0.403	0.202	0.034	0.000	0.084	0.311	0.018	0.006	0.088
D	618	0.453	0.768	0.144	0.055	0.000	0.082	0.180	0.054	0.009	0.165
E	413	0.018	0.664	0.196	0.201	0.003	0.435	0.285	0.072	0.288	0.008
F	331	0.008	0.573	0.592	0.423	0.018	0.183	0.601	0.129	0.175	0.014

Conclusions – Some trends varied with method used to identify UR. Using the more stringent methods (A, E and F), energy (EI) and CHO intake (g) increased over time, while % fat energy decreased.

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NSA Poster Presentations: Wednesday 11 August 2004

Erythrocyte biomarker-based validation of a diet history method used in a dietary intervention trial

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Background - Intervention trials provide the evidence for potential health benefits of dietary manipulations. The quality of the dietary data is critical for relating benefits to nutrient intakes. Although diet histories are often used to assess dietary intake in intervention trials, they have seldom been validated with objective measures.

Objective - To determine, in a dietary intervention trial, the validity of the diet history method using erythrocyte fatty acid composition as a gold standard indicator of fatty acid intakes.

Design - Overweight volunteers with mild cardiovascular risk factors and consuming less than one serve of fish per week were randomly assigned to either the intervention group (n=43) or the control group (n=48). Subjects were asked to choose at least eight serves per day from a selection of either omega-3 fatty acid enriched foods (~125 mg very long chain omega-3 (VLC n3) per serve) or matched control foods. Dietary intake was assessed using a diet history method and analysed using Foodworks (Australian Fatty Acids Rev 0.6 (Royal Melbourne Institute of Technology, 2002) with analytical data for the test foods added to the database. Erythrocyte fatty acid fractions were extracted from blood collected at baseline, three-months and six-months and was quantified by gas chromatography.

Outcomes - Dietary intakes of docosahexaenoic acid (22:6 n3), eicosapentaenoic acid (20:5 n3), VLC n3 and total n3 were related to levels of the same parameter seen in the erythrocyte membranes at three-months (Pearson's correlation; r=0.463, 0.418, 0.421, 0.341 respectively; P<0.001) and six-months (r=0.743, 0.663, 0.641, 0.515 respectively; P<0.05), but not at baseline.

Conclusions - The VLC n3 accumulated in erythrocytes after three-months of dietary supplementation reflect habitual dietary intakes assessed from diet histories. However, at customary lower rates of consumption (~200mg/day), they do not accurately reflect the n3 intakes of individuals.

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Food advertisements during children's and adult's viewing times: a comparative study

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Background - Current estimates of the prevalence of obesity in childhood in Australia are between 27-30%.¹ Television advertising of food to children is a contributing factor. Food advertisements on Australian television occur frequently and the majority of content is for foods high in saturated fat and sugar, most notably fast foods, chocolate and sugared cereals.²

Objective - To describe the quantity and content of food advertising on Australian television directed at children and adults as well as the marketing methods used in the promotion of food.

Design - Seventy five hours of television programming including advertisements from three commercial stations in Victoria were recorded. Content analysed included the types of products advertised, the representation of foods on adult's and children's television, and the marketing methods used.

Outcomes - Children's and adult's television advertisements occurred at a frequency of 20/h and 27/h respectively, while the frequency of food advertisements was identical for both audiences at 6/h. Adult's advertisements contained more core food products such as breads and cereals, fruit and vegetables, and dairy products. Children's television advertising of food used more cartoon (25.1%) and animated (13.7%) characters, a faster pace (3X), and the themes of magic, adventure and violence (50%) than adult's did.

Conclusions - There are differences between the types of food advertised on children's and adult's television. Results suggest the use of manipulative advertising directed at children. The foods predominately advertised to children do not support current dietary recommendations for optimum health or avoidance of overweight and obesity.

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2. Zuppa JA, Morton H, Mehta KP. Television food advertising: counterproductive to children's health? A content analysis using the Australian Guide to Healthy Eating. *J Diet Assoc Aust*, 2003;60(2):78-84

NSA Poster Presentations: Wednesday 11 August 2004

How does dietary advice for diabetes management divide families?

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Background – Healthy eating for a person with type 2 diabetes is the same as that recommended generally. In diabetes management, however, healthy eating advice often targets individuals with diabetes in isolation from their family context.

Objective – To explore how healthy eating for diabetes management and prevention is negotiated by urban Indigenous people within their families.

Design - Ethnographic study in a Brisbane Indigenous community was conducted in 2003-4. Research included indepth interviews with 25 people who either had diabetes, were family members or people with other risk factors for diabetes. Participant observation in community events, health-focussed groups and family homes was also conducted.

Outcomes – Often women with diabetes tried to prepare special recommended food for themselves but prepared 'normal' food for the family. This is tiring, time consuming and expensive and so, often not sustained. Community members typically refer to foods such as full cream milk, white bread, cordial and fatty meats as 'normal' foods. 'Normal' meals do not have a focus on low fat or higher fibre. 'Normal' snacks and take-aways are high fat. The types of foods nutritionists recommend for healthy eating patterns, management of diabetes and weight are not regarded as normal by many in this community. Thus these foods remain special diet foods. It is not usual for people with diabetes to consider their recommended diet to also be good for other family members.

Conclusions – People with diabetes often find it hard to maintain special diets they have been recommended. Opportunities to address diabetes prevention in family contexts are lost by focussing dietary advice solely on the individuals with diabetes. Recommendations for healthy family food may be more effective than recommendations for individual dietary changes.

Evaluating the short-term impact of nutrition education in outpatient cardiac rehabilitation programs

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Background – Nutrition education (NE) is an essential part of the risk factor modification component of cardiac rehabilitation (CR) programs in Australia, but there is a lack of information about the effectiveness of NE in CR.

Objective - To determine whether NE in Victorian outpatient CR programs improves the short-term knowledge, attitudes and dietary behaviour of participants, and the effects of differencing amounts of NE.

Design – Observational study in three hospital outpatient and two health centre established CR programs. The NE content of the programs varied: one had 4.5 hours (long NE), two had one hour of NE per program (short NE), and two had no NE between assessments (no NE). Eighty volunteer patients were studied from each program. Pre- and post-program assessments consisted of self-administered questionnaires of dietary knowledge, healthy eating attitudes and fat intake.

Outcomes – In all groups, participants' baseline knowledge was poor, but attitude was positive and fat intake was low (compared to community survey using the same instrument). All groups improved significantly in dietary fat knowledge, with increase greatest in the group with the longest intervention. Attitude improved most and fat intake declined most in the group with the longest intervention.

Mean difference (CI 95%)	Scale	Long NE		Short NE		No NE	
Knowledge	(0-21)	3.5	(2.6 to 4.4)	1.7	(-0.9 to 2.5)	2.0	(1.3 to 2.8)
Attitude	(10-50)	3.0	(2.0 to 4.0)	0.5	(-0.3 to 1.3)	0.0	(-0.6 to 0.7)
Fat intake	(0-62)	-4.6	(-5.7 to -3.5)	-0.8	(-1.8 to 0.1)	-1.9	(-2.8 to -1.1)

Conclusions- Greatest improvements resulted from weekly knowledge-based NE sessions and individual dietary advice. Programs should thus be encouraged to offer this input to ensure that pre-existing dietary changes are maintained, and to facilitate further improvements.

NSA Poster Presentations: Wednesday 11 August 2004

Practical food-based dietary guidelines developed for 12-24 month old New Zealand toddlers

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Background - Up to 33% of 12-24 month old urban New Zealand (NZ) children have sub-optimal iron status related to inadequate dietary iron intakes. Dietary intakes of other essential micronutrients are also often low in this population.

Objective - To develop practical food-based dietary guidelines (FBDGs) for 12-24 month old NZ toddlers that, if put into practice, will ensure adequate micronutrient intakes.

Design - Two sets of FBDGs were designed and tested using linear programming analysis and food consumption data (3-day weighed food records) recently collected from a representative sample of 12-24 month old urban South Island NZ toddlers (n=188). The FBDGs were distinguished on the basis of the inclusion or exclusion of fortified toddler foods. In this analysis, nutritional and palatability constraints were introduced, and deviations from observed food consumption patterns were minimised. This ensured nutritionally adequate FBDGs that were consistent with habitual food consumption patterns of NZ toddlers.

Outcomes - Practical FBDGs, which ensured nutritionally sound diets, were achievable only when fortified toddler foods were included in them. In these FBDGs, toddlers are encouraged to consume at least two toddler sized servings of foods from each of the cereal, dairy, fruit and vegetable food groups, as well as one toddler sized serving from each of the meat/fish/poultry/eggs/legumes and fortified toddler foods food groups per day. In addition, at least four toddler sized servings of carrots/pumpkin, and two of orange/kiwifruit/mandarin are recommended per week to ensure adequate intakes of vitamins A and C. FBDGs that exclude fortified toddler foods were designable. However, to ensure nutritional adequacy, they were necessarily prescriptive, which means adherence to them may prove difficult.

Conclusions - FBDGs that ensure nutritionally sound NZ toddler diets are only practical when they include a guideline for fortified toddler foods. The bioavailability of iron and zinc from these fortified toddler foods, however, is unknown. Hence, the efficacy of these FBDGs, for ensuring optimal micronutrient status of NZ toddlers requires further research.

How achievable are recommended dietary allowances for 12-24 month old New Zealand children?

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Background - Reported nutrient intakes of 12-24 month old New Zealand (NZ) children are often below the USA/Canadian recommended dietary allowances (RDAs).

Objective - To investigate whether RDAs are achievable with modest changes to NZ toddler diets.

Design - Dietary data (weighed records) collected from 12-24 month old NZ children (n=188) were analysed using linear programming analysis. In this analysis, the minimum dietary modifications required to achieve the RDAs for 13 nutrients, when feasible, were examined while allowing (1) modifications in the food portion sizes, (2) increases in red meat and (3) replacement of cows' milk with fortified toddler milk. All models minimised the difference between each child's actual and modelled food intakes while meeting constraints on dietary energy (child's reported intakes), nutrients (RDAs), and on the food portion sizes (up to twice the reported amounts). Unfeasible modelled diets did not meet at least one constraint.

Outcomes - Before modelling, only 7% of the reported toddler diets achieved all RDAs. Iron was the most difficult RDA to achieve (15% achieved it) followed by Ca (71%). Only 39%, 46% and 78% of modelled diets were feasible after allowing changes in the food portion sizes, red meat intakes and the type of milk, respectively. The most common changes (expressed as a % of diets in which they were present) were increased amounts of fortified breakfast cereals or milo (9-75%), meat/fish/legumes (4-30%) and milk (20-26%) with corresponding decreased amounts of milk (8-59%), other beverages (1-18%) and cakes/biscuits (1-15%), depending on the model run.

Conclusions - Achievement of the RDAs in toddler diets, especially for iron, is difficult given their small appetites relative to high nutrient requirements. Implications for nutrition planning and promotion become important, if achievement of the USA/Canadian RDAs in NZ toddler diets is our desired aim.

NSA Poster Presentations: Wednesday 11 August 2004

Are meal replacements an effective strategy for treating obesity in adults with features of metabolic syndrome?

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Background - Meal replacements as a weight loss strategy are widely used, however their effectiveness outside controlled clinical trial environments is unknown.

Objective - To compare meal replacements with a structured weight reduction diet in overweight/obese Australians with raised triglycerides.

Design - In a randomised parallel design, 2 groups [Meal Replacement (MR) and Control (C)] of 66 matched subjects underwent a 6000kj intervention for 3 months (stage 1) and a further 3 months (stage 2). Groups were provided oral and written information. C was supplied shopping vouchers and followed a low fat/energy diet. MR was supplied Slimfast™ product for two meals (1800kj) and consumed a low fat evening meal. Clients were weighed every 2-wk, received structured supervision without professional dietary input, with compliance assessed by 3d-weighed food records. Blood biomarkers assessed fruit/vegetable intake and questionnaire assessed attitudes to treatment.

Outcomes - Fifty-five subjects completed stage 1 and 42 stage 2. Mean weight loss was comparable in both groups at 3 months (6.0±4.2 kg ± sem MR, 6.6±3.4 kg C) and at 6 months (9.0±6.9 kg MR, 9.2±5.1 kg C). Serum folate and plasma β-carotene were higher in MR, and plasma homocysteine fell in both groups. Diets were nutritionally adequate in both groups, but some nutrient intakes were higher in MR than C. The MR program was viewed by subjects remaining in the study as acceptable and convenient, thereby aiding compliance.

Conclusions - A meal replacement program is equally effective for losing weight compared to a conventional but structured weight loss diet. Meal replacements offer a convenient and potentially nutritionally beneficial weight loss alternative than conventionally structured weight loss diets.

Determining the energy requirements of army recruits

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Background – The Australian Army's recruit training course was reduced recently from 12 weeks to 45 days, leading to a substantial intensification in training tempo. On most days recruits are active from 0600 to 2200 h. The course is both physically and psychologically demanding. Anecdotal reports of excessive fatigue among recruits led senior staff at the Army's Recruit Training Centre to question the adequacy of the food provided to recruits.

Objective – To determine whether or not the quantity and nutritional quality of food available to recruits is sufficient to meet their energy requirements.

Design – Total energy expenditure (TEE) was estimated by the factorial method. This involved making detailed observations of the timing and nature of physical activities, assigning values obtained from the scientific literature¹ for their energy cost, and then summing to estimate daily TEE. Several days' activities were observed, including days of relatively low-intensity, moderate-intensity and high-intensity physical activity.

Outcomes – On average, male recruits were found to expend ~17 MJ and female recruits ~13 MJ per day. The gender-weighted mean TEE, based on the ratio of females to males (15:85), was calculated to be 16.5 MJ/day. The current Army entitlement to food provides ~17 MJ per person per day. Using this figure, and an estimated value for food wastage, it is estimated that the recruits mess provides between 15 MJ and 16 MJ of energy intake per recruit per day. However, during their training, recruits also have access to several other food sources.

Conclusions – Taking all food sources into account, it is concluded that the total food available to recruits provides sufficient energy to sustain them through the Army's 45-day recruit training course.

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NSA Poster Presentations: Wednesday 11 August 2004

Very low carbohydrate diets for weight loss and cardiovascular risk¹

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Background - It is not clear to what extent high saturated fat very low carbohydrate (VLCARB) diets for weight loss affect cardiovascular (CVD) risk.

Objective - To compare a VLCARB diet isocalorically to 2 conventional weight loss strategies on a spectrum of cardiovascular risk factors after energy balance was re-established.

Design - Sixty seven subjects aged 48±8y, total cholesterol 5.9±1.0mmol/L, and BMI 33±3kg/m² were randomly allocated to one of 3 isocaloric weight loss dietary interventions which were energy restricted for 8 weeks (6MJ) and in energy balance for 4. The diets were Very Low Fat (VLF) (10% fat, 3% saturated fat), High Unsaturated Fat (HUF) (30% fat, 6% saturated fat) and Very Low Carbohydrate (VLCARB) (61% fat, 20% saturated, 4% carbohydrate).

Outcomes - VLCARB resulted in 9.2% weight loss compared to VLF (7.3%) and HUF (7.0%) (P=0.034). DEXA data revealed no difference in percent total fat loss between diets. Lean mass loss was higher on VLCARB and VLF (31-32% of weight loss) compared to HUF (21%) (P<0.05). LDL-C increased 0.18±0.18mmol/L on VLCARB but decreased 0.40±0.11mmol/L on VLF and 0.34±0.14mmol/L on HUF (P=0.009). VLCARB had the greatest triglyceride reduction (-0.73±0.12mmol/L) followed by HUF (-0.15±0.07mmol/L) and VLF (-0.06±0.13mmol/L) (P<0.001). HDL-C increased only on VLCARB (+0.06±0.03mmol/L). Plasma homocysteine increased 6.6% on VLCARB, decreased 6.8% on VLF and remained unchanged on HUF (P=0.026 for diet effect). VLCARB lowered fasting insulin by 33% compared to a 19% fall on HUF and no change on VLF (P<0.001). All diets resulted in significant decreases in fasting glucose, blood pressure and CRP with weight loss (P<0.05).

Conclusion - Under isocaloric conditions VLCARB results in substantial improvements but also some deterioration in cardiovascular risk factors compared to conventional weight loss patterns.

¹*Sponsorship: National Heart Foundation of Australia*

Acute effect of dietary proteins on appetite, energy intake and glycemic response in overweight menJ Bowen¹, M Noakes¹, P Clifton¹, A Jenkins², M Batterham²¹*CSIRO Health Sciences and Nutrition, Adelaide, SA 5000*²*Smart Foods Centre, University of Wollongong, NSW*

Background – Dietary protein is thought to be the most satiating macronutrient. It is unclear if protein type affects appetite and energy intake.

Objective – To investigate the role of whey and casein proteins, relative to high and low glycemic index carbohydrates (glucose and lactose, respectively) in appetite, energy intake and glycemic response.

Design – Eighteen overweight men (53.4 ± 1.5 y, BMI 32.2 ± 0.9kg/m²) with impaired glucose tolerance (6.3 ± 0.1mmol/L) consumed a liquid “breakfast” preload (~1 MJ, 50 g of whey protein isolate, calcium caseinate, lactose or glucose) and ate an *ad libitum* “buffet lunch” three hours later. Preloads were administered in a single blind, randomised order and separated by a seven day interval. Energy intake, visual analogue scale (VAS) ratings of appetite and post prandial glucose and insulin were measured 0, 15, 30, 45, 60, 90, 120 and 180 minutes after commencing the preload.

Outcomes – There was a trend for lower *ad libitum* energy intake at lunch after the whey preload (4070 kJ ± 293, casein 4343 ± 301 kJ, glucose 4678 ± 260, lactose 4122 ± 234, P=0.06). VAS ratings of satiety, hunger, emptiness and desire to eat were not different between treatments (assessed by area under the curve, AUC, 0 – 180 min). Post prandial glucose AUC was significantly lower after the whey and casein preloads compared to the carbohydrate based preloads (P=0.026), although post prandial insulin AUC was similar.

Conclusions- Acute, *ad libitum* energy intake and subjective ratings of appetite are not affected by consumption of whey and casein liquid preloads. Similarly, energy intake and appetite are not influenced by protein or carbohydrate based preloads, despite different post-prandial glucose responses.

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Oxidised LDL in newly diagnosed type 2 diabetes mellitus and impaired glucose toleranceL MacDonald-Wicks, LZ Gibson, DM Godfrey, JM Green, BP Horan, KL Monger,
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Background - It is recognised that individuals with diabetes have a 2-3 fold increase in mortality secondary to coronary artery disease¹ and individuals with impaired glucose tolerance (IGT) also share this risk.² Factors that contribute to the endothelial cell dysfunction associated with the initiation of atherosclerosis include oxidative stress.

Objective - The present study examined baseline levels of biomarkers associated with atherosclerosis in people with newly diagnosed type 2 diabetes.

Design - Twelve subjects were recruited with either type 2 diabetes or impaired glucose tolerance diagnosed within the last 3 months, with control subjects (12) sex matched. Biomarkers and anthropometry measured included oxidized LDL, fatty acids, HbA_{1c}, blood glucose level, insulin, C-reactive protein (CRP), weight, height, waist circumference, vitamins A and E.

Outcomes - The results showed significant differences between waist circumference ($p=0.005$), Body mass index (BMI) ($p=0.01$), CRP ($p=0.0019$) and triglycerides ($p=0.035$). While a small difference between oxidized LDL levels was observed, it was not statistically significant. Positive correlations emerged between oxidized LDL and HbA_{1c} ($r=0.442$, $p=0.031$), oxidized LDL and triglycerides ($r=0.569$, $p=0.004$), and oxidized LDL and CRP ($r=0.441$, $p=0.031$).

Conclusion - It is concluded that although no statistically significant difference in oxidized LDL was found between the two groups, the positive correlations found with oxidized LDL and HbA_{1c}, CRP and triglycerides warrant further investigation. The results showed a relationship between the biomarkers of diabetes mellitus and a serum oxidized LDL level.

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Inhibition of platelet aggregation from people with type 2 diabetes mellitus following consumption of tomato juice

SA Lazarus, ML Garg

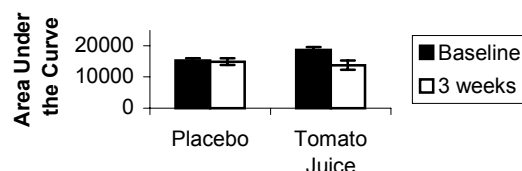
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Background - Platelet hyperreactivity is one of the metabolic abnormalities found in type 2 diabetes mellitus and contributes to this populations increased risk of developing cardiovascular complications. Recently, clarified tomato juice has been shown to inhibit human platelet aggregation *in vitro*¹ and in an animal model of thrombosis²

Objective - The aim of this study was to determine whether the consumption of a clarified tomato juice could inhibit *ex vivo* platelet aggregation in patients with type 2 diabetes mellitus or impaired glucose tolerance.

Design - Twenty patients were randomly assigned to consume 250 mL of clarified tomato juice or placebo tomato-flavoured beverage daily for 3 wks. Fasting blood samples were collected at baseline and following supplementation. Platelet aggregation was monitored for 5 min following stimulation of platelet rich plasma (500 μ L) with collagen (1 mg/L).

Outcomes - Following supplementation with tomato juice, platelet aggregation was significantly lower as compared to baseline ($P=0.001$) and compared with the placebo group ($P=0.002$). No difference was observed in the placebo group between baseline and post-supplementation ($P=0.85$).



Conclusion - Consumption of tomato juice may provide a safe, dietary alternative to reduce platelet activity; however, larger randomised controlled trials are needed to determine whether tomato juice can improve cardiovascular outcomes in patients with type 2 diabetes mellitus.

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NSA Poster Presentations: Wednesday 11 August 2004

Comparative serum cholesterol and glucose responses of rats fed on wheat flour and chickpea composite flour

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Background - Composite flours (CF) have proven practical uses in the cereal industry in many parts of the world. Cereal based products made from CF have found easy acceptability. Chickpea (CP) is capable of lowering blood cholesterol (BC) and blood glucose (BG) levels and is consequently effective against coronary heart disease (CHD) and diabetes mellitus (DM).

Objectives - To determine the efficacy of wheat flour blended with CP on BC and BG levels.

Design - WF was fortified with CP flour at 10% replacement level to produce the CF. Proximate analysis of CF along with WF was carried out. Young male Sprague-Dawley rats (n=14) were divided into two groups having 7 rats in each. One group was fed CF and the other WF (control). Feed intake was determined daily while body weight was measured weekly. At the end of 40 days, rats were decapitated and their serum was procured for future analysis.

Outcomes - Comparing the palatability of WF and CF, there was no significant difference between feed and water intake but body weight showed a significant difference ($P < 0.05$). Protein, ash, moisture, fat and fiber was significantly higher in CF as compared to WF ($P < 0.05$). Serum total cholesterol, glucose, Low density lipoprotein cholesterol (LDL-C) was found to be significantly lower in the group fed CF as compared to WF ($P < 0.05$) while no significant difference was found in high density lipoprotein cholesterol (HDL-C) and triglycerides between the two groups.

Conclusion - Consumption of chickpea CF can be of assistance in lowering of BC, BG and LDL-C thus leading to lesser risk of developing CHD and DM.

Effect of combined propolis-ethanol-extract and Shaoyao-Gancao-tang on blood sugar levels in rabbits with alloxan induced experimental diabetes

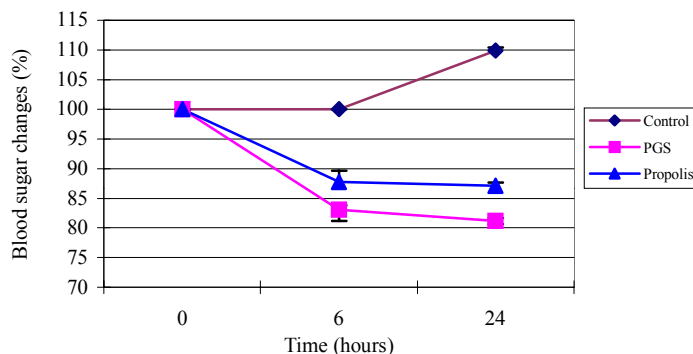
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Background - Propolis, a bee-hive product, has been used as a Chinese folk medicine for thousand years, with reported beneficial effects on various clinical conditions.¹ Shaoyao-Gancao-tang, a prescription Chinese Medicine, is a mixture of the water extract of liquorice (*Radix Glycyrrhizae*) and peony (*Paeonialaciflora*) roots.

Objective - To investigate the effect of combined propolis-ethanol-extract and Shaoyao-Gancao-tang (PSG) on blood sugar levels of rabbits following alloxan induced experimental diabetes.

Design - PSG was prepared as a 1:1 mixture of propolis-ethanol-extract and water extract of liquorice and peony roots. Fasting (8 h) blood sugar $>180\text{mg/mL}$ was considered as experimental diabetes after rabbits were treated with 100mg/kg of 5% alloxan for 72 h. Blood sugar levels of the diabetic rabbits were measured after they were given a 0.3g/kg oral dose of PSG (n=8) or propolis (n=8) at 6 and 24 h, respectively. A control group of diabetic rabbits (n=8) had no PSG or propolis administered and were tested at the same time points.

Outcomes - Compared with control group, diabetic rabbits treated with PSG or propolis showed a significant reduction in blood sugar levels at 24 h ($P < 0.05$), and PSG was more potent than propolis alone (Figure).



Conclusions - The results indicated that propolis-ethanol-extract has a beneficial effect on reduction of blood sugar levels in alloxan induced diabetic rabbits, and may have a synergistic effect with Shaoyao-Gancao-tang.

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NSA Poster Presentations: Wednesday 11 August 2004

The effect of short-term altered macronutrient status on *acne vulgaris* and biochemical markers of insulin sensitivity

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Background – It has been suggested that a low-glycemic index diet may alleviate acne and this hypothesis is currently being investigated in a long-term dietary intervention study. A short-term, live-in study was designed to further investigate this link and to provide information on the short-term effects of altered macronutrient levels.

Objective – To determine the short-term effects of a low-glycemic load diet on markers of insulin sensitivity and how this relates to the clinical progression of *acne vulgaris*.

Design – Eleven male acne sufferers, aged 15-20, were allocated to either a high protein (HP, n=6, 40-45% energy from carbohydrate, 25% energy from protein) or high carbohydrate group (HC, n=5, 55-60% energy from carbohydrate, 10% energy from protein). Fat intake was maintained at 30-35% energy for each group. All meals were provided on an *ad libitum* basis for 7 days. Food consumed was measured at baseline and during the live-in study for an overall assessment of an individual's glycemic load. At baseline and day 7, the subject's acne was assessed by a dermatologist and blood was sampled for hormonal markers of acne and HOMA-IR.

Outcomes

Group	Glycemic load/day		Acne inflammatory count		HOMA-IR	
	HP (n=6)	HC (n=5)	HP	HC	HP	HC
Baseline ^a	202.5 ± 11.8	191.2 ± 11.4	34.7 ± 5.8	6.2 ± 2.9	1.73 ± 0.45	1.82 ± 0.39
Day 7 ^a	89.4 ± 9.5	239.8 ± 7.9	33.6 ± 3.8	10.4 ± 6.0	1.12 ± 0.26	1.90 ± 0.22
P value ^b	0.001	0.006	0.90	0.32	0.09	0.85

^a Values expressed as mean ± SEM. ^b Statistical evaluation within groups was obtained using paired t-test

Conclusion – The sample size and/or study length was insufficient to observe any significant changes in inflammatory counts or HOMA-IR in either the HP or HC groups. Although some results appear promising, further research is needed to confirm the diet-acne connection.

NSA Poster Presentations: Thursday 12 August 2004

Relationship between BMI and serum and lipoprotein lipids in the Hangzhou regionD Li¹, XM Yu², XQ Zhou², YH Zhang¹, T Yao¹, AJ Sinclair³¹Department of Food Science and Nutrition, Zhejiang University, Hangzhou, China, 310029²Clinical laboratory, Zhejiang Hospital, Hangzhou, China³Department of Food Science, RMIT University, Melbourne, VIC, 3000

Background – Many epidemiological and observational studies have consistently confirmed a direct correlation between body weight, mortality and multiple CVD risk factors including dyslipidemia, hypertension and glucose intolerance. BMI measurement is the most commonly used measure of general adiposity.

Objective – The aim of the present study was to investigate the relationship between BMI and serum and lipoprotein lipids in a population sample from Hangzhou, China.

Design – In this cross-sectional study, 271 (186 male, 56 ± 14 yrs and 85 female, 55 ± 11 yrs) free-living subjects were recruited from Hangzhou, China. BMI and other physiological parameters were measured. Each subject gave fasting blood, from which the serum and lipoprotein lipids were measured by standard methods.

Outcomes – BMI was 23.6 ± 2.9 and 22.7 ± 3.0 (kg/m²) for males and females, respectively. Male and female subjects had a serum total cholesterol (TC) 4.7 ± 0.8 and 5.1 ± 0.9 mmol/L, LDL-C 2.2 ± 0.5 and 2.3 ± 0.6 mmol/L, HDL-C 1.2 ± 0.2 and 1.5 ± 0.3 mmol/L, and triacylglycerol (TAG) 1.6 ± 0.9 and 1.3 ± 0.4 mmol/L, respectively. BMI was significantly negatively correlated with HDL-C for both genders and all subjects (P<0.05), and it was significantly positively correlated with LDL-C and TAG for males and all subjects (P<0.05) (Table).

	Male + Female (n=271)		Male (n=186)		Female (n=85)	
	R	P-value	R	P-value	R	P-value
TC	0.017	0.7863	0.078	0.3236	0.002	0.9834
LDL-C	0.137	0.0329	0.164	0.0359	0.125	0.2647
HDL-C	-0.287	<0.0001	-0.262	0.0007	-0.242	0.0283
TAG	0.240	0.0002	0.225	0.0037	0.181	0.1048

Conclusions – The present results indicate that general adiposity, expressed as BMI, was significantly correlated with CVD risk factors such as decreased HDL-C, increased LDL-C and TAG in a sample of 271 adults from the Hangzhou population. This data is consistent with the results from Western countries.

Phytosterols decrease the secretion of atherogenic lipoproteins from HepG2 liver and Caco2 intestinal cells

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Background - Several studies in humans have demonstrated the hypocholesterolemic effect of plant sterol consumption. It is unclear whether plant sterols regulate lipoprotein production and secretion from the liver and intestines, thereby decreasing the levels of circulating atherogenic lipoproteins.

Objective - To investigate the effect of the three main phytosterols: stigmasterol, campesterol, and β-sitosterol on lipoprotein production in HepG2 human liver cells and Caco2 human intestinal cells and the mechanisms involved.

Design - HepG2 and Caco2 cells were incubated for 24 h with 50 μM of the different phytosterols or 10 μM of atorvastatin. VLDL [measured by apolipoprotein B100 (apoB100)] levels in HepG2 cells and chylomicron [measured by apolipoprotein B48 (apoB48)] levels in Caco2 cells were measured using western blotting. Intracellular cholesterol levels were measured using gas chromatography. Analysis was carried out using student's t-test and ANOVA.

Outcomes - Secretion levels of apoB100 were significantly decreased by approximately 30% after incubation with all plant sterols compared to control. In addition, cholesterol ester concentrations were significantly decreased when HepG2 cells were incubated with stigmasterol, campesterol, and β-sitosterol compared to control cells. Secretion of apoB48 from intestinal cells was significantly decreased by 15% with stigmasterol, 16% with campesterol and 19% β-sitosterol compared to control.

Conclusions - Collectively the data suggests that plant sterols limit lipid (cholesterol ester) availability in cells leading to increased degradation of apoB100 in HepG2 liver cells and apoB48 in Caco2 intestinal cells. This results in decreased production of VLDL from the liver and chylomicrons from the intestine, precursors of LDL and chylomicron remnants, respectively. These results suggest that consumption of plant sterols would decrease numbers of the atherogenic lipoproteins LDL and chylomicron remnants, thereby reducing the risk of developing cardiovascular disease.

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Lack of effect of sugar cane and sunflower seed policosanols on plasma cholesterol in rabbitsKJ Murphy¹, DA Saint², PRC Howe^{1,2}*Nutritional Physiology Research Group, ¹School of Health Sciences, University of South Australia, SA 5000
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Background- Policosanols, a mixture of high molecular weight primary aliphatic alcohols from sugar cane (SCP), has been shown to be safe and effective at lowering blood cholesterol when administered in low (pharmacological) doses (5-20 mg/day) to experimental animals, healthy patients and patients with type II hypercholesterolemia.

Objective- We attempted to see whether a similar product derived from winteriser cake containing policosanols during sunflower oil production (SFP) has cholesterol-lowering potential.

Design- Normocholesterolemic rabbits were administered either a control oil (water/emulsifier/sunflower oil emulsion), 100 mg/kg SCP (Lesstanol®, provided by Johnson & Barana) (in control) or 100 mg/kg SFP winteriser cake (provided by Goodman Fielder) (in control) by gavage at 48 hour intervals for 4 weeks. Fasting blood samples were taken for cholesterol (C) and triglyceride (TAG) analysis at weekly intervals from 1 week beforehand.

Outcomes- The table shows changes in plasma lipids between averaged pre- and post-treatment values. Food intake and body weight were unaffected by the treatments. Plasma low-density lipoprotein (LDL)-C increased and plasma TAG decreased in all groups following gavage: hence there was no treatment effect of either policosanols.

Change from baseline (mmol/L)	Total C	HDL-C	LDL-C	TAG
Control (n=7)	0.07 ± 0.05	0.04 ± 0.04	0.05 ± 0.02 ¹	-0.06 ± 0.02 ¹
SFP (100 mg/kg body weight) (n=8)	0.05 ± 0.04	0.03 ± 0.03	0.05 ± 0.02 ¹	-0.06 ± 0.03 ¹
SCP (100 mg/kg body weight) (n=8)	0.17 ± 0.07 ¹	0.08 ± 0.05	0.11 ± 0.03 ¹	-0.06 ± 0.02 ¹

Values are mean±SEM; ¹Significant change from pre-treatment (P<0.05; repeated measures ANOVA with simple contrasts).

Conclusions- Our data do not confirm a hypocholesterolemic effect of policosanols extracted from either sunflower oil cake or sugar cane, even though a lower dose of SCP than used here (5 mg /day) has been reported to lower cholesterol in rabbits.¹

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The effect of diet standardisation on postprandial chylomicron response

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Background - Postprandial dyslipidaemia has been repeatedly demonstrated in subjects with or at risk of cardiovascular disease. Acute exposure of remnant lipoproteins to the blood vessel wall increases the risk of atherosclerosis¹ and endothelial dysfunction.² Despite interest in the effect of diet on lipoprotein metabolism, many studies do not control for the observation that a subjects' recent dietary patterns may influence lipoprotein levels. We have previously shown that the chylomicron response to a fat challenge examined on two occasions can vary by as much as 56% when diet is not standardised. Hence we conducted a pilot study to investigate the effect of three days of diet standardisation on postprandial chylomicron kinetics.

Methods - Five non-obese, normolipidaemic males consumed a three-day standard diet on two occasions four weeks apart. Following each diet the postprandial chylomicron (measured as apo B₄₈) and triacylglycerol responses to a high-fat meal were assessed. The standard diet represented an average dietary pattern that allowed subjects limited freedom to choose from food/snack options. The diet provided 9800 kJ, 30% of energy as fat, 52% of energy from carbohydrate and 15.3% of energy from protein.

Results - Fasting apoB₄₈ concentration was similar on both study days following the diet standardisation (8.35 ± 0.67 v 9.67 ± 1.74 µg/mL, P>0.05). A comparison of the postprandial apo B₄₈ response measured as incremental area under the curve showed no significant difference following diet standardisation (18.80 ± 2.18 v 20.34 ± 7.36 µg/mL⁻¹ h, P>0.05). In the present subjects postprandial triacylglycerol varied more than in subjects who had not undergone diet standardisation (24% v 14% variability).

Conclusion - In non-obese, normolipidaemic subjects, standardising food intake for three days reduces the intra-individual variability associated with postprandial chylomicronaemia (apoB₄₈) but it may require more days for a similar effect to be seen with postprandial lipaemia (triacylglycerol).

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NSA Poster Presentations: Thursday 12 August 2004

Conjugated linoleic acid suppresses the secretion of atherogenic lipoproteins from human HepG2 liver cells

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Background - Studies in healthy humans have shown that consumption of conjugated linoleic acid (CLA) significantly reduced VLDL and LDL cholesterol concentrations in circulation. We propose that the mechanism for decreased lipoprotein levels is due to the inhibition of production and secretion of VLDL (measured by secretion apolipoprotein B100 (apoB100)) from the liver

Objective - To investigate the effects of a mixture of CLA isomers on VLDL production and secretion in HepG2 liver cells.

Design - HepG2 cells were incubated for 24 h with 50 μ M of the different fatty acids or 50 μ M of CLA and 50 μ M of a saturated fatty acid (SFA). Effects of CLA were compared to that of a SFA (palmitic acid, PA; C16:0), an n-6 polyunsaturated fatty acid (PUFA) (linoleic acid, LA; C18:2) and a blend of CLA and PA (CLA+PA). ApoB100 levels in HepG2 cells were measured using western blotting. Analysis was carried out using student's t-test and ANOVA.

Outcomes - ApoB100 secretion was significantly decreased in cells treated with CLA and CLA+PA (44%, $p < 0.005$ and 62%, $p < 0.0005$ respectively) compared to control cells and those enriched with PA. ApoB100 secretion did not differ between CLA and CLA+PA treatments.

Conclusions - Collectively, these results show that CLA reduces apoB100 production and secretion compared to SFAs and plant-derived PUFAs, possibly by limiting the availability of free cholesterol (a requirement for apoB100 production), thus extending available evidence suggesting that CLA is potentially anti-atherosclerotic. Another novel finding of this study was that apoB100 secretion was significantly reduced with CLA even in the presence of PA, despite PA being a strong promoter of apoB100 secretion. A reduction of apoB100 production in the body would decrease the number of VLDL and the number of atherogenic LDL and thus reduce the risk of developing cardiovascular disease

The effect of chickpeas on human serum lipids and lipoproteins

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Background - Consumption of pulses has been associated with reduction of hypercholesterolaemia and reduced risk of coronary heart disease (CHD). Chickpeas have been a staple part of Indian, Mediterranean and African diets for many thousands of years but are a relatively novel addition to Western cuisine.

Objective - To compare the effect of a chickpea-supplemented diet with a wheat-based diet on human serum lipids and lipoproteins.

Design - Randomized, crossover dietary interventions each at least five weeks in duration, involving 47 free-living adults with at least one CHD risk factor, or a family history of CHD. Intervention diets were isoenergetic to the participants' usual diet, designed to be matched for macronutrient content and controlled for dietary fibre. Chickpeas were consumed in the form of canned, drained chickpeas and in bread and biscuits containing 30% chickpea flour. Results were analysed using repeated measures ANOVA by general linear modelling.

Outcomes - Reductions in the concentration of serum total cholesterol (3.9%) and low density lipoprotein-cholesterol (4.7%) on completion of the chickpea diet compared to the wheat diet. When corrected for the effect of gender, age, total fat, percent fatty acid composition and dietary fibre, the effect of diet on total cholesterol and low density lipoprotein cholesterol disappeared.

Conclusions - Despite attempts at controlling macronutrient intake, the inclusion of chickpeas in the intervention diet caused changes in dietary fat and fibre composition, leading to reduced serum total and low density lipoprotein cholesterol.

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The effect of red wine polyphenols on cardiovascular disease risk in postmenopausal women

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Background - Moderate consumption of red wine has been shown to reduce cardiovascular disease (CVD) risk, although presently, the mechanisms are unknown. Furthermore, it is unclear whether the beneficial effects of red wine are due to the alcohol or polyphenolic components. In this study we have investigated the effects of dealcoholised red wine and full compliment red wine on several cardiovascular risk factors in mildly dyslipidemic postmenopausal women.

Objectives - To elucidate whether the acute and chronic consumption of red wine polyphenols improve risk factors associated with CVD in dyslipidemic postmenopausal women.

Design - *Acute study*: Seventeen dyslipidaemic postmenopausal women each consumed a mixed meal accompanied by either water, dealcoholised red wine (DRW) or alcoholic red wine (RW) on three separate visits, in a random order, 2 weeks apart. One fasting and six hourly post-meal blood samples were taken and analysed for plasma lipids, lipoproteins, insulin and glucose at each time point. *Chronic study*: Forty five dyslipidaemic postmenopausal women were randomised into either a water-, DRW- or RW group for 6 weeks following a 4 week washout. Fasting measures of various CVD risk factors were taken at 0, 3 and 6 weeks.

Outcomes - Acute DRW consumption did not affect postprandial lipaemia. Acute consumption of RW increased postprandial TAG and insulin levels, and TG:ApoB48 ratio, compared to water. Chronic consumption of RW reduced fasting LDL-cholesterol and improved HDL-cholesterol and the HDL:LDL ratio. Vascular compliance improved with DRW consumption

Conclusions - Collectively, consumption of a single dose of DRW and RW did not produce any cardiovascular benefits in dyslipidaemic postmenopausal women. However, moderate long-term consumption of red wine and its polyphenolic constituents may reduce CVD risk by improving fasting lipid levels and endothelial function. The ethanol and polyphenolic components in red wine may act synergistically to produce these cardiovascular benefits.

Acute effects of tea on fasting and post meal blood pressure

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Background - Results of population and intervention studies suggest that drinking tea might protect against cardiovascular disease (CVD). However, tea contains caffeine, which can transiently increase blood pressure (BP) in people who have avoided caffeine for >12h. We have previously shown that a single dose of tea (equivalent to 4 standard cups containing 180mg of caffeine) transiently increased BP more than caffeine alone (180mg dose) in people who had fasted and avoided caffeine for >12h. The importance of this finding to risk of CVD is uncertain since short-term regular ingestion of tea does not alter BP, and results of population studies suggest that long-term regular ingestion of tea may lower BP.

Objective - To investigate the acute effects of tea consumption with and without food on BP.

Design - BP was measured in 20 participants with coronary artery disease before and 3.5h after drinking 3 cups of black tea or hot water with and without a meal. There were a total of 4 treatments (water alone, tea alone, meal with water and meal with tea) administered in random order. One cup of tea or water was provided at time=0, 1.5 and 3h. The meal was provided at time=0 and consumed over 0.5h.

Outcomes - In comparison to water alone, tea alone significantly increased mean (95%CI) systolic BP by 9.4 (1.3, 17.5) mmHg (P=0.01). However, there was negation of the acute pressor effect of tea when the tea was consumed after a meal (2.2 (-5.9, 10.2) mm Hg; NS).

Conclusions - A capacity for food to negate the pressor activity of tea in the fasting state may help to explain a lack of any longer-term effects to raise BP. The apparent inconsistency between the results from acute studies and studies of regular ingestion may be due to differential effects of tea, in the fasting and fed states, on BP. That is, people generally drink tea with and between meals rather than in a fasting state.

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Antioxidative behaviour of Malaysian plant extracts in model and food oil systems

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Background – ‘Pegaga’ (*Centella Asiatica*) and ‘limau purut’ (*Citrus hystrix*) are two types of plant traditionally used in Malaysian local dishes. Recent studies showed that pegaga and limau purut leaves not only can be used as food ingredients, but also can benefit human health.

Objective - To investigate the antioxidative behaviour of the crude extracts of pegaga leaves, and limau purut leaves, peels, and stems in a linoleic acid model system and in palm olein system.

Design - Antioxidant activity of these local plants were analyzed using an oxygen consumption method and by differential scanning calorimetry (DSC). The antioxidant activity of these plants were then compared to the activity of rosemary and sage, two types of antioxidant commonly found in the market.

Outcomes - From the analysis using oxygen consumption method, it was found that among the samples evaluated, pegaga leaves had the longest time to reach the 50% oxygen in the chamber, with 90 min, meaning that this sample had the highest level of antioxidant activity. This was followed by the extracts of limau purut leaves (85 min), peels (60 min), and stems (39 min). Results from the DSC analysis showed that addition of pegaga leaves and limau purut samples to the palm olein in the system reduced the oxidation as evidenced by longer T_o of antioxidants-treated samples. Statistical analysis from this study showed that there was no significant difference between T_o of pegaga leaves and those of rosemary and sage. This meant that the antioxidant activity of pegaga leaves was comparable to the activities of rosemary and sage.

Conclusion - The finding from this study indicated that all samples used in this study had very good potential to be explored as sources of natural antioxidants.

Catechins are the major source of flavonoids in a group of Australian women

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Background - Evidence is emerging for the role of flavonoids in the prevention of degenerative diseases such as cancer and cardiovascular disease.

Objective: To determine the dietary intake of flavonoids in a group of Australian women.

Design: Twelve day weighed record data were available from 24 healthy young women, participating in a larger study on diet and hormones; mean \pm SD age was 32.7 ± 9.9 y and body mass index was 23.3 ± 4.1 kg/m². Dietary data were analysed for intake of 15 individual flavonoids, comprising four major subclasses: flavonols (quercetin, kaempferol, myricetin and fisetin), flavones (apigenin and luteolin), flavanones (hesperetin, naringenin and eriodictyol) and flavanes or catechins (epicatechin, epicatechin 3-gallate, epigallocatechin, epigallocatechin 3-gallate, catechin, gallocatechin). As limited data are available for the flavonoid content of Australian food and drink items, values were mainly sourced from published international data; intake was estimated utilising data for the aglycone form and for a limited number of glucosides converted to aglycone equivalents.

Results: Mean (SEM) daily intake in the group was 25.6 ± 2.5 mg/d for flavonols, 3.9 ± 0.7 mg/d for flavones, 22.6 ± 4.9 mg/d for flavanones and 76.1 ± 15.9 mg/d for catechins; total intake of flavonoids was 128 ± 19.9 mg/d. Major food sources in this group of women were: onions, apples (with skin), tea (green, black), olives and broccoli, for flavonols; fresh parsley and celery, for flavones; oranges, grapefruit and their juices, for flavanones; and tea (green, black), apples (with or without skin), red wine, dark chocolate and cocoa, for catechins.

Conclusions: To our knowledge these results are the first Australian data available on flavonoid intake. Catechins were the major subclass of flavonoids in this group of women, providing 59% of the total intake, followed by the flavonols (20%) and flavanones (18%), and with a smaller contribution from the flavones (3%). Our mean catechin intake was higher than that reported in Finnish (14.1 mg) or American (25.4 mg/d) populations, and comparable to that in a Dutch population (72 mg/d).

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Usual intake of isoflavonoids and lignans in association with urinary excretion - evaluation of an Australian dietary tool

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Objective - To evaluate a phytoestrogen frequency questionnaire by examining the association between intake and urinary excretion of isoflavonoids or lignans in a group of Australian women.

Design - A sample of 141 women aged 40 to 59 y was recruited from a larger cohort participating in the Brisbane Longitudinal Assessment of Ageing in Women (LAW). Phytoestrogen intake over the previous month from food and supplements was assessed using a specially-designed food frequency questionnaire containing 112 items, selected to include major sources of isoflavonoids and lignans in the Australian market. Excretion was determined by analysis of nine isoflavonoids and four lignans from three 24 h urines, using HPLC MS/MS. Analyses were conducted separately for the total group and soy consumers defined as consuming ≥ 1 serve/ month of soy foods.

Outcomes - Median (range) intakes of isoflavonoids and lignans were 0.021 (0-153) and 1.61 (0.4-23) mg/d, respectively. There was a significant association between intake and excretion of isoflavonoids in the total group ($r=0.192$, $P<0.05$), with a stronger association in soy consumers ($r=0.497$, $P<0.01$). There was no significant association between intake and excretion of lignans, however both intake and excretion were associated with energy-adjusted consumption of dietary fibre ($r=0.303$ and $r=0.230$, respectively, $P<0.01$ for both).

Conclusions - The current phytoestrogen questionnaire was useful for assessment of isoflavonoids; it was not acceptably precise for measurement of lignans, however dietary fibre intake could be an appropriate surrogate. A more comprehensive phytoestrogen database, especially for lignan content, would enable more accurate estimation of intake for epidemiological studies on the relationship between phytoestrogen status and health.

Intake of phytoestrogen-rich foods and associated lifestyle and sociodemographic characteristics in Australian women

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Background - Phytoestrogen-rich soy and linseed foods are not a traditional component of Western diets however their intake has been promoted on the basis of the purported health benefits associated with high intake.

Objective - To determine intake of soy and linseed foods and constituent isoflavones and lignans in a representative sample of Australian women, and to investigate sociodemographic and lifestyle variables associated with intake.

Design - Subjects were 500 women aged 40-80 y randomly selected from the electoral roll and participating in the Brisbane Longitudinal Assessment of Ageing in Women (LAW). Intake of isoflavonoids and lignans from food and supplements was assessed by a phytoestrogen frequency questionnaire. Data were collected on nutrient intake, physical activity, smoking, alcohol intake, use of supplements, socio-economic position (SEP) (subject or partner's occupation) and education. Differences between soy or linseed consumers and non-consumers were investigated.

Outcomes - Consumption of soy food was reported by 40% and consumption of linseed by 34% of women. Median (range) intakes in soy/ linseed consumers for isoflavonoids, 3.87 (0-173) mg/d, and lignans, 2.40 (0.1-33) mg/d, were significantly higher than corresponding intakes in non consumers of 0.005 (0-2.6) and 1.57 (0.4-4.7) mg/d, respectively ($P<0.001$). Soy/linseed consumers, compared to non-consumers, had higher intakes of dietary fibre ($P=0.003$) and energy ($P=0.043$); they also reported a higher level of physical activity ($P=0.006$), SEP ($P<0.001$), education ($P<0.001$) and supplement use ($P<0.001$). There were no significant differences between consumers and non consumers in alcohol intake, smoking or use of HT.

Conclusions - Few women who chose phytoestrogen-rich foods consumed amounts similar to women with traditional soy based diets. Women who consumed soy or linseed foods differed in lifestyle and sociodemographic characteristics that could influence the association with disease outcomes in epidemiological studies.

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Phytoestrogen intake, excretion and markers of bone health in Australian womenK Hanna¹, J Wong², C Patterson¹, S O'Neill², P Lyons-Wall¹¹School of Public Health, Queensland University of Technology, QLD 4059²Betty Byrne Henderson Centre, Royal Brisbane & Women's Hospital and The University of Queensland, QLD 4006

Background – Phytoestrogens may be protective against osteoporosis due to their ability to exert oestrogenic actions on bone cells in postmenopausal women with low serum oestrogen concentration.

Objective - To examine the association between usual intake of isoflavonoids and lignans and biomarkers of bone health in a group of Australian women.

Design – Subjects were a representative group of 500 women aged 40-80 y, participating in the Brisbane Longitudinal Assessment of Ageing in Women (LAW). Intake over the previous month of isoflavonoids and lignans from food and supplements was assessed by a phytoestrogen frequency questionnaire. Bone mineral density (BMD) of femur, total hip and lumbar spine were measured by dual energy x-ray absorptiometry. Bone formation was assessed by serum bone alkaline phosphatase (bone ALP). Potential confounding factors were evaluated, including energy, macronutrient and calcium intakes, body mass index (BMI), smoking, alcohol, hormone therapy, menopause status, age and activity. Women were divided into quartiles of intake and analyses were conducted in the total group and subgroup with lower BMI (≤ 25 kg/m²) (n=200) or osteoporosis/ osteopaenia (n=219).

Outcomes - Bone ALP was significantly higher in the lowest compared to higher three quartiles of isoflavonoid intake (P=0.005) for the total group (P=0.005) and subgroup with lower BMI (P=0.002); this remained significant in the lower BMI group after adjustment for confounding factors ($F_{2,178}=3.21$, P=0.024). There were no significant associations between isoflavonoid intake and BMD at any site, or between lignan intake and any bone markers.

Conclusions - Data suggest that higher isoflavonoid intakes, especially in women with lower BMI, are associated with lower bone ALP, a short term marker of bone formation and turnover. The clinical significance of this finding and whether this effect is adequate to ameliorate age-related decline in BMD, will be explored in subsequent years of the LAW study.

Carotenoid concentrations in asthmatics versus healthy controlsLG Wood¹, ML Garg², RJ Blake², PG Gibson¹¹Respiratory and Sleep Medicine, Hunter Medical Research Institute, John Hunter Hospital, NSW, 2310²Nutrition and Dietetics, School of Health Sciences, Faculty of Health, University of Newcastle, NSW, 2308

Background - Oxidative stress and impaired antioxidant defences are increasingly recognised features of asthma. Carotenoids, such as lycopene, are potent antioxidants that are obtained from dietary sources and may protect against oxidative stress. Epidemiological evidence indicates that carotenoids and carotenoid-rich foods, including fresh fruit, vegetables, tomatoes and tomato products, are protective against asthma.

Objective - To examine carotenoid levels in blood and induced sputum of asthmatics compared to healthy controls.

Design - Peripheral blood and sputum (induced during a hypertonic saline challenge) were collected from asthmatics (n=9) and healthy controls (n=7). Carotenoids in blood and sputum were analysed using HPLC.

Outcomes - Whole blood concentrations of total carotenoids and lycopene were low in asthma compared to controls. Plasma and sputum total carotenoid (r=0.835, p=0.001) and lycopene (r=0.771, p=0.005) concentrations correlated.

Carotenoid	Whole blood concentrations (mg/L)	
	Controls	Asthma
Lycopene	0.13 (0.04-0.47)	0.03 (0.02-0.10)*
Lutein	0.09 (0.05-0.10)	0.05 (0.03-0.07)
α -carotene	0.02 (0.00-0.04)	0.01 (0.00-0.02)
β -Carotene	0.17 (0.02-0.42)	0.04 (0.02-0.12)
β -cryptoxanthin	0.07 (0.04-0.20)	0.04 (0.01-0.06)
Total	0.59 (0.14-1.23)	0.24 (0.08-0.35)*

* p<0.05 versus Controls; Values are Median (Q1-Q3)

Conclusions - We conclude that asthmatics are relatively deficient in carotenoids, increasing susceptibility to oxidative stress. Dietary supplementation with carotenoids may be beneficial in asthma.

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Effect of dietary sialic acid supplementation on saliva content in piglets

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Background - Saliva contains sialic-acid (SA) containing proteins (mucins) that influence its viscosity and protective properties. Dietary intake of SA may be responsible for differences in the salivary SA levels between breast-fed and formula-fed infants.¹

Objective - To investigate the effect of supplementation with casein glycomacropeptide (cGMP, a protein-bound source of SA) on salivary concentration in piglets during the first 5 weeks of life.

Design - Twenty 3-day-old male domestic piglets (*Sus scrofa*) from 4 litters were distributed evenly to 2 groups. The control group (n=10) was fed a standard diet of soy/whey/casein sow milk pig-replacer (55:9:36) containing 150 mg/L of naturally-occurring SA. The treatment group (n=10) received a similar formula in which cGMP replaced some of the whey and casein such that the final level of SA was 600 mg/L. Milk intake in both groups was 285 ml/kg/day during the first 2 weeks and 230 ml/kg/day for the remaining weeks, therefore the control group received 43 mg/kg/day of SA and the treatment group 170 mg/kg/day. Saliva samples (0.5-1mL) were collected once per week. Free and bound SA content were determined using HPLC.¹ During the first two weeks, 7 piglets in the control group and 4 piglets in the treatment group required antibiotics (3-day) for weaning diarrhoea.

Outcomes - Rate of weight gain was similar in the two groups (170 g/day in the control group, 155 g/day in treatment P=0.44). Total salivary SA content varied from 2% to 41% higher in the treatment group compared with the controls. The difference was significant on day 10 and day 24 (429±80, 366± 47mg/L in treatment and 253± 32, 265± 29 mg/L in control respectively, P<0.05), but not on days 17 or 31. The time trends over the whole time period were not significantly different. The majority of SA was in the bound form (>93%) and showed the same trends.

Conclusions-The findings of this study suggest that a protein-bound dietary source of SA such as cGMP increases the SA content of saliva. The level of SA in saliva may be indicative of that found in other serous fluids, plasma and other tissues, including the brain. There are implications for both immunity and development.

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Palm fruit extracts protect against oxidative damage in human red blood cellsN Balasundram^{1,2}, NS Agar¹, K Sundram², S Samman¹¹ *School of Molecular and Microbial Biosciences, University of Sydney, NSW 2006*² *Malaysian Palm Oil Board, 6 Persiaran Institusi, 43000 Kajang, Malaysia*

Background – Palm fruit (*Elaeis guineensis*) extracts have been shown to exhibit antioxidant activity in a liposome model system, acting as scavengers of reactive oxygen species via hydrogen- and electron-donating mechanisms (1).

Objective - To evaluate the antioxidant properties of palm fruit crude extract (CE) and ethanolic extract (EE) in an *ex vivo* model system using human red blood cells (RBC).

Design – Blood was obtained from healthy volunteers and collected in heparine-tubes. It was centrifuged at 3000 RPM for 20 min and RBC washed three times with phosphate buffered saline (PBS) pH 7.4. The cells were suspended in PBS to obtain a haematocrit of 10% when incubated at 37°C with 50 mM 2,2'-azobis-(2-amidinopropane) dihydrochloride (AAPH), with no extracts (Control), or with CE or EE at a final concentration of 0.1 mM gallic acid equivalence (GAE). Aliquots were taken at timed intervals over 6 h, for measurement of haemolysis, and concentrations of reduced glutathione (GSH) and methaemoglobin (MetHb). In a separate series of experiments, MetHb formation in haemolysate was induced by 1.8 mM NaNO₂, and the effects of CE and EE on the rates and extent of MetHb-formation were then measured.

Outcomes – Both CE and EE protected RBC from AAPH-induced haemolysis in a dose dependent manner. After 6 h of incubation, the degree of haemolysis in the Control was 64.3 ± 14.6%, compared with 25.9 ± 11.7% and 24.8 ± 12.9% for RBC treated with CE and EE respectively. However, no consistent effects were observed in GSH and MetHb concentrations over 6 h. Both CE and EE inhibited NaNO₂-induced MetHb-formation in haemolysates. At 0.1 mM GAE, the inhibition was 73.3 ± 5.7% for CE and 79.9 ± 3.9% for EE.

Conclusions – Palm fruit extracts delayed AAPH-induced haemolysis in human RBC. These findings suggest that the extracts protect the RBC membrane against oxidative damage induced by peroxy radicals. The results also suggest that palm fruit extracts reduce the rate and extent of oxidation of haemoglobin exposed to oxidative stress.

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The n-3 polyunsaturated fatty acid status in the Hangzhou regionD Li¹, XM Yu², YH Zhang¹, T Yao¹, XQ Zhou², AJ Sinclair³¹Department of Food Science and Nutrition, Zhejiang University, Hangzhou, China, 310029²Clinical laboratory, Zhejiang Hospital, Hangzhou, China³Department of Food Science, RMIT University, Melbourne, VIC, 3000

Background – Increased dietary intake of n-3 polyunsaturated fatty acid (PUFA) raises n-3 PUFA levels in tissues, and is associated with beneficial effects on the prevention of cardiovascular diseases and inflammation, and perhaps with neuropsychiatric disorders.

Objective – To investigate the n-3 PUFA status in the Hangzhou region in China by determination of the serum phospholipid (PL) fatty acid composition, as a biomarker of status.

Design – Cross-sectional study of 154 free-living subjects (108 males and 46 females) recruited from Hangzhou, China. Each subject gave a fasting blood sample, serum phospholipid was separated by thin liquid chromatography. Fatty acid methyl esters were prepared by standard methods, and separated by gas liquid chromatography.

Outcomes – The ages were 55.9 ± 13.7 and 55.6 ± 10.1 yrs, and BMI were 23.9 ± 3.1 and 22.6 ± 3.1 kg/m² for males and females, respectively. Table shows the serum PL composition of total and individual n-3 PUFA for both genders (as percent of PL fatty acids).

	Male (n=108)	Female (n=46)
18:3n-3	0.7 ± 0.2	0.8 ± 0.3
20:5n-3	2.1 ± 0.8	2.2 ± 1.0
22:5n-3	0.6 ± 0.3	0.5 ± 0.3
22:6n-3	5.3 ± 2.0	5.7 ± 2.2
Total n-3 PUFA	8.6 ± 2.0	9.2 ± 2.0

Conclusions – Compared with our previous study from Australian populations, where the total n-3 PUFA was found to be 5.9% of PL fatty acids¹, the higher proportion of 20:5n-3, 22:6n-3 and total n-3 PUFA in serum PL reported here may contribute to the lower coronary heart disease incidence in the Hangzhou population.

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Effects of exposure to grape-seed polyphenols and vitamin C on lipid peroxidation in vivo

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Introduction - Oxidative stress has been implicated in a number of disease processes. There is evidence suggesting that vitamin C, a major water-soluble antioxidant, may reduce oxidative stress. The effects of dietary polyphenols, water-soluble compounds with potent antioxidant activity *in vitro*, on oxidative stress are unclear.

Objectives - The objectives of this study were to investigate the effect of supplementation with grape-seed polyphenols on oxidative stress, and to compare any effects to those of vitamin C.

Design - Following a 3-week washout, participants were randomised to receive (i) 500mg/day vitamin C + matched placebo (n = 19), (ii) 1000mg/day polyphenols + matched placebo (n = 16), (iii) 500mg/day vitamin C + 1000mg/day polyphenols (n = 16), or (iv) matched placebos (n = 18). Plasma and urinary F₂-isoprostanes and oxidised low-density lipoproteins were analysed as markers of oxidative damage.

Outcomes - Supplementation with grape-seed polyphenols resulted in a significant increase in urinary excretion of specific phenolic acids (3-hydroxyphenylpropionic acid), but did not alter F₂-isoprostane concentrations or oxidised low-density lipoproteins. The phenolic acid metabolites, markers of exposure to grape-seed polyphenols, were not related to changes in markers of oxidative stress. Plasma vitamin C levels increased significantly following supplementation. Plasma F₂-isoprostane concentrations fell following supplementation with vitamin C (p=0.056). There was no change in urinary F₂-isoprostane concentrations or oxidised low-density lipoproteins. There was no relationship between increases in plasma vitamin C and changes in markers of oxidative stress.

Conclusions - These results support the suggestion that supplementation with vitamin C may reduce *in vivo* lipid peroxidation. However, supplementation with grape-seed polyphenols and exposure to phenolic acid metabolites had no effect on *in vivo* lipid peroxidation.

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Metabolic fate of palm tocotrienols in human postprandial plasma model

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Background – Detection of tocotrienols in human plasma has proven difficult even after long periods of supplementation. The rapid disappearance of tocotrienols has raised questions about their physiological effects in humans.

Objectives – To elucidate the metabolic fate of palm tocotrienols in humans using a postprandial model system.

Design – Seven healthy volunteers (four males & three females) were conditioned on a tocotrienol-free diet for seven consecutive days. On the eighth day, all volunteers were administered a single dose of vitamin E supplement, either 1010 mg palm vitamin E (318 mg α -tocopherol + 692 mg tocotrienols) or 1098 mg α -tocopherol in the form of capsules. Blood was sampled at baseline (fasted), 2, 4, 6, 8 & 24 h after supplementation. Tocopherols & tocotrienols concentration in total plasma, triglyceride rich particles (TRP), LDL & HDL fractions for each bleeding interval was determined.

Outcomes – Following the intervention with palm vitamin E, tocotrienols were detected in total plasma, TRP, LDL and HDL. However, the concentrations of the tocotrienols detected were minimal, while α -tocopherol remained the major circulating plasma vitamin E isomer. Findings showed that tocotrienols appeared in the blood stream at 2 h interval & disappeared within 24 h. Tocotrienols concentration in total plasma, TRP & LDL peaked between 4 to 6 h; in HDL, tocotrienol concentrations peaked at 8 h after supplementation. α -tocopherol was the major vitamin E detected in plasma despite supplementation with either α -tocopherol or the tocotrienol-rich palm vitamin E preparations.

Conclusions – Rapid disappearance of tocotrienols in plasma and all lipoprotein fractions suggest that tocotrienols have a very short duration of absorption & distribution in circulating blood.

Influence of dietary omega-3 polyunsaturated fatty acid (PUFA) supply on brain gene expression

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Background - The functional roles of omega-3 polyunsaturated fatty acids (PUFA) are thought to be mediated by the modulation of physico-chemical properties of the cell membrane and eicosanoid metabolism. Recent evidence suggests that omega-3 PUFA might also play a pivotal role in regulation of body functions through the modulation of its genetic apparatus.

Objective - To determine the influence of dietary omega-3 PUFA supply on brain gene expression.

Design - Female rats were fed with a α -linolenic acid (ALA) sufficient (CON) or deficient (DEF) diet throughout gestation and lactation. Three groups of male offspring were studied: (1) pups maintained on CON diet, from mothers on CON diet, CON (n=4); (2) pups maintained on DEF diet, from mothers on DEF diet, DEF (n=4); (3) pups maintained on CON diet from weaning ((3 weeks of age), from mothers on DEF diet, DEF-CON (n=4). Brain gene expression of weanlings and adult offspring were analysed by microarray technique. Confirmation of prominent microarray results was done by RT-PCR.

Outcomes - Compared to CON weanlings, a total of 24 known genes and expressed sequence tags (ESTs) were differentially expressed in DEF weanlings. Compared to CON adults, a total of 129 genes and ESTs were differentially expressed in adult DEF offspring; a total of 12 genes and ESTs were differentially expressed in adult DEF-CON animals. Over-expression of the zinc transporter 3 gene was identified as the most prominent change in gene expression due to omega-3 PUFA deficiency.

Conclusions - Dietary omega-3 PUFA supply influences the gene expression apparatus of the brain and it may be one of the mechanisms responsible for the physiological actions of the omega-3 PUFA.

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Lack of correlation between plasma and prostate tissue alpha-linolenic acid levels

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Background - Several epidemiological studies have reported a positive association between plasma alpha-linolenic acid (ALA) levels and the incidence of prostate cancer; however other studies have not supported this association, as recently reviewed.¹

Objective - The aim of this study was to determine if there was a correlation between the plasma and prostate tissue levels of ALA and/or other n-3 polyunsaturated fatty acids (PUFA).

Design - Plasma and prostate tissue were collected from patients undergoing prostate surgery, and prior to surgery completed a brief dietary questionnaire on the intake of dietary n-3 PUFA. Twenty-eight patients participated in the study, of which 20 were diagnosed with benign prostatic hyperplasia (BPH) and 8 with prostate cancer (PC).

Outcome - The main lipids in the prostate tissue were phospholipids (PL) and sterols. The results showed that there was no significant correlation between plasma PL ALA and prostate tissue PL ALA concentrations (or proportions). There were, however, positive correlations between the proportions (not concentrations) of plasma and prostate tissue for EPA, DHA and total n-3 PUFA in the PL fraction. There was no significant difference in plasma and prostate tissue ALA and n-3 PUFA levels between the BPH patients and the PC patients for either the PL and triacylglycerol (TAG) fractions. Plasma ALA concentrations were significantly higher than the prostate tissue ALA levels for each subject.

Conclusions - These pilot data do not show a significant association between plasma and prostate ALA in humans.

1. Attar-Bashi NM, Frauman A and Sinclair AJ. (2004) Alpha-Linolenic Acid and the Risk of Prostate Cancer, What is the Evidence? Journal of Urology, 171:1402-7.

Docosa-hexaenoic acid (DHA) accumulation is regulated by the polyunsaturated fat content of the diet: Is it synthesis or is it incorporation?

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Background - Tissue levels of docosahexaenoic acid (DHA, 22:6n-3) in animals and humans are minimally influenced by increasing the level of its precursor alpha linolenic acid (ALA, 18:3n-3) in the diet. We have tested the hypothesis that this could be due either to competitive inhibition of a key step in the pathway, the conversion of dietary ALA to long chain polyunsaturated fatty acids (LCPUFA) by linoleic acid (LA, 18:2n-6) since both fatty acids (ALA, LA) are substrates for the Δ^6 -desaturase or is due to LA inhibiting DHA incorporation.

Methods - We tested weaning rats fed a spectrum of 54 separate diets for three weeks. The diets varied in fat content (11.8, 22.2 and 39.4 percent of energy, en%), in the levels of LA (0.07 - 17.1 en%), ALA (0.02 - 12.1 en%) and in the LA:ALA ratio (0.5:1 to 10:1).

Results - The concentrations of DHA in plasma phospholipids of some dietary groups reached 9% of total fatty acids but the peak of DHA accumulation was seen within a narrow range of 1-3 en% ALA and 1-2 en% LA. Beyond 3 en% of either ALA or LA, DHA levels are uniformly low. On the other hand, plasma DHA levels were inversely correlated with plasma LA ($r^2=0.6$) indicating that high LA intakes may inhibit incorporation of DHA. This may explain the apparent curvilinear effect of dietary ALA on synthesis of DHA. Past stable isotope experiments may not taken this into account.

Conclusions - The apparent conversion of ALA to DHA is dependent on both an adequate level of ALA and a low level of LA in the diet.

NSA Poster Presentations: Thursday 12 August 2004

Omega-3 long-chain polyunsaturated fatty acids in plasma phospholipids of 12-month-old infants consuming cow's milk, breast milk or formula: a cross-sectional studyT Udell¹, M Makrides², RA Gibson²¹ Dept Paediatrics and Child Health, Flinders University, Bedford Park, SA 5042² Child Health Research Institute, North Adelaide, SA 5006

Background - Docosahexaenoic acid (DHA; 22:6n-3) is a long-chain polyunsaturated fatty acid (LCPUFA) derived endogenously from ALA and the high LA/ALA ratio in formula is thought to contribute to the poor DHA status of formula-fed infants. Butterfat contains some n-3 LCPUFA however it contains no DHA and has a low LA/ALA ratio. Even so, studies with animals fed butterfat have shown increased DHA concentrations.

Objective - To determine the n-3 LCPUFA status of 12-month old infants changing from breastmilk or formula to cow's milk as their main drink compared with breastfed and formula-fed infants.

Design - A cross-sectional study of ninety 12-month-old infants who were either breastfed (reference), formula-fed (reference), breastfed then formula-fed, breastfed then cow's milk fed or formula-fed then cow's milk fed. Infants included in the cow's milk groups were fed cow's milk for at least 4 weeks. The primary outcome was plasma phospholipid n-3 LCPUFA concentrations.

Outcomes - Cow's milk fed infants had significantly higher plasma phospholipid eicosapentaenoic acid (EPA; 20:5n-3) and docosapentaenoic acid (DPA; 22:5n-3) but not DHA compared to formula fed infants at 12-months of age (Table).

	Breastfed n = 24	Formula n = 21	Breastfed then formula n = 11	Breastfed then cow's milk n = 10	Formula then cow's milk n = 20
EPA ¹	0.53 ± 0.20 ^a	0.46 ± 0.18 ^a	0.37 ± 0.07 ^a	0.93 ± 0.26 ^b	0.84 ± 0.33 ^b
DPA	1.15 ± 0.25 ^{ab}	0.99 ± 0.21 ^{ac}	0.83 ± 0.12 ^b	1.13 ± 0.19 ^b	1.32 ± 0.41 ^c
DHA	4.12 ± 0.90 ^a	2.09 ± 0.54 ^{bc}	2.75 ± 0.87 ^b	2.87 ± 0.63 ^c	2.05 ± 0.51 ^b

¹ mean ± SD, different subscript letters indicate significant difference between dietary groups, P<0.05

Conclusions – Feeding cow's milk in late infancy can improve the n-3 LCPUFA status at 12 months of age.

Effects of omega-3 fatty acid deficiency on rat intestinal structure and microbiologyHJ Ralph¹, DH Volker¹, J Chin²¹ Human Nutrition Unit, School of Molecular and Microbial Biosciences, University of Sydney, NSW 2006² Elizabeth Macarthur Agricultural Institute, Camden, NSW 2570

Background - The omega-3 (n-3) fatty acids are known to influence inflammatory responses in the body. However little attention has been given to n-3 fatty acid effects on structures such as the intestinal tract. In order to determine if further research is warranted, a pilot study was conducted into the effects of n-3 fatty acid deficiency on rat intestinal structure and microbe populations.

Method - Eight female Wistar rats were divided evenly by random selection into a control and experimental group. The control group were given 30 g of feed daily containing 3.9 g/kg of α -linolenic acid (ALA) and the experimental group given 30 g of feed daily containing 0.6 g/kg of ALA from age nine to 11 weeks until sacrifice at age 38 to 40 weeks. Plasma phospholipids were analysed using thin layer chromatography and gas chromatography. Intestinal segment contents were collected, cultured onto a variety of media and colony forming units counted. Segment pieces were processed using standard histological techniques and section structure assessed under a light microscope.

Results - The plasma phospholipid of the control group contained greater (P<0.05) total n-3 fatty acid. Increased proportions (P<0.05) of haemolytic bacteria were in the ileum and increased numbers (P<0.05) of total bacteria and lactic acid bacteria were in the caecum of the experimental group. Villi in the duodenum of the experimental rats was more cellular, while an elevated mitotic activity and inflammatory cell infiltration was seen in their ileum.

Conclusion - This pilot study established that n-3 fatty acid deficiency does affect rat intestinal structure and microbe populations. Results suggest that a deficiency of n-3 fatty acid can lead to increased cell proliferation, inflammation and microbe overgrowth in the normal intestinal tract. An association was identified between the structural changes and microbe population present in the ileum due to n-3 fatty acid deficiency. Hence further research on this topic is undoubtedly warranted in the future.

NSA Poster Presentations: Thursday 12 August 2004

Levels of n-3 enrichment and Australian consumer sensory panel ratings of lamb meat from sheep supplemented with protected tuna oil for different numbers of weeks

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Background- Cost-effective strategies to further enhance the levels of n-3 polyunsaturated fatty acids in red meat require determination of the optimum period of supplementation with dietary lipid supplements and the sensory characteristics of meat from animals under different periods of supplementation.

Objective- To determine the optimum period of supplementation required to enrich lamb meat with eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA) through dietary tuna oil supplementation and the consequent effect on the sensory characteristics of lamb meat.

Design- Fifty weaner lambs of similar liveweight and condition were drafted from the Yalanbee Research Station (Bakers Hill, WA) flock. They were randomly divided into 5 groups and assigned to the treatments of 0, 3, 6, 9 and 12 weeks of protected tuna oil supplementation (PTO) (3% dry matter). The trial was arranged to have all sheep slaughtered on the same day. Accordingly, the 10 lambs assigned to 12 weeks of supplementation were removed from pasture on the date the trial commenced and fed hay-grain mixture plus PTO indoors. Every three weeks after that, the next group of 10 lambs was moved indoors. At slaughter, both back straps (*Longissimus dorsi*) from each animal were obtained; one was used for total fat and fatty acid analysis and the other for sensory evaluation using a 48-member consumer panel at Food Science Australia, Werribee.

Outcomes- The concentrations of EPA and DHA in muscle reached plateau after 3 weeks of supplementation. However, the yield in mg per 100g muscle increased with increase in the duration of supplementation over the whole period. Consumer panel acceptability ratings for most sensory attributes were not different between muscle from unsupplemented sheep and those supplemented with tuna oil for the number of weeks used in this study.

Conclusions- This study suggests that for a given level of dietary inclusion, there may not be continued gain in the concentration of EPA and DHA in muscle beyond three weeks of supplementation. The ratings for juiciness, tenderness, odour, flavour and aftertaste were similar for all groups of lambs.

Effects on plasma lipids when plant sterol enriched fat spread or carbohydrate provide replacement energy for saturated fatty acids

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Background - Clinical practitioners often inquire whether patients who need to lower plasma cholesterol are better served by consuming a plant sterol-enriched fat spread or reducing fat intake by consuming no spread.

Objective - To determine the effects on plasma cholesterol of replacing a plant sterol enriched fat spread with carbohydrate.

Design - Twenty-nine healthy volunteers with raised low density lipoprotein cholesterol concentrations were assigned to follow in random order three diets; a typical New Zealand diet high in total (34%kJ) and saturated (15%kJ) fat, a cholesterol-lowering diet reduced in total (30%kJ) and saturated fat (8%kJ) but including a plant sterol spread, and the same cholesterol-lowering diet with the plant sterol spread isocalorically replaced with carbohydrate (total fat, 26%kJ; saturated fat 7%kJ). All foods were provided and each diet was followed for four weeks.

Outcomes - Mean (SD) plasma low density lipoprotein cholesterol concentration declined from 4.68 (0.92) mmol/L on the high saturated fat diet to 4.12 (0.83) mmol/L ($P < 0.001$) on the carbohydrate diet and 3.76 (0.84) ($P < 0.001$) on the plant sterol diet. The 20% decrease on the plant sterol diet was significantly greater ($P < 0.001$) than the 12% decrease on the carbohydrate diet. Relative to the high saturated fat diet, mean (95%CI) plasma high density lipoprotein cholesterol concentration declined by -0.11 (-0.16 to -0.06) mmol/L on the carbohydrate diet but changed little on the plant sterol diet, -0.03 (-0.09, 0.02).

Conclusions - Including a plant sterol fat spread in a cholesterol-lowering diet produces a more favourable plasma lipid profile than replacement of the spread with carbohydrate.

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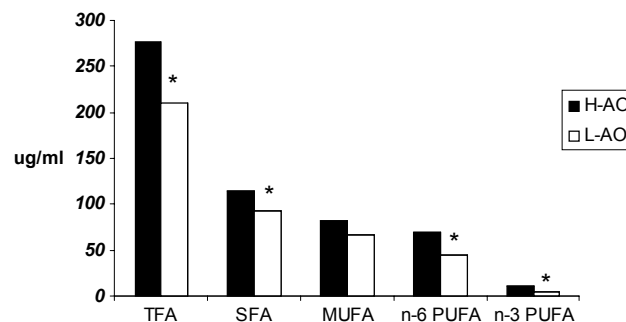
Antioxidant restricted diet reduces plasma non-esterified fatty acids in trained athletesTA Watson¹, RJ Blake¹, R Callister², LK MacDonald-Wicks¹, ML Garg¹¹Nutrition & Dietetics, ²Human Physiology, University of Newcastle, Callaghan, NSW 2308

Background - Non-esterified fatty acids (NEFA) are a major fuel source for humans at rest and during exercise have been previously shown to increase during exercise.¹ A reduction in the availability of NEFA as an energy substrate may impair exercise performance.

Objective - To determine the role of dietary antioxidants on plasma NEFA and exercise performance in athletes.

Design - Seventeen trained athletes underwent two separate exercise tests. Prior to the initial exercise test participants followed their habitual (high) antioxidant (H-AO) diets. Then they followed a two-week restricted-antioxidant (R-AO) diet before the second exercise test. Blood was taken at rest, following sub-maximal and incremental exhaustive exercise, and after one hour of recovery.

Outcomes - The R-AO diet induced a 3 fold reduction in antioxidant intake when compared to the H-AO diet, which resulted in a significant reduction in total, saturated, n-6 polyunsaturated and n-3 polyunsaturated fatty acids of plasma NEFA fractions at all time points even though the amount or types of fat consumed were not difference between the R-AO and H-AO diet. Time to exhaustion was not affected by the R-AO diet.



Conclusion - Despite lacking an effect on time to exhaustion, the interactions between antioxidants and plasma NEFA may impact on endurance exercise capacity and is worthy of further investigation.

1. Jensen, MD. Fate of fatty acids at rest and during exercise: regulatory mechanisms. *Acta Physiol Scand* 2003; 178: 385-390

Bovine colostrum and whey protein supplementation during running training increase intestinal permeabilityJD Buckley¹, GD Brinkworth¹, E Southcott², RN Butler²¹ Nutritional Physiology Research Group, University of South Australia, SA, 5032. ² Department of Gastroenterology, Adelaide Women's and Children's Hospital, SA, 5000

Background - Bovine colostrum (BC) is a rich source of bioactive components. BC has been shown to improve athletic performance, reduce the incidence of upper respiratory tract infections, and reduce intestinal damage and permeability caused by the administration of non-steroidal anti-inflammatory drugs.

Objective - To determine whether BC supplementation could reduce the increases in intestinal permeability associated with endurance exercise training.

Design - Thirty-one healthy adult males (18 – 35 yr) completed eight weeks of running training, consisting of running at their lactate threshold for 45 min, three times per week. Subjects were randomly allocated (double-blind) to the consumption of 60 g·day⁻¹ of BC (n = 9) or whey protein (WP, n = 9), or took no supplement (CON, n = 13). Intestinal permeability was estimated at baseline and at the end of the study period from the urinary excretion of two orally administered non-metabolised sugars (lactulose / rhamnose).

Outcomes - By the end of the study period intestinal permeability had increased more in the BC and WP groups compared with the control group (BC 251 ± 140%, WP 192 ± 173%, CON -7 ± 13%; P<0.05).

Conclusions - Supplementation with BC and WP during running training increases intestinal permeability. The transport pathway affected could not be determined, but if some component(s) of BC (and WP) stimulate transcellular macromolecular transport then this might stimulate the absorption of some of the bioactive components contained in BC, thereby accounting for the previously described effects of BC on athletic performance and immunity.

NSA Poster Presentations: Friday 13 August 2004

Acute suppression of spontaneous food intake following dairy calcium and vitamin D

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Background – Obesity is the result of subtle but long term perturbations in both energy expenditure and energy intake. Calcium and vitamin D have long been known for their health benefits, but their potential role in energy balance is yet to be elucidated.

Objective – To compare the postprandial effects of calcium and vitamin D on (1) subjective feelings of hunger and satiety, and (2) subsequent food intake in humans.

Design – 11 subjects (mean \pm SEM, age 54 ± 1.2 yr, weight 84.6 ± 5.4 kg, and BMI 31 ± 2.4 kg/m²) participated in a single blind, cross over study with a sequential-meal design. Volunteers were randomised to high dairy calcium, high vitamin D breakfast (HCB – 543 mg calcium & 349 IU vitamin D) or low dairy calcium, low vitamin D breakfast (LCB – 248 mg calcium & 12 IU vitamin D). Both breakfasts were followed by a very low calcium, low vitamin D standard lunch (SL – 48 mg calcium & 25 IU vitamin D). Both breakfasts had similar energy and macronutrient profiles, and were identical in volume. Visual analogue scale (VAS) questionnaires were used to track changes in subjective feelings of hunger and satiety in the postprandial period. Palatability questionnaires were used to determine acceptance of each test meal served. Ad libitum food intake at a buffet meal was noted and free-living food intake over the following 30h was recorded using a food diary. Data was analysed as a 2x2 repeated measures design, for diet effects (HCB vs. LCB), meal effects (breakfast vs. lunch) and diet x meal interaction.

Outcomes – There were no statistical differences in the postprandial VAS responses. Overall, subjects preferred the lunch following LCB ($P=0.03$), as they perceived it as less oily ($P=0.02$). There was a trend for food intake at buffet meal to be lower by 444 kJ following the HCB diet. This effect widened to 765 kJ at the evening meal. Reported 24h food intake on the following day was significantly lower following the HCB diet (8484 ± 699 kJ vs. 7143 ± 435 kJ, $P<0.02$). Lower 24h food intake was mainly due to reductions in the intake of fat (9.6 g/d) and carbohydrate (53 g/d).

Conclusions – A high dairy calcium and vitamin D diet did not affect subjective sensations of hunger and satiety in the immediate postprandial period. However, spontaneous food intake over the subsequent 24h period was significantly suppressed.

Acknowledgement – The study was funded by Dairy Australia.

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Dairy products consumption and calcium intakes of Chinese urban adolescent girlsQ Zhang¹, GS Ma², K Zhu¹, CY Zhang², LH Foo¹, DR Fraser¹, H Greenfield¹¹Faculty of Veterinary Science, University of Sydney, NSW, 2006, Australia²Institute of Nutrition and Food Safety, Chinese Centre for Disease Control and Prevention, Beijing 100050 China

Background – In 1995 urban Beijing adolescent girls had very low calcium intakes (mean 388 mg/d) and low dairy products consumption (mean 83 g/d) (Du et al, 2002).¹

Objective –To estimate dairy products consumption and calcium intakes of Chinese urban adolescent girls in 2003.

Design –Subjects were 293 adolescent girls (14.0 ± 0.1y) who had participated in a milk intervention trial in 1999-2001 in urban Beijing, China. Food and beverages consumption were estimated by 1-year Food Frequency Questionnaires (FFQ) in face- to-face survey. Dietary intake information was also obtained by 3-day (two weekday and one weekend day) Food Records (FR).

Results –The mean calcium intake of Chinese urban girls was 619 ± 328 mg/d by FFQ and 513 ± 199 mg/d by FR, which was about 50-60% of the adequate calcium intake of 1000 mg/d defined by the Chinese Dietary Reference Intake for adolescents aged 11-17 years. Calcium intakes estimated by FFQ and FR were significantly correlated (r=0.368, P<0.001). Dairy products, soybean products, vegetables, and nuts provided 64%,12%,9% and 7% of the calcium intake, respectively.

The proportion of girls who drank milk, yogurt, cola, other soft drinks, tea and tea beverages, fruit juice, coffee were 93%, 91%, 79%, 46%, 73%, 65%, and 44%, respectively. Mean consumption was milk 246 ± 166 g/d, yogurt 102 ± 138 g/d. Controlled for intakes of yogurt, cola, other soft drinks, tea and tea beverages, fruit juice, coffee, milk consumption was significantly correlated with calcium intake (r=0.438, P<0.01). Milk consumption was significantly correlated with fruit juice consumption (r=0.173, P<0.05), but not with consumption of other beverages.

Conclusion – The calcium intakes of Chinese urban adolescent girls are still low. Dairy products consumption has increased greatly compared with seven years earlier and has become the dominant calcium source for Chinese urban adolescent girls.

1. Du, X et al. Milk consumption and bone mineral content in Chinese adolescent girls. *Bone*, 2002, 30: 521-8

Bone mineral accretion and growth in Chinese adolescent girls following the withdrawal of school milk intervention: preliminary results after two yearsK Zhu¹, H Greenfield¹, Q Zhang¹, G Ma², Z Zhang², X Hu², D R Fraser¹¹Faculty of Veterinary Science, University of Sydney, NSW 2006, Australia²Institute for Nutrition and Food Safety, Chinese Centre for Disease Control and Prevention, Beijing 100050, China

Background - A two-year school milk intervention study with 757 10-year-old Beijing girls showed that at end-trial, the two groups which had received vitamin D and/or calcium fortified milk supplement had increases greater than controls in total body BMD (3.2-5.3%), total body size-adjusted BMC (1.2-2.4%), and height (0.6-0.7%).¹

Objective - To evaluate whether the effects of school milk intervention on bone mineral accretion and growth are retained two years after discontinuation of supplementation.

Design - 294 subjects were recruited two years after discontinuation of supplementation (48 months), with 112 from calcium fortified milk group (Group 1), 113 from calcium and vitamin D fortified milk group (Group 2) and 69 from the control group (Group 3). Total body BMC and BMD were measured by DEXA (XR 36, Norland). Other measurements made included anthropometry, pubertal development, dietary intakes, and physical activity.

Results - Preliminary data analysis showed that two years after withdrawal of supplementation, there are no significant differences between Group 1, Group 2 and the control group in percentage changes (48 months minus baseline) in total body BMC (60.7 ± 1.6%, 60.5 ± 1.7% vs 58.9 ± 2.0%) and BMD (24.8 ± 0.8%, 25.9 ± 0.8% vs 24.6 ± 1.0%), and height (14.3 ± 0.3%, 13.5 ± 0.3% vs 13.4 ± 0.4%).

Conclusions - Follow-up data for 294 subjects showed that effects of school milk supplements on bone mineral accretion and growth had disappeared two years after discontinuation of supplementation in Chinese adolescent girls. The effects will be further evaluated when more complete data have been collected from a larger number of subjects three years after cessation of the supplementation.

1. Du X, Zhu K, Trube A, et al. School-milk intervention trial enhances growth and bone mineral accretion in Chinese girls aged 10-12 years in Beijing. *Br J Nutr* 2004; 91:1-11.

NSA Poster Presentations: Friday 13 August 2004

Milk selenium concentration varies with time of year and feeding practices in grazing cows

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Background – Selenium (Se) deficiency is implicated in disease processes such as cardiovascular disease, muscular dystrophies, cancers and neurological conditions (moods, anxiety states).¹ Milk-derived Se appears to have a higher bioavailability and bioactivity compared with inorganic Se.² Understanding the factors Se concentration influence in milk and dairy products will help to determine their potential as a important source of dietary Se.

Objective – To determine the effect of season and farm management practices on milk Se concentrations.

Design – Milk samples representative of both autumn and spring-calved dairy herds located in the northern irrigation region of Victoria were collected at 6–7 wk intervals between April 2001 and March 2002. Farms were selected to reflect a range in input of concentrates (<15-50% of energy to support lactation), with most of the remaining energy coming from pasture. Samples were digested in a mixture of nitric acid and hydrogen peroxide and the Se concentration was determined using Inductively Coupled Plasma Mass Spectrometry/Vapour Generation.

Outcomes – The mean (\pm SE) and range in milk selenium concentrations for 166 observations were 12.7 (0.56) and <3 – 37.1 $\mu\text{g}/\text{kg}$ milk, respectively. Milk collected in spring had a lower concentration of selenium compared with milk collected in autumn (9.8 vs 16.2 $\mu\text{g}/\text{kg}$ milk; $P < 0.05$). The average concentration of selenium in milk was higher (16.3 vs 8.7 $\mu\text{g}/\text{kg}$ milk; $P < 0.01$) in cows fed mineral supplements, and increased by 0.7 (0.15) $\mu\text{g}/\text{kg}$ milk for every kg of cereal grain-based concentrate fed. There was no effect of time of calving on milk Se concentrations.

Conclusions – Season and mineral supplements were important in determining the concentration of Se in milk. These data suggest that targeted feeding strategies will be effective in enhancing the Se concentration in milk.

1. Rayman MP. The argument for increasing selenium intake. *Proc. Nut. Soc.*, 2002; 61:203-215.

2. McIntosh GH and Royle PJ. Final report to the DRDC on project CSHN 04, 2003.

Folic acid fortified milk increases red blood cell folate concentration in women of childbearing age

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Background – Folic acid (~400 $\mu\text{g}/\text{day}$) taken around the time of conception significantly reduces the risk of bearing a child with a neural tube defect (NTD). Strategies to reduce NTDs with folic acid include supplement use and fortified foods. One fortification option is to add folic acid to milk powder formulated for use by women prior to and during pregnancy. It is uncertain whether folic acid fortified milk reduces NTD-risk. However, NTD risk has been inversely associated with red cell folate (RCF) concentrations.

Objective - To determine whether consuming folic acid (375 $\mu\text{g}/\text{day}$) fortified milk increases RCF and plasma folate concentrations in women of childbearing age compared to an equivalent amount of unfortified milk, over 12 weeks. A second aim was to determine the effect of fortified milk on plasma homocysteine concentration, a functional indicator of folate status

Design - Seventy-three women (aged 18-47 years) were randomized for 12 weeks to receive either a fortified milk powder (ANMUM™, NZNew Zealand Milk Ltd) or unfortified (control) milk powder. Participants were instructed to consume 75 g of milk powder as two servings per day. Both milks provided 38 μg of naturally occurring folate per day. The fortified milk provided an additional 375 μg of folic acid per day. The control milk powder was a blend of whole milk and a skim milk powder that was blended to match the fat level of the fortified milk. Blood samples were collected at baseline, 6 and 12 weeks.

Results – Sixty-six women completed the trial. Consuming the fortified milk caused RCF concentrations to rise markedly so that by week 12 the mean (95% CI) concentration was 539 nmol/L (436, 641) higher in those consuming the fortified milk than those consuming the control milk ($P < 0.01$). The mean plasma folate concentration in participants consuming the fortified milk was 35 nmol/L (30, 41) higher at week 12 than in those taking the placebo ($P < 0.01$). Women consuming the fortified milk had a 14% lower mean homocysteine concentration at week 12 than women consuming the control milk ($P < 0.01$).

Conclusion - Milk fortified with folic acid (375 $\mu\text{g}/\text{day}$) substantially increases RCF and plasma folate and lowers plasma homocysteine concentration over 12 weeks in women of childbearing age. Milk powder fortified with folic acid can increase women's RCF concentrations and would be expected to reduce the risk of bearing a child with a NTD.

New Zealand Milk Limited funded the study and provided the milk powders.

NSA Poster Presentations: Friday 13 August 2004

Higher intakes of calcium are associated with lower BMI and waist circumference in Australian adults: an examination of the 1995 National Nutrition Survey

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Background – Recent evidence suggests a role for dietary calcium in the control of body composition.¹

Objective – To determine whether high calcium intakes were associated with reduced indices of adiposity in the Australian population.

Design – The Australian National Nutrition Survey Confidential Unit Record File (1995) was reanalyzed to explore relationships between dietary calcium and obesity. The inclusion criteria were adult men and women aged ≥18 yr, body mass index (BMI) ≥ 18.5, not on vitamin or calcium supplements and valid dietary records. Data on men and women were analyzed separately, and divided into 3 groups based on low (<600 mg), moderate (600-1000 mg) and high (>1000mg) calcium intakes. Between-group differences were assessed by one-way ANOVA after controlling for confounders.

Outcomes – Men in the high calcium category had significantly lower BMI as well as waist circumference compared to moderate and low calcium categories. These results were obtained after controlling for age, energy intake (EI), fat & protein intake, reporting bias (EI/predicted BMR), and socio-economic status. The results in women were identical to men, with significantly lower BMI and waist circumference in the high calcium group. Overall, calcium intakes made a small but significant contribution to both BMI and waist circumference.

Conclusions - Calcium intake is inversely related to total as well as abdominal adiposity in adult Australians.

1. Zemel M. Regulation of adiposity and obesity risk by dietary calcium: mechanisms and implications. *J Am Coll Nutr* 2002; 21(2): 146S-151S.

Prevalence of low serum folate, red cell folate, serum vitamin B12 and elevated homocysteine

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Background - Recent data indicate that higher risk of cardiovascular disease may result from mild elevation of serum homocysteine, which has been linked to low blood levels of folate and vitamin B12. Folate fortification of food may increase the risk of masking B12 deficiency in older people. Thus, it is important to have population-based prevalence estimates of low levels of folate and vitamin B12 and elevated homocysteine amongst older people.

Objective - To provide prevalence estimates of serum folate, vitamin B12 and homocysteine using a representative group of older Australians.

Design - During 1997-2000, 3508 persons aged 50 years or older were examined in a population-based cohort study conducted in two postcode areas, west of Sydney. Of these, 2963 participants (84%) provided fasting blood for estimates of serum folate, vitamin B12 and total homocysteine.

Outcome - Low serum B12 (<185pmol/L) was found in 22.9% of participants and low serum folate (<6.8nmol/L) in 2.3% of participants. Elevated serum homocysteine (>15µmol/L) was found in 20.8% of men and 13.7% of women.

Conclusions - Low serum levels of vitamin B12 are relatively frequent in older Australians and a substantial proportion have elevated serum homocysteine levels, which are of public health concern.

NSA Poster Presentations: Friday 13 August 2004

Copper intake of a cohort of women: food sources and age group differences

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Background- Worldwide dietary copper intakes are apparently falling. Minimal data is available on copper intake in Australia.

Objective - The aims of the study were to estimate the dietary copper intake of a randomly selected population of Victorian women; to ascertain the main food groups contributing to the mean daily Cu intake and to investigate the effect of age group differences in food choices on Cu intake and sufficiency.

Design - A detailed semi-quantitative food frequency questionnaire (FFQ) was analysed from 556 women aged 20 – 88 yrs, randomly selected from the Barwon electorate, which is representative of Australia in several demographic factors. The FFQ captured responses on 359 foods, and copper intake was individually estimated from available food data (ANZFA where available and otherwise USDA).

Outcomes - The women consumed 1.56 ± 0.55 mg/day Cu (mean \pm SD); median, 1.49 mg/day. This is higher than most Western nation Cu intakes, but lower than that found in most non-industrialised, rural regions. No toxic level intakes were found. Grains contributed 28% of the total intake, and vegetables provided 24%, including potatoes (13%). Fruit provided 17% and all meats (beef, poultry, lamb, pork, fish, shellfish and offal) provided 16% of the total. Significant age group differences were found. Young women were those most likely to be at risk of low intake. Older women consumed more Cu from whole grains, fruits, offal, beverages, peas & beans, lamb and eggs. Younger women consumed proportionally more Cu from refined grains, beef, mixed dishes (including many “take away” foods), dairy and chocolate foods.

Conclusion – Further studies of copper intake in young Australians are warranted.

Acknowledgement. The FFQs were from a sample obtained as part of the Geelong Osteoporosis study (J.Pasco, M.Kotovitz & G.Nicolson)

Serum selenium concentrations in New Zealand children

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Background - The low selenium content of New Zealand soils has resulted in sub-optimal blood selenium concentrations in New Zealand residents. At present there is no data on the biochemical selenium status of New Zealand children.

Objective – To determine the biochemical selenium status of New Zealand children.

Design - The survey aimed to recruit 3000 participants with 1000 children each of Māori, Pacific, and New Zealand European and other (NZEO) ethnicity. The nationally representative sample was recruited using a two-stage process involving random selection of schools followed by random selection of children within each school. Stored serum was available from 1621 children, and selenium concentrations were analysed using graphite furnace atomic absorption spectrometry.

Results - The mean (SEM) serum selenium level was 73.3 (1.5) μ g/L (n=832) and 78.5 (1.6) μ g/L (n=789) in females and males, respectively. Pacific Island children had the highest mean serum selenium concentrations (81.6 μ g/L, n=667), followed by Maori (76.0 μ g/L, n=468), and New Zealand European children (75.3 μ g/L, n=486). Regional differences were found within New Zealand. Mean selenium concentrations in South Island children ranged between 61.0 and 64.7 μ g/L compared with a range of 74.1 to 84.1 μ g/L in North Island children (P<0.05).

Conclusion - South Island children have lower selenium concentrations compared with North Island children. Dietary interventions to improve selenium status in South Island children should be considered.

The Ministry of Health funded the selenium analysis and the 2002 National Children's Nutrition Survey.

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Comparison of dairy and non-dairy sources of calcium on thermogenesis and substrate oxidation in humans

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Background – Calcium homeostasis is important to a large number of physiological processes in the body. Recently, calcium has been linked to the regulation of adiposity. However, it remains to be confirmed whether this occurs through modulation of energy expenditure or energy intake.

Objective – To compare the acute effects of different sources of calcium on energy expenditure and substrate utilisation.

Design – 8 subjects (mean \pm SEM, age 53.8 ± 2.3 yr, weight 92.4 ± 7.0 kg, and BMI 32.5 ± 1.0 kg/m²) participated in a randomised, single blind, 3-way crossover design. Subjects were provided a low calcium (dairy)- low vitamin D meal (LD), a high calcium (dairy)- high vitamin D meal (HD), and a high calcium (non-dairy, calcium citrate)- low vitamin D meal (HC). The energy, macronutrient content and volume of meals were matched. The LD, HD and HC diets contained 175 mg, 531 mg and 575 mg of calcium, and 40 IU, 364 IU and 45 IU of vitamin D, respectively. Diet induced thermogenesis (DIT), fat oxidation (FOX) and carbohydrate oxidation (COX) were measured using the Deltatrac II (Datex, Finland), that is based on indirect calorimetry. Results were analysed as change from fasting (resting) values. Statistical analysis employed a repeated measures ANOVA with a LSD post-hoc procedure, when appropriate.

Outcomes – Change in glucose concentrations were not different between meals, when examined over 2h and over the entire postprandial period. Change in respiratory quotient (Δ RQ) was significantly different between meals ($P < 0.05$) with a lower rise following the high calcium meals (LC 0.3 ± 0.1 , HD -0.013 ± 0.1 , HC -0.025 ± 0.11). Consequently, Δ FOX was significantly higher following the high calcium meals (LC -6.5 ± 2.2 , HD 3.3 ± 2.5 , HC 2.93 ± 2.34 g.6h, $P < 0.01$), and Δ COX was significantly lower (LD 34.1 ± 7.7 , HD 15.2 ± 7.1 , HC 13.6 ± 7.5 g.6h, $P < 0.05$). There were no statistical differences in DIT between meals, though a trend for a 10 % higher DIT was seen on the HD and HC meals (LD 6.5 ± 1.1 %, HD 7.0 ± 0.8 %, HC 7.2 ± 1.4 %).

Conclusions – Calcium acutely stimulated postprandial fat oxidation and suppressed carbohydrate oxidation. Both dairy and non-dairy calcium meals were equipotent in their effects when examined over the 6 h postprandial period.

Acknowledgement – The study was funded by Dairy Australia.

Folic acid deficiency is genotoxic and increases sensitivity to chromosome damage by gamma-radiation

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Background - Folic acid deficiency can alter DNA-methylation, lead to excessive uracil incorporation and an increased level of DNA strand breaks. Therefore, it was hypothesized that folic acid is an important micronutrient in the prevention of both spontaneous and radiation induced chromosome damage.

Objective - To determine the impact of folic acid deficiency on spontaneous and radiation induced chromosome damage and chromosome 21 aneuploidy.

Design - Chromosome damage and aneuploidy were determined using the cytokinesis-block micronucleus assay in long term WIL2-NS cultures in cell culture medium with four different folic acid concentrations (0.2 nM, 2 nM, 20 nM and 200 nM). WIL2-NS cells were exposed to 0 Gy or 1.5 Gy of gamma-radiation.

Outcomes - Micronucleus frequency increased significantly (55.5%) with decreasing folic acid concentration ($P < 0.0001$). Micronucleus frequency and nucleoplasmic bridge frequency showed a significant difference of 46.5% and 50.1%, respectively, between the control (0 Gy) and irradiated (1.5 Gy) group ($P < 0.05$). Folic acid deficiency caused an increase of 51.7% in micronucleus frequency ($P < 0.0001$) and of 7.1% nucleoplasmic bridge frequency ($P = 0.0280$) in irradiated cultures when compared to irradiated cultures that were folic acid replete. Folic acid deficiency and gamma-radiation interact significantly with respect to micronucleus frequency (Two-way ANOVA, $P < 0.0001$). Apoptosis and necrosis were increased by folic acid deficiency but were not significantly altered by exposure to ionising radiation. Chromosome 21 aneuploidy was significantly increased ($P < 0.05$) by folic acid deficiency but not by ionising radiation and there was no significant interaction between those two factors.

Conclusions - Folic acid deficiency induces chromosome 21 aneuploidy by non-disjunction as well as chromosome breaks and chromosome rearrangements and it interacts significantly with ionising radiation in inducing chromosome damage that leads to the formation of micronuclei (eg chromosome breaks and/or chromosome loss).

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Effect of sucrose feeding on genes associated with liver fat metabolism

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Background - High sucrose intake causes marked derangements in liver metabolism, characterised by increased lipogenesis, elevated triglyceride accumulation and hepatic insulin resistance. To date little is known of the molecular mechanisms governing these alterations in lipid homeostasis.

Objectives - This study aimed to investigate the alterations in the expression of the peroxisome proliferator activated receptor (PPAR) family of transcription factors and key genes necessary for lipid oxidation and synthesis.

Design - Sprague Dawley rats were ad-libitum fed a high sucrose (30%) (n=8) or high starch diet (n=8) for 4 weeks after which the mRNA level of PPAR α , PPAR δ , peroxisome proliferator activated receptor gamma co-activator beta (PGC-1beta) and genes important in lipid oxidation and synthesis was measured in the liver.

Outcomes - Sucrose feeding markedly lowered the gene expression of PPAR α (50% lower). However, the gene expression of PPAR δ and PGC-1beta remained unaltered by sucrose feeding. Analysis of genes important in lipid synthesis (lipogenesis) revealed that malonyl-CoA decarboxylase (MCD) was increased 1.5 fold by sucrose feeding.

Conclusion - These results support previous findings that lipogenic activity is increased by sucrose feeding, however these alterations are not due to increased PPAR α gene expression. Further work is necessary to characterise the sucrose-dependent transcriptional control of MCD and the impact of sucrose on genes necessary for the oxidation of lipids.

Short term energy restriction (using meal replacements) improves reproductive parameters in polycystic ovary syndrome

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Background- Polycystic ovary syndrome (PCOS) is a common endocrine condition affecting women of reproductive age. Weight loss improves the reproductive and metabolic dysfunction associated with PCOS. However, it is unclear what extent of adiposity reduction is required to restore reproductive function.

Objective- To assess the relative effects of energy restriction and weight loss on changes in reproductive parameters and to assess the effectiveness of meal replacements as a weight loss strategy in overweight women with PCOS.

Design- Overweight women with PCOS (n = 34; age = 32.6 \pm 5.1 years; weight = 96.0 \pm 19.5 kg; mean \pm SD) followed a weight loss intervention (two meal replacements, low fat snacks and evening meal daily) for 8 weeks. Fasting weight, waist circumference, body composition (assessed by bioelectrical impedance analysis), blood pressure (BP) and venous testosterone, sex hormone binding globulin (SHBG) and free androgen index (FAI) were assessed fortnightly.

Outcomes- The intervention resulted in a reduction in weight (5.6 \pm 2.4 kg, 6%), waist circumference (6.1 \pm 2.5 cm), body fat (4.1 \pm 2.2 kg) and systolic BP (8.4 \pm 11.1 mmHg) (p < 0.001). There was no change in SHBG but a significant reduction in testosterone (0.3 \pm 0.7 nmol/L, p = 0.05) and FAI (3.1 \pm 4.6 nmol/L, 16.8%) (p = 0.001). This change in FAI occurred from week 0 – 2 (2.4 \pm 4.2 nmol/L, p = 0.002) and corresponded with a weight loss of 2.4 \pm 1.0 kg (2.5%) with no further changes in FAI occurring from week 2 – 8. The change in FAI from week 0 – 2 or week 0 – 8 did not correlate with the change in weight, waist circumference or fat mass.

Conclusions- Reproductive parameters improved after only 2 weeks of weight loss. Therefore, these data suggest that reproductive function can be restored with either a small degree of weight loss or by acute energy restriction. The implication is that only short term energy restriction may be required to improve reproductive function. This requires further investigation.

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Dietary narcoleptics and immunocastration improve growth in group-housed boarsI McCauley¹, GM Cronin¹, RH King¹, PH Hemsworth¹, JL Barnett¹, B Luxford², RJ Smits²,
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Background – The growth potential of boars may be only partially realised commercially because of aggressive and/or sexual activity. Dietary bromide and tryptophan and immunocastration may reduce these behaviours.

Objective – To determine effects of immunocastration and dietary narcoleptics on growth of group-housed boars.

Design – Three hundred boars were stratified on live weight into three 33.3 percentiles (heavy, medium and light) and within weight class allocated to five groups of 2 pens of 10 pigs per treatment. Control and immunocastrate (Improvac®, CSL at 13 and 17 wk, Imp) boars were fed a finisher ration while the other treatments were supplemented with bromide (140 mg bromide chloride/kg, Br), tryptophan (5 g tryptophan/kg, Trp) or both Br and Trp. Feed was offered *ad libitum* and intake and live weight per pen were determined weekly from 17 until 22 wk.

Outcomes – Imp boars grew more quickly than other treatments (808, 823, 826, 891 and 961 g/d for control, Br, Trp, Br+Trp and Imp boars, respectively, LSD=77 g/d). While there were no main effects of either Br or Trp treatments on daily gain, Br+Trp boars grew 10% faster (P<0.05) than controls. Importantly, there was an interaction between treatment and weight class such that, in the heavy weight class of pigs, all treatment groups grew faster than the control boars. Imp boars ate more feed than the other groups (2.35, 2.44, 2.42, 2.51 and 2.75 kg/d, LSD=0.24 kg/d), particularly over the last 3 wk. Over the first 4 wk the Br+Trp boars ate significantly more (+ 8.3%, P=0.05) feed than the control boars. There was no effect of any of the treatments on feed conversion ratio.

Conclusions – These data suggest that dietary narcoleptics can improve growth performance in group-housed boars, particularly in heavy animals, and confirm the performance enhancing effects of immunocastration.

Less efficient sheep are more responsive to an ACTH induced stress challengeSA Knott^{1,2}, BJ Leury², FD Brien¹, LJ Cummins¹, FR Dunshea^{2,3}¹Department of Primary Industries, Hamilton, VIC 3300²Institute of Land & Food Resources, The University of Melbourne, VIC 3010³Department of Primary Industries, Werribee, VIC 3030

Background – Animals which are susceptible to stress are generally considered to be less efficient in utilising feed, however this relationship has not been explored in sheep with known feed conversion efficiency.

Objective – To determine the influence of ACTH (adrenocorticotrophic hormone) on serum cortisol levels in animals of known feed conversion efficiency.

Design – Blood samples were taken from 44 cross-bred rams (12 mo, x kg) before and 45 min after intramuscular administration of ACTH (Virbac®, 2µg/kg LW). The individually-housed rams were fed *ad libitum* pellets (13 MJ/kg DM, 17% CP) with feed intakes and live weights recorded for 61 d. Feed conversion efficiency was calculated as feed eaten:liveweight gain (FCR). Total serum cortisol levels were determined in both pre- and post- ACTH samples. Rams were ranked from the most efficient to the least efficient in terms of FCR into 20 percentiles and the 9 most efficient animals (H) were then compared with the 9 least efficient animals (L).

Outcomes – There were no significant differences between H and L animals in either basal serum cortisol concentrations (28.4 vs 19.2 nM for H and L rams, respectively, P>0.05) or cortisol concentrations found in serum obtained 45 min after ACTH administration (143.0 vs 163.6 nM, P>0.05). However, the incremental serum cortisol response to ACTH injection was significantly greater in the least efficient rams (114.5 vs 144.4 nM, P<0.05).

Conclusions – Sheep with low feed conversion efficiency have a greater response serum cortisol to a known stressor such as ACTH than sheep that have a better feed efficiency. These differences in response to stress may partially explain some of the variability that exists between animals of differing efficiency and is likely to have a major impact on efficient production of lambs.

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The potential anthelmintic effect of *Calliandra calothyrsus* in lambs

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Background - Resistance to anthelmintic drugs by gastrointestinal (GI) worm parasites is a growing problem. Thus there is merit in the development of alternative systems of control of such parasites. Some high tanniniferous temperate forages have been shown to improve the resilience of animals to GI parasites; an effect that may be due to the presence of condensed tannins or to improvements in protein nutrition.

Objective - This study was undertaken as a pilot examination of the potential anthelmintic effects of *Calliandra calothyrsus* (Calliandra), a tropical legume high in tannin and protein.

Design - Eighteen three-month-old Merino lambs, in six groups of three, were infected with either *Trichostrongylus colubriformis* or *Haemonchus contortus*, and fed either *Astrelba lappacea* (Mitchell grass hay; low protein), *Medicago sativa* (Lucerne pellets; low tannin, high protein) or Calliandra. The Lucerne and Calliandra diets were modified to have similar concentrations of crude protein (CP; 200 g/kg DM) and rumen-undegradable protein (130 g/kg DM). Nitrogen balance (NB) was determined in the first week post-infection, and faecal egg counts (FEC) were performed weekly. Twenty-eight and 35 days post-infection, lambs infected with *Trichostrongylus* and *Haemonchus* respectively, were slaughtered and number of worms present in the GI tract determined.

Outcomes -

Worm species	<i>Trichostrongylus colubriformis</i>			<i>Haemonchus contortus</i>		
	Hay	Lucerne	Calliandra	Hay	Lucerne	Calliandra
Worm counts	5218 ^a	7101 ^a	5897 ^a	1012 ^a	1860 ^a	1932 ^a
FEC1	180 ^a	831 ^a	70 ^b	1340 ^a	1670 ^a	1210 ^a
FEC2	460 ^a	1080 ^b	160 ^c	3510 ^a	2940 ^a	1650 ^a

For each worm species, means with different superscripts within a row are different significantly ($P < 0.05$).

Diet did not affect worm counts of either species ($P > 0.05$). However, *Trichostrongylus*-infected sheep fed Calliandra had the lowest FEC ($P < 0.05$). In *Haemonchus*-infected sheep, there was no difference in FEC between dietary treatments ($P > 0.05$). There was no difference in CP intake and NB between animals fed Calliandra and Lucerne.

Conclusion - It is suggested that Calliandra could reduce FEC of lambs infected with *T. colubriformis*, and that such an effect is mediated probably by some direct toxic or physiological effect of the legume rather than by improvement in protein nutrition.

Digestibility of pearl millet in broiler diets

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Background - New dwarf-grain pearl millet (*Pennisetum glaucum*) hybrids being evaluated as an alternative feed grain will complement sorghum in Queensland's dryland farming areas and deliver considerable benefits to the summer cereal value chain. The crop's short growth cycle will allow late-season opportunity cropping and remove grain growers from exposure to economic risks such as sorghum midge and sorghum ergot. Data on these Australian pearl millet (PM) hybrids to characterize their nutritive value has been inadequate.

Objective - To compare the energy and ileal digestibility of pearl millet hybrids with that of sorghum.

Design - Three pearl millet hybrids (PM31, PM3 and PM4) and sorghum were fed to 15-21 day old broilers in cages in a randomised block design of 4 replicates per treatment with 8 birds in each replicate. Diets containing 97% PM or sorghum plus minerals and vitamins and chromic oxide as an indigestible marker were prepared and offered *ad libitum*. Total excreta was collected over a seven day period and ileal digesta collected after birds were euthanased on day seven. Diet, excreta and digesta samples were dried and analysed for energy, protein and amino acids.

Outcomes - The crude protein content of the 3 new PM hybrids were 13.7, 14.8 and 14.3% respectively for PM hybrids compared to sorghum 12.0%. Protein digestibilities were 74, 78 and 80% respectively compared to sorghum 76%. The digestibility of amino acids in PM hybrids were similar to sorghum ($> 70\%$). However, the individual amino acid content of the hybrids were different to sorghum with the mean lysine content of the PM hybrids being 3.45 g/kg compared to sorghum 2.3g/kg. Similarly, for; methionine (2.5 & 1.5), cystine (6.0 & 4.4) and threonine (5.1 & 3.5g/kg), respectively for the hybrids and sorghum. AMEs of the hybrids were at least 1 MJ/kg DM higher than sorghum (14.0, 14.3 and 14.2 compared to sorghum 13.3 MJ/kg DM).

Conclusions - Data suggest that the PM hybrids developed in Australia has higher energy and protein content than sorghum and digestibility of their amino acids are comparable to sorghum. These hybrids have the potential for providing an excellent source of energy and protein for the broiler industry.

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Cereal grain source, dietary level of lupins and broiler performance

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Background -Lupins (*Lupinus angustifolius*) are promoted as a source of dietary protein for broilers. When diets are formulated, it is assumed that the nutrients within each ingredient are additive. However, this assumption may not always be correct because of the possible presence and possible interaction between antinutritive factors in lupins and cereal grains.

Objective - To examine the relationship between cereal grain source and dietary level of lupins on the performance of broiler chickens.

Design -Day-old male, broiler chicks (Cobb) were allocated to pens with six chicks per pen. Experimental diets contained maize, sorghum or wheat as the sole cereal source and 0, 100 or 200 g/kg lupins. Each experimental diet was fed to six pens from day 1 to day 17 post hatch. Body weight gain and feed intake were recorded and feed efficiency calculated. Excreta were collected from days 14 to 17 and dried at 80°C for apparent metabolisable energy (AME) determination. Digesta viscosity was measured on day 17.

Outcomes - Cereal grain source did not affect feed conversion, but significantly ($P<0.001$) influenced body weight gain, feed intake, AME, apparent DM digestibility and digesta viscosity. There were inverse relationships between the lupin content of the diet and both DM digestibility and AME. Digesta viscosity increased as dietary lupin level increased. There were no interactions between cereal grain source and dietary lupin level.

Conclusion - The response of the broiler chicks to dietary lupin level was independent of cereal grain source, which is an important observation for feed formulation.

The efficacy of phytase in corn soybean meal based broiler diets

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Background - To overcome the inability of poultry to utilise phosphorus bound to phytate in plant feed ingredients, phytase of microbial origin is added to poultry diets. This has the added advantage of reducing phosphorus build up in manure.

Objective - To examine the efficacy of two commercial phytase sources on the performance of broiler chickens fed corn soybean meal based diets.

Design - Day-old, male broiler chicks (Ross) were allocated to 30 pens in a completely randomised experimental design with each diet offered to 6 pens of 50 chicks per pen. The 6 experimental mash diets were formulated as: 1) standard Phosphorus (P), 2) low-P, 3) low-P + phytase A at 500 U/kg feed, and 4) low-P + phytase A at 1000 U/kg feed, 5) low-P + phytase B at 500 U and 6) low-P + phytase B at 1000 U/kg feed. A starter diet was fed from day old to day 22 and a finisher diet from day 23 to day 42. The standard-P starter and finisher diets contained 0.4% and 0.32% available phosphorus respectively compared to 0.28% and 0.20% in the low-P diets.

Outcomes - At the completion of the study body weight of the birds fed the standard-P diet were significantly ($P<0.05$) heavier than those fed the unsupplemented low-P diets. There was no significant difference in body weight between the groups fed the standard-P diet and the phytase supplemented diets. Feed conversion ratio was not significantly affected by phytase supplementation.

Conclusion - The performance of broilers fed low phosphorus corn soybean meal based diets can be significantly improved by phytase supplementation. Both sources of phytase gave similar results, and can replace approximately 50% dicalcium phosphate in diets, without affecting broiler performance.

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Level of nutrition and breed can influence basal and stimulated metabolism in lambs

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Background – Sheep breeds with a reputation for adaptation to harsh environments are more able to conserve fat during feed restriction than less adapted breeds, possibly because of differing responses to homeostatic signals.

Objective – To determine the effects of breed on metabolism in lambs fed either a low or high-quality ration.

Design – Twenty-four 7 mo old lambs (12 ewes and wethers) of two breeds (Merino (M) or Border Leicester x Merino x Poll Dorset (2X)) were allocated to either low (15:85 lucerne:oaten chaff, 8% CP & 8.1 MJ ME/kg; L) or high (85:15 lucerne:oaten chaff, 16% CP & 8.8 MJ ME/kg; H) quality diets. After 3 wk the plasma glucose and non-esterified fatty acid (NEFA) responses to iv insulin (10 µg/kg) and epinephrine (0.8 µg/kg) were measured.

Outcomes – Breed (40 vs 3 g/d for 2X and M lambs, respectively, P=0.21) and diet quality (3 vs 39 g/d for L and H diets, respectively, P=0.29) had no effect on daily gain although lambs ate less of the L diet (914 vs 1203 g DM/d, P=0.001). Basal plasma NEFA was not significantly different between the breeds (86 vs 100 µmol/L, P=0.20) but was higher in lambs fed the L diet (82 vs 104 µmol/L, P=0.06). The NEFA response to epinephrine over the 60 min post-injection was not different between breeds (2695 vs 1900 µmol.min/L, P=0.40) but was higher in lambs on the L diet (3272 vs 1323 µmol.min/L, P=0.05). Although basal plasma glucose was not affected by either breed (3.70 vs 3.61 mmol/L, P=0.37) or diet (3.58 vs 3.73, P=0.14) the response to epinephrine was greater in lambs on the L diet (46.1 vs 32.5 mmol.min/L, P<0.001). Insulin caused a small decrease in NEFA over the 20 min post-injection that was not influenced by breed (P=0.61) or diet (P=0.41). There was a rebound in NEFA between 45 and 90 min post-injection that was most pronounced in M lambs (1748 vs 6708 µmol.min/L, P=0.03). There was an interaction (P=0.02) such that insulin decreased blood glucose over the 20 min post-injection to a greater extent in 2X lambs on the L diet (-7.1 vs -11.8 mmol.min/L) whereas diet had no effect in M lambs (-11.5 vs -11.0 mmol.min/L).

Conclusions – Both breed and level of nutrition can influence basal and stimulated metabolism in lambs.

The role of oligosaccharides and *Helicobacter pylori*-specific antibodies in disease prevention

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Background- Problems with current therapies for management of *Helicobacter pylori*-associated disease are patient compliance and increasing antibiotic resistance. Therefore, prevention of disease via nutritional intervention is a practical alternative approach for management of *Helicobacter pylori* (*H. pylori*) infection.

Objective- This study was carried out to assess the ability of nutritional components, namely oligosaccharides and *H. pylori*-specific antibodies, to prevent acquisition of disease.

Design- The interventions investigated were 0.25 % (w/v) hyperimmune bovine colostrum (HBC), 25% (w/v) acidic oligosaccharides (AOS) and 30% (w/v) fructo- and galacto-oligosaccharides (FOS/GOS), administered alone or in combination twice daily by orogastric gavage (0.2 ml per mouse on each occasion) from day 1 onwards. Control animals were given water by the same method. Mice were then challenged on day 14 with 1 x 10⁸ viable *H. pylori*, Sydney strain 1 (SS1; 1 x 10⁹/ml) in sterile saline (0.1 ml) by orogastric gavage. After challenge, intervention was continued for a further 21 days. The next day (day 36), blood was withdrawn for antibody testing then mice were killed and the stomach removed for histology and bacterial culture.

Outcomes- None of the interventions studied prevented colonisation by *H. pylori*. However, gastritis scores were lower in treatment versus control mice. Antibody titres were also different between groups, lower in all oligosaccharide-treated mice and higher in mice treated with HBC alone, compared with control mice.

Conclusions- Nutritional components may be beneficial in *H. pylori* infection and in preventing progress of disease.

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Selenised dairy protein and colon cancer inhibition in AOM induced rats

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Background: Selenium is potentially important in cancer prevention as has been shown by Clark *et al*¹ where 200µ Se/day as Se yeast provided over 4.5 y was associated with a halving of colon, lung and prostate cancers in the 11 y study. The form of Se most effective for anticancer effects is of interest, and food forms containing selenocysteine or selenomethionine are common and dairy foods could be a significant source of Se.

Objective: To examine the influence of high Se diet fed as Se enriched casein relative to yeast Se supplements on colon tumour expression in the azoxymethane induced rodent model.

Design: Selenised casein was fed to 25 male Sprague-Dawley rats at 1ppm in diet, and compared with yeast selenium (Selplex™ Alltech Biotechnology P/L, Victoria) supplemented diets (1 and 4 ppm Se) and control diet (no Se added, 0.05ppm Se) fed rats. After 3 w on these diets rats were induced with two doses of azoxymethane (AOM- Sigma Chemicals) at 15mg/Kg BW given one week apart. The rats were maintained on diets for 26 w.

Outcomes: There were significant reductions in colonic tumour incidence (rats with tumours) and burden (tumours/rat) with selenised casein relative to control, not seen with the yeast Se treatments. There was an effective reduction in the benign (B) and malignant (M) tumours in the selenised casein group relative to control and other Se

Diet Treatment	Tumour Incidence	Tumour Burden		Significance
Control	56	1.08	29/3 (B/M)	
Se casein (1ppm)	40*	0.52**	16/2 “	* p<0.05
Se yeast (1ppm)	61	1.43	36/6 “	**p<0.02
Se yeast (4ppm)	61	1.26	25/8 “	

yeast treatments.

Conclusions: When fed at supplemental levels (1ppm) in the diet, while still considered safe (chronic toxicity is associated with >5ppm Se in diet) Se in dairy protein was very effective at reducing tumours of the colon, an effect not seen when fed in equivalent amounts as Se yeast supplements.

1. Clark LC *et al*. Effects of selenium supplementation for cancer prevention in patients with carcinoma of the skin. A randomized controlled trial. Nutritional Prevention of Cancer Study Group. *JAMA* 276:1957-63, 1996.

Nutritional and anti-inflammatory strategies in the treatment of advanced colorectal cancer – a pilot study

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Background - Patients with advanced cancer become nutritionally compromised and experience considerable wasting, due to the cachectic inflammatory processes apparent in cancer. The impact of nutritional status on the tolerance to anti-neoplastic therapy has been known for some time, however prognostic nutritional assessment tools, prognostic nutritional indicators and nutritional intervention strategies have been neglected in predicting and modifying chemotherapy treatment.

Objective – To determine the degree of malnutrition in patients with advanced colorectal cancer, and to determine if nutritional intervention using a source of concentrated Eicosapentanoic acid (EPA) will help maintain or improve the patients' nutritional and “quality of life” parameters, and improve their tolerance to chemotherapy treatment.

Design – 15 of 25 patients with advanced colorectal cancer have been recruited. They are instructed to take the EPA (2g) - containing high protein energy supplement for 3 weeks prior to commencing Irinotecan chemotherapy, and then for 6 weeks during 3 cycles of Irinotecan treatment. Nutritional parameters and inflammatory markers are collected at baseline, at the end of week 3 and at the end of week 9. Nutritional parameters include PGSGA, triceps skin fold, bioelectrical Impedance, and quality of life. The inflammatory markers measured include CRP, IL6 and IL1.

Outcome – 15 patients have been accrued into the trial. 13 patients have completed to the end of 3 weeks, 8 have fully completed the trial and 2 are currently on trial. 5 patients have withdrawn before completion. After 3 weeks of taking the EPA-supplement, using a Wilcoxon Signed Ranks test, there were no significant changes in nutritional parameters, indicating patients are maintaining their nutritional status. There is a significant increase in the inflammatory marker over 3 weeks. Due to small numbers data at 9 weeks cannot be analysed. Of those who have completed only 2 patients experienced gr.3 diarrhoea, and 1 patient experienced gr.3 neutropenia.

Conclusion – Animal studies suggest that EPA reduces the toxicity to Irinotecan. The data suggests the EPA in addition to a high energy/protein diet, helps patients to maintain their nutritional status whilst also helping patients tolerate their treatment with fewer side-effects.

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Lyprinol™: a potential preventive treatment for inflammatory bowel disease (IBD)?D Tenikoff¹, KJ Murphy², M Le¹, RN Butler¹, GS Howarth¹, PRC Howe²¹Child Health Research Institute, Women's & Children's Hospital, SA 5006²Nutritional Physiology Research Group, University of Adelaide and University of South Australia, SA 5005

Background- Fish oil and the stabilised lipid extract of New Zealand Green Lipped Mussel (Lyprinol™; LYP) are considered beneficial in treating arthritis and other inflammatory conditions. Unlike fish oil, it is uncertain whether any benefit seen with LYP is due to its omega-3 (ω 3) fatty acid content. We compared the effect of LYP and fish oil pre-treatments on experimental induction of IBD in mice.

Methods- Male C57BL/6 mice aged 6 weeks were gavaged daily for 13 days with 150 μ l of olive oil (OO, n=7), LYP (5mg in OO; n=8) or fish oil (FO, 55mg EPA/DHA; n=8). Mice consumed 2% dextran sulphate sodium (DSS) for 6 days from day 7 to induce colitis. Body weight and disease activity index (DAI) scores were recorded daily; colonic inflammation was assessed by myeloperoxidase (MPO) activity and histopathologic damage to the ileum and colon.

Results- FO treatment had no significant benefit compared with OO. By day 12 of the trial, OO treated mice had gained 15 \pm 2% body weight, FO treated mice had gained 6 \pm 5% and LYP treated mice had gained 21 \pm 3%: LYP treated mice had a lower DAI score (0 vs. 1 for OO, 4 for FO). Compared with FO, LYP treated mice had smaller crypt area losses (distal colon), lower caecum and colon weights and a trend for lower overall colitis severity in the distal colon. MPO activity was not significantly affected by either LYP or FO vs. OO (see table).

	Units	OO	FO	LYP	P value (LYP vs FO)
Distal colon					
Crypt area	% tot mucosal area	39.8 \pm 10.1	24.6 \pm 9.0	48.9 \pm 9.4	0.03
Colitis severity	median score	5 (1-10)	9 (5-15)	4 (1-14)	0.07 ¹
Colon weight	mg	154 \pm 5	151 \pm 7	133 \pm 7	0.05
Caecum weight	mg	98 \pm 7	120 \pm 12	88 \pm 7	0.002
MPO activity	MPO units/gm	15 \pm 0.06	30 \pm 0.08	15 \pm 0.12	0.12

One-way ANOVA, with Tukey-Kramer Post test; ¹Kruskall-Wallis Test (non-parametric ANOVA).

Conclusions- These findings indicate that LYP may be potentially useful in ameliorating symptoms of IBD. The lack of effect of FO indicates that the benefit of LYP is attributable to components of the stabilised lipid extract other than its ω 3 content. A dose-response evaluation of LYP in experimental IBD is warranted.

ICCN Poster Presentations

Nutrition and cardiovascular disease

Food and nutrient intake in relation to cardiovascular disease among rural males of Punjab, India

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A nutritional study was carried out on one hundred rural males in the age group of 40-60 years hospitalised with first cardiac attack to determine the relationship of food and nutrient intake with the cardiovascular disease (CVD). 37% of the subjects were overweight and 7% were obese on the basis of body mass index. The mean waist/hip (W/H) ratio was 0.8 and was normal. 22% were having hyperglycaemia and 32% were hypertensive with average random blood glucose (RBG) levels and systolic blood pressure (BP) values of 205.7mg/dl and 160.4mm, respectively. The average serum values of cholesterol, LDL-C, HDL-C and triglycerides were 180.5, 106.4, 47.4 and 156.7 mg/dl, respectively. 6% subjects suffered from hypercholesterolemia and 28% subjects had borderline high values of cholesterol. The mean daily intake of cereals, pulses, green leafy vegetables, root and tubers, other vegetables, fruits, milk and milk products, meat and poultry, fats and oils and sugars was 332.0, 40.5, 34.4, 93.7, 193.6, 107.3, 573.2, 15.5, 27.9 and 24.7 g, respectively. Cereals were significantly ($p \leq 0.1$) but negatively correlated with BMI and systolic BP. Pulses and legumes had a significant ($p < 0.05$ and 0.1) but negative correlation with serum cholesterol and triglycerides. Fruit and vegetable consumption was negatively correlated ($p < 0.05$) with serum triglycerides. A significant correlation was also observed between milk consumption and serum triglycerides ($p < 0.01$), LDL-C ($p < 0.05$), triglycerides and blood glucose levels ($p < 0.1$). The average daily intake of energy, niacin and iron was inadequate while protein, vitamin A, thiamine, riboflavin, folacin, ascorbic acid, calcium, phosphorus and magnesium intake was adequate. The average daily intake of total and visible fat was 71.4 and 27.9 g, respectively. Polyunsaturated fats to saturated fats ratio was 0.15 and much lower than the ideal ratio of 1.0. Average daily cholesterol intake was 131.2mg. A highly significant ($p < 0.01$) correlation was observed between saturated fat intake and serum cholesterol. A significant ($p < 0.05$) relation was also found between saturated fats and LDL-C and serum triglycerides. The percent contribution of fats to total daily energy was 32.5%, which was undesirable. Hence, it was concluded that modification in diet can reduce the incidence of CVD among rural male population of Punjab.

The effect of adherence to recommendations for fish intake on adipose tissue composition and plasma lipids

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Background: Marine n-3 polyunsaturated fatty acids (PUFA) reduce the mortality in patients with coronary heart disease (CHD), and these patients are recommended to eat fatty fish at least 2 times a week.

Patients and methods: Patients referred for coronary angiography due to suspected CHD were included and (n=288) completed a food questionnaire regarding their fish intake. Those who followed the recommendations were classified as belonging to the Fish+ group (n=197), while those, who consumed fish less than twice a week, were in the Fish- group (n=91). Plasma lipids and lipoproteins and the content of marine n-3 PUFA in adipose tissue, a long-term marker of fish consumption, were then compared between the 2 groups. The content of n-3 PUFA in adipose tissue was measured by gas chromatography and expressed as percent of total fatty acids.

Results: In the Fish+ group the content of the marine n-3 PUFA, eicosapentaenoic acid (EPA) was 0.14 % (0.05) and docosahexaenoic acid (DHA) was 0.39 % (0.16) compared to the Fish- group, where the content of EPA was 0.11 % (0.04) and of DHA 0.28 % (0.11) in adipose tissue ($p = < 0.001$ for both). Plasma lipids and lipoproteins did not differ between the 2 groups.

Conclusion: Patients who followed the general recommendations about fish intake (Fish+ group) did have at higher incorporation of EPA and DHA in adipose tissue, compared to patients who consumed little fish (Fish- group). However, plasma lipids and lipoproteins did not significantly differ between the groups.

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Nutrition and cardiovascular disease

Clinical studies on the innocuousness of chitosan and its short-chain derivative generated by enzymatic hydrolysis

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Chitosan is a cationic polysaccharide produced by partial or total deacetylation of chitin from crustacean shells. Due to its beneficial activity on lipid disorders, chitosan is seriously considered as a potential ingredient of functional foods. Chitosan forms of intermediate molecular weight have been shown to be more effective than high molecular weight forms in lowering plasma cholesterol in a number of animal studies. We have used a proprietary procedure to generate chitosan forms of specific molecular weights by enzymatic hydrolysis and have developed a procedure of recovery of the hydrolysate that is fully compatible with applications to human diets. Here, we present the results of a 3-month clinical study of the innocuousness of 1.6, 2.4 and 3.2 g/day, respectively, of chitosan added as a supplement to the unrestricted diet of female and male volunteers. Two types of chitosan differing by their molecular weight, 30 kDa (Libracol™) and 250 kDa, were used. A placebo group was also included in our study. Monitoring of a series of physiological, biochemical and clinical tests was used to assess the effects. Results showed that there were no untoward effects of either form of chitosan on the neurological, cardio-vascular, respiratory, urinary, hepatic, digestive and circulatory systems. Some minor discomforts were observed such as belching and some cases of bloating. However, the ingestion of chitosan did not cause any major digestive problems. There were no changes in a series of clinical and biochemical tests. The plasma levels of the lipo- and water-soluble vitamins were not affected. The diet supplement of chitosan (2.4 and 3.2 g/day) was associated with a significant decrease in plasma cholesterol levels (Student's *t*-test for paired data) in the cohort of subjects. The plasma cholesterol levels returned to their initial values one month after terminating chitosan ingestion.

Sponsor: Magistral Biotech Inc, 1060 Michèle Bohec Street, Blainville, Quebec, Canada, J7C 5E2.

Marine n-3 fatty acids and ventricular arrhythmias in patients with implantable cardioverter defibrillators

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Background: Dietary n-3 polyunsaturated fatty acids (PUFA) derived from fish may reduce the incidence of sudden cardiac death (SCD) probably due to an antiarrhythmic effect. However, such an effect of n-3 PUFA has only been sparsely investigated in humans.

Methods and Results: We included 98 patients with ischemic heart disease and treated with an implantable cardioverter defibrillator due to a previous serious arrhythmic event. The number of recorded and treated ventricular fibrillation (VF) and ventricular tachycardia (VT) events were assessed during a 12 month period and related to the concentration of marine n-3 PUFA in serum phospholipids. Patients with more than one arrhythmic event had significantly lower n-3 PUFA levels compared to patients without arrhythmias (mean 7.1 % vs 9.2 %, $p < 0.01$). Dividing the patients into quintiles according to their n-3 PUFA level those with the lowest content of n-3 PUFA had more ventricular arrhythmias than patients with the highest concentration of n-3 PUFA (mean 1.3 event vs 0.2 event, $p < 0.05$). In line with this, 33% of the patients in the two lowest n-3 PUFA quintiles developed arrhythmias compared to 18 % in the other quintiles ($p < 0.05$).

Conclusion: Patients with a low content of n-3 PUFA in the blood had a significantly higher incidence of malignant ventricular arrhythmias compared to patients with high blood levels of n-3 PUFA. The data suggest that the protection offered by n-3 PUFA on SCD observed in previous studies is caused by a direct antiarrhythmic effect of n-3 PUFA.

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Nutrition and cardiovascular disease

Calcium status among pregnant women

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The dietary intake of women when they conceive is considered to be important to the outcome of the pregnancy (as well as intake of certain nutrients). Each individual nutrient has certain specific effect on the fetal outcome if it is not taken at optimal level. During pregnancy, a mother will experience various physiological and psychological changes. These changes will warrant additional intake of certain nutrients, one of which is calcium. The main objective of this study was to determine the calcium status among pregnant women in rural areas of Malaysia. A total 60 women of Malay, Chinese and Indian ethnic groups agreed to participate in the study. The data on demographic characteristics of the respondents, knowledge on nutrition, 24 hour dietary intake and food frequency were collected by using a set of pretested questionnaires. Three milliliters of blood were collected from each respondent to determine serum calcium. The calcium in the blood was analysed by using AAS. Results on the serum calcium showed that 43.75 % of the respondents had normal, 37.5% had lower and 18.75 % had high serum calcium in their blood. However from the analysis of 24 hour dietary recall, it was found that calcium intake from the diet in 92% of the respondents was less than recommended amount according to RDA. The sources of calcium intake as determined by using food frequency questionnaire were mainly from leafy vegetables, seafoods and powdered milk. One of the demographic data taken from the respondents was level of blood pressure. Many studies found that intake of calcium as recommended in RDA will prevent incidence of pregnancy-induced hypertension among pregnant women. Analysis of the data using Pearson correlation between level of blood pressure and serum calcium found a negative correlation between the two variables, however it was not significant ($r = -0.1091$, $p = 0.552$). Since majority of respondents had less than recommended amount of calcium intake, the nutrition education on pregnant mothers could be further enhanced in this area.

Impact of incorporating soya fibre and processed soyabean flours on the glycaemic index of parantha

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The glycaemic index (GI) of foods has important implications for the prevention and treatment of the major causes of morbidity and mortality including diabetes mellitus, cardiovascular disease and obesity. This study was conducted to estimate the GI of an Indian snack food 'parantha' (a kind of unleavened bread) made from unrefined wheat flour. Its three variations containing soya fibre, roasted soyabean flour and defatted soyflour (approximately 20% level) respectively and having 50g available carbohydrate were also tested. Five healthy, normal weight females aged 21-23 years comprised the sample. Glucose was used as a reference food. The test meals were given within 4 weeks of reference food administration, with at least 4 days interval between each test food. The test and reference food were served at a fixed time in the morning, after a 12-h overnight fast. Blood glucose was estimated at 0, 30, 60 and 120 min after eating, using Arkaray blood glucose test meter II. The plain parantha had the highest GI (87.03%). Soya fibre was most potent in lowering GI, the value being 55.03%. Roasted soyabean flour and defatted soyflour containing paranthas had a GI of 75.63% and 65.67% respectively. There was a significant difference among the four mean GI values. All the paranthas had good acceptability as judged by a semi-trained panel using 9 point hedonic scale and 5 point rating scale.

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Nutrition and cardiovascular disease

The health status of hypertensive patients in Hospital Teluk Intan, Perak, Malaysia

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Hypertension is one of the risk factors of cardiovascular diseases and is a major determinant for the incidence of stroke, coronary heart diseases and renal failure. The prevalence of hypertension in Peninsular Malaysia has shown a marked increase from 14.4% to 24.0% as reported by the 2nd National Health and Morbidity Survey, 1996. Twenty percent of the total certified deaths due to cardiovascular diseases were recorded in 1996 and it increased up to 20.33% in 1998. The objective of this study was to determine the health status of hypertensive patients in Hospital Teluk Intan, Perak. Data were collected using an interviewer-administered questionnaire which assessed the socio-demographic status, medication compliance and lifestyle practices. Dietary intake was assessed through Food Frequency Questionnaire. Data were analysed using SPSS Version 10.0. Current information on height, weight and blood pressure were recorded. One hundred subjects, 48 males and 52 females, with a majority of them between the ages of 45 and 64, participated in the study. Most of the subjects had only primary level of education (49%) with a mean income of RM 704.08 ± 539.95. Results indicated that the mean systolic and diastolic blood pressure of the subjects were 141 ± 16.53mm Hg and 87 ± 8.10 mm Hg respectively. Approximately 57% of the subjects were overweight with a mean Body Mass Index of 26.2 ± 4.4 kg/m². The majority of subjects were non-smokers (79%) and led sedentary lifestyles. Oil, salt and sugar were food items consumed highly and regularly. In terms of lifestyle and dietary modifications, only 30% of the subjects claimed to have reduced salt intake and 10% have stopped smoking. Compliance with medication regimen was 100% through self-reporting but only 62% of the subjects had their blood pressure under control. There was no relationship seen between the level of education with medication regimen compliance among subjects. In conclusion, the health status among hypertensive patients in Hospital Teluk Intan was moderate and needed modifications on dietary intake and lifestyle practices to prevent undesired complications. The findings from this study should be taken into attention in future hypertension studies and interventions programmes.

Simvastatin not low-cholesterol diet lowers the elevated plasma nitric oxide level in hyperlipidemic patients

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Introduction: Simvastatin is beneficial for preventing cardiovascular diseases through its modulation of nitric oxide production in addition to its lipid-lowering effects. It is not known whether statins inhibit NO production or down-regulate the iNOS expression in human. It is not clear from experiments to date whether it is possible to predict the final changes of plasma NO concentration of hypercholesterolemic patients after low-cholesterol diet and statin therapy. This is because the statin therapy leads to the activation of eNOS activity of the endothelium while it leads to suppression of iNOS expression in the leukocytes infiltrating the atherosclerotic lesions. We investigated the effects of simvastatin therapy and lipid-lowering diets on plasma NO concentration as well as on plasma lipid profile and coronary risk factors in hyperlipidemic patients.

Method: We measured the plasma level of nitrite and nitrate (NOx), and lipid profiles in nineteen hyperlipidemic patients controlled with low-cholesterol diet and following simvastatin therapy for 12 weeks, respectively.

Result: Plasma level of NOx, stable metabolites of nitric oxide (NO), was elevated by 2-fold in hyperlipidemic patients. Although 12 weeks of low-cholesterol diet did not lower NOx level, subsequent 12-week of simvastatin (10mg/day) therapy along with the therapeutic diets, lowered NOx level significantly. This lowered level of NOx induced by simvastatin therapy was positively correlated with the lower coronary risk factor ($r=0.40$, $p=0.02$).

Discussion: Simvastatin therapy appears to down-regulate, selectively, the iNOS expression which produces large amounts of NO that contribute to overall plasma NOx concentration while increase the eNOS activity and expression which may not contribute plasma NOx level in hyperlipidemic patients. Simvastatin therapy decreases plasma NOx level by, perhaps, decreasing iNOS expression or activity leading attenuation of development of neointima.

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Nutrition and cardiovascular disease

Does body mass index reflect percentage body fat and body fat distribution in low and high birth weight subjects?

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Background: Birth weight has been linked to increased morbidity and mortality in later life, but the mechanisms are poorly defined. It is not clear if adults with low and high birth weights have different percent body fat and pattern of fat distribution, which are associated with health outcomes, including cardiovascular disease. The purpose of this study is to assess if the percentage body fat and its distribution within the body differ between adults with a low and high birth weight, after adjusting for BMI.

Methods: A total of 29 men aged 65-72 y old were recruited randomly from a Hertfordshire cohort with known birth weight and divided into two groups: a low birth weight group (<6.5 lbs); and a high birth weight group (>9 lbs). Body composition was assessed using DEXA Hologic Delphin and the results were processed using software v12.2, and expressed as mean \pm standard error.

Results: Compared to the high birth weight group the low birth weight subjects were shorter (1.72 ± 0.02 v 1.78 ± 0.02 m; $P=0.05$) and lighter (79.44 ± 2.17 v 88.80 ± 3.42 kg; $P = 0.02$). The low birth weight group also had a greater % body fat (28.71 ± 1.03 v $25.53 \pm 1.85\%$; NS) despite a lower BMI (26.76 ± 0.50 v 28.00 ± 1.17 kg/m²; NS). When adjusted to the same BMI (27.31 kg/m²) using ANCOVA, there was ~5% more body fat (29.32 ± 1.03 v 24.77 ± 1.15 %; $P=0.006$) and more centrally located fat (ratio of non limb/ limb fat, 1.53 ± 0.05 v 1.34 ± 0.06 ; $P=0.03$).

Conclusion: At the same BMI, older adults with a low birth weight had relatively more body fat and more centrally distributed fat than those with a high birth weight. This suggests that BMI should not be indiscriminately used to assess adiposity in low and high birth weight adults. The results could also help explain the higher risk of cardiovascular disease associated with poor fetal growth.

Elevated blood pressure: emerging health problem in Iran

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Introduction: Hypertension is a major underlying cause of coronary heart disease and stroke. The risk of both CHD disease and stroke increases progressively throughout the observed range of blood pressure. Observational studies show that a sustained difference of only 7.5 mmHg in the diastolic blood pressure confers up to a 28% difference in risk of CHD and a 44% difference in the risk of stroke.

Methods and materials: This national survey was conducted in 2001. The method was cluster sampling for households and in each cluster, 8 households were studied. Totally, 8776 urban and 4719 rural households participated fully in this cross sectional descriptive study, giving a response rate of 99%. Samples had anthropometrics and blood pressure measured and filled out a questionnaire consisting of socio-economic, demographic, dietary intake and biomedical items.

Results: The results indicated that 13.9% of males and 22.1% of females had systolic blood pressure in 45-69 age group. This rate reached to 28.1% of males and 42.3% of females in +70 age group. In addition, 38.9% of males and 46.4% of females had diastolic blood pressure in 45-69 age group. This rate went up to 47% of males and 57.3% of females in +70 age group. The average values of systolic and diastolic blood pressure were 138.6+22.5 and 84.9+12.7 mmHg in men, and 144.7+24.6 and 87.1+13.7 mmHg in women respectively. Based on the results, in different age groups (25-44, 45-69 and, more than 70 years) hypertension was diagnosed in 7.1%, 27% and, 41.4%. Women have statistically significantly higher values of blood pressure compared with men.

Conclusion: Since in many developed and developing countries, the risk of CHD may be three to six times that of stroke, the population benefit of a lower blood pressure will have its greatest impact by reducing the number of cases of CHD. The benefit of lowering blood pressure are clear in both primary and secondary preventive trials. This research reinforces the need for preventive program to control elevated blood pressure in Iran.

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Nutrition and cardiovascular disease

Non communicable disease risk factors in Iran

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Introduction: Non-communicable disease, especially cardiovascular disease (CVD), as a public health problem became evident in developed and developing countries in this century. The majority of deaths (59%) is from non-communicable diseases. Six out of ten leading risk factors to all deaths in the world relate to diet and physical activity. Approximately 80% of the NCD burden is found in developing countries. Iran is an example of countries in the eastern Mediterranean region undergoing a nutritional transition.

Methods and materials: This article reviews 3 national surveys: "National health and disease", in 1999, "National Food consumption", in 1995, and "Analytical report on edible oils situation", in 2002.

Results: The results show that 34.8% of deaths were due to CVD in 2000. Hypertension affected 10.2% of the total population. This rate reached to 27% and 41.4% in 45-69 and +70 age groups respectively. In addition Hyperlipidemia prevalence (>200mg/dl) was 25.7%. Diabetes prevalence based on personal given history was 1.5%. The prevalence of over weight and obesity was as high as 50% among men and 66% among women in 40-69 age groups. Fat and carbohydrate consumption were 30% and 40% more than recommended amounts respectively. 80-90% of edible oils were hydrogenated oil. Mean elaidic acid levels (trans fatty acid) in hydrogenated oils were 30%, 23.8% and 27.2% in 1999-2001. This rate was reported 38.3% in 2002. Mean trans fatty acid intake (15.6-30gr/day) was far away from recommended amount (<5gr/day). The population's sedentary life style was also becoming as a public health problem, with 70-80% being physically inactive.

Conclusion: Non-communicable diseases and their related morbidity and mortality are becoming a significant serious public health problem in Iran. Development and implementation of national policies to modify food consumption patterns is highly recommended to decrease the risks of NCDs.

Used oil consumption impairs peripheral vascular physiology

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With the growing number of fast-food outlets, consumption of products cooked in used oils may increase. This study investigated whether lipid parameters and peripheral vascular physiology were affected in individuals after consuming a meal cooked in unused oil compared to a meal prepared in used oil, sourced from fast food outlets after one month of use. Twelve healthy volunteers (6M, 6F: mean age 31 yr \pm 7, range 21-41 yr) were asked to consume an isocaloric meal prepared in either unused or used oil on two different occasions (1030kcal, 61g total fat). Biochemical, endocrine and vascular studies were performed in the fasting state, 3-hours and 6-hours after consuming each meal. Arterial endothelial function was assessed as flow-mediated dilation (FMD) in the brachial artery, using high-resolution ultrasound. Resting and post-hyperaemic forearm blood flow were recorded using venous occlusion strain-gauge plethysmography before and after five minute upper arm ischaemia induced by suprasystolic blood pressure cuff inflation. Repeated measures analysis of variance determined the statistical differences. The physiological, postprandial fluctuations were seen in total cholesterol, LDL and HDL-cholesterol, triglycerides, insulin, glucose and homocysteine, however, there were no statistical differences at corresponding timepoints after the consumption of each oil. The normal decrease in free fatty acids was not sustained as strongly over time after the used oil meal ($p=0.001$). There was no significant change in FMD or vessel size, however, blood flow in the brachial artery was reduced at the 6 hour timepoint postprandially when baseline differences were accounted for ($p=0.009$). Resting forearm blood flow and total hyperaemia did not change significantly over time. The postprandial increase in post-hyperaemic forearm blood flow was reduced after ingestion of the used oil meal ($p=0.002$). Eating a meal prepared in used oil reduces blood flow in the brachial artery and the post-hyperaemic microvascular response. As these are key indicators of vascular health, this data is consistent with adverse effects of ingesting used oils, as regards to normal cardiovascular reactivity to a meal. Further work into the adverse mechanism of used oil consumption on the vasculature is warranted. With the growing awareness of public health issues, promotion of more frequent discarding of oils in the food industry should be supported.

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Nutrition and cardiovascular disease

Antioxidants modulate the nitric oxide system and SOD activity and expression in rat epithelial lung cells

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Nitric Oxide (NO) plays a key role in many physiological processes and is synthesized by the enzyme Nitric Oxide Synthase (NOS). There is increasing evidence that NO produced in human airways is involved in pathological events, such as asthma. This work investigated the effect of various antioxidants on NO production and on iNOS and SOD expression and activity in stimulated epithelial lung cells, as a model for asthma. L-2 cells were stimulated with combinations of TNF α , INF γ and LPS for 24h, followed by incubation with increasing concentrations of N-acetyl-l-cystein (NAC), resveratrol, Genistein, Quercetin, soy saponin 2, 3-dihydro-2, 5-dihydroxy-6-methyl-4H-pyran-4-one (DDMPI) and with an olive leaf polyphenol extract. NO production was determined by measuring nitrate and nitrite concentrations using the Griess reaction. Expression of iNOS and SOD were detected using western blot analysis. SOD activity was measured by an ingel activity assay. cGMP was also detected using radioimmunoassay kit. In stimulated cells, the concentration of nitrites in the medium increased 4 fold compared to control cells. Resveratrol and the olive leaf extract reduced nitrite levels in the medium by 37% and 41% respectively. Quercetin and genistein reduced nitrite levels by approximately 50%. However, NAC increased levels by 48% and DDMP had no effect. Significant reductions in iNOS expression were measured following treatment with polyphenol extract and resveratrol. SOD expression was higher in stimulated cells when compared to controls and significant increases were detected by olive leaf extract, quercetin and genistein. Total SOD activity, as well as cGMP levels were not affected by cytokine stimulation or by any treatment. The presence of resveratrol as well as a polyphenol extract in a cellular model of asthma significantly reduced iNOS expression and medium nitrite concentrations. These compounds presumably act by different mechanisms. The polyphenol extraction affects the antioxidant enzyme MnSOD while resveratrol does not. These results indicate that treatment with these active compounds may be beneficial in inflammatory lung diseases.

Long- term effects of policosanol on older patients with Type 2 diabetes

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Diabetes and hypercholesterolemia are major coronary risk factors. Coronary risk of diabetics is also greater than non-diabetics. The main goal of dyslipidemia control in diabetics is to lower elevated low-density lipoprotein-cholesterol (LDL-C) levels. Policosanol is a cholesterol-lowering drug purified from sugar cane wax, which significantly reduces LDL-C levels and inhibits platelet aggregation. Previous short-term studies have shown the efficacy and tolerability of policosanol at 10 mg/day on patients with Type 2 diabetes, but no previous study on the effects of long-term treatment or lower doses has been reported. This study was undertaken to investigate the long-term efficacy, safety and tolerability of policosanol on patients with Type 2 diabetes. After 5 weeks on a step one cholesterol lowering diet, 239 patients with Type 2 diabetes were randomized to policosanol 5 mg/day or placebo for 2 years. Analysis was by Intention-to-treat. Baseline characteristics were well matched in both groups. After one year, policosanol reduced significantly ($p < 0.0001$ versus baseline and placebo) low-density lipoprotein-cholesterol (LDL-C) (21.1 %), total cholesterol (TC) (17.5 %) and triglycerides (TG) (16.0 %), whereas increased ($p < 0.01$ versus baseline and placebo) high-density lipoprotein-cholesterol (HDL-C) levels (10.7 %). Treatment effects on LDL-C, HDL-C and TC persisted, even moderately enhanced, during the study, the effect on TG being persistent too. Thus, at study completion, policosanol lowered ($p < 0.0001$ vs baseline and placebo) LDL-C (29.5 %), TC (21.9 %), TG (16.9 %) and raised ($p < 0.0001$ vs baseline and placebo) HDL-C (12.4 %). No significant changes on lipid profile variables of placebo group occurred during the study. Of 239 randomized patients, 63 (26.4 %) discontinued the study, 43/120 placebo (35.8 %) and 20/119 policosanol patients (16.8 %). Of them, 35 patients (28 placebo, 7 policosanol) withdrew from the study due to some AE. The frequency of serious adverse events (SAE), most vascular, in policosanol patients (6/119, 5.0 %) was lower than in respective placebo (26/120, 43.3 %). Five patients, all placebo, died during the study, four of them due to myocardial infarction. No drug-related impairment of safety indicators, particularly on glycemic control, was observed. Nevertheless, a reduction of systolic and diastolic blood pressure was observed in policosanol patients compared with placebo. The overall frequency of policosanol patients reporting mild and/or moderate was similar than in placebo. It is concluded that policosanol was long-term effective, safe and well tolerated on patients with dyslipidemia due to Type 2 diabetes.

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Long-term effects of policosanol on obese patients with Type II Hypercholesterolemia.

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Both hypercholesterolemia (HC) and obesity are coronary risk factors. Clinical studies have shown the benefits of lowering elevated plasma levels of low-density lipoprotein-cholesterol (LDL-C) on clinical end-points. Policosanol is a cholesterol-lowering drug purified from sugar cane wax with a therapeutic range from 5 to 20 mg/day. This randomised, double-blinded, placebo-controlled study was undertaken to investigate the long-term efficacy and safety of policosanol in obese patients (BMI \geq 30) with Type II hypercholesterolemia. After 5 weeks on step one cholesterol-lowering diet, 129 patients were randomised to policosanol 5 mg or placebo tablets taken once daily with the evening meal for 3 years. Lipid profile variables, safety indicators, adverse events (AE) and compliance with diet counselling and study medications were assessed. Study patients showed a high frequency of other coronary risk factors, hypertension being the most common. Both groups were well matched at randomisation. After one year on treatment, policosanol significantly ($p < 0.01$ vs placebo) lowered serum LDL-C, the primary efficacy variable (24.3 %) and total cholesterol (TC) (15.8 %), whereas increased high-density lipoprotein-cholesterol (HDL-C) (21.9 %). Changes of lipid variables in placebo were not significant. Treatment effects were persistent, even slightly enhanced, during the trial. At study completion, policosanol had lowered ($p < 0.00001$) LDL-C (31.8 %) and TC (20.1 %), while markedly raised ($p < 0.00001$) HDL-C (24.6 %). Thirty patients (18 placebo, 12 policosanol) discontinued the study: 15 (11 placebo, 4 policosanol) due to AE and 12 (9 placebo, 3 policosanol) due to serious adverse events (SAE), most vascular. Policosanol was safe and well tolerated, not impairing significantly any safety indicator. Average body weight was slightly reduced over the study, indicating a general acceptable compliance with dietary recommendations, but policosanol did not show any drug effect on body weight. Overall, 28 placebo and 26 policosanol patients reported some mild or moderate AE during the study. It is concluded that policosanol was effective for lowering cholesterol in obese patients with type II hypercholesterolemia, being also safe and well tolerated.

Effect of a soy supplement on spontaneous atherosclerosis in low density lipoprotein receptor knock out (LDLR^{-/-}) mice

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Dietary isoflavones with estrogenic activity (phytoestrogens) may be an alternative to hormone replacement therapy in prevention of cardiovascular disease for postmenopausal women. In order to investigate the effect of an isoflavone rich soy supplement on blood lipids and atherosclerosis, twenty 6-week old female LDLR^{-/-} mice, with plasma cholesterol 6.72mM, and triglycerides 1.81 mM, received a standard diet (control, N=10) or 1% soy supplement added to the standard diet (N=10) for 5 weeks followed by addition of 0.02% cholesterol to the respective diets for 18 weeks. Blood lipids were measured at the start, prior to cholesterol addition to the diets, every third week thereafter, and at termination. Malondialdehyde (MDA), a biomaker for redox status in LDL, was measured at termination. The aortic atherosclerosis, expressed as lipid accumulation of the initial part of the ascending thoracic aorta was quantified by point counting on histological cross sections and expressed as the ratio: R_{lipid/wall}. Cholesterol addition to the diets increased plasma cholesterol in both groups but the increase was lower in the soy group (after 6 weeks of cholesterol addition: 9.38 mM vs. 7.29 mM. $P < 0.05$, at termination: 6.96 mM vs. 6.02 mM, $p < 0.05$). Plasma triglycerides were slightly but statistically significantly lower in the soy group than in controls during cholesterol feeding. Blood lipid levels in lipoproteins were comparable between the groups except for a lower very low density lipoprotein (VLDL)-cholesterol in the soy group (2.70 vs. 2.04, $p < 0.05$). Concentration of MDA in LDL was similar in both groups. R_{lipid/wall} was lower in the soy group (0.129 vs. 0.063, $p < 0.05$). In conclusion, the present study in LDLR^{-/-} mice demonstrated that the tested soy supplement reduced aortic atherosclerosis in LDLR^{-/-} mice, possibly due to reduction of plasma cholesterol and its concentration in VLDL. This finding is in line with an association between the dietary intake of soy products and the reduced risk of cardiovascular disease observed in epidemiological studies. Furthermore, it indicates that LDL receptor deficiency does not abolish the atheroprotective action of soy isoflavones. The latter may be of importance for humans with either genetically conditioned or acquired deficiency in functional LDL receptors.

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Study of leek (*Allium porrum*. L) extract on cholesterol plasma levels in hyperlipidemic animals

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Atherosclerosis is a disease affecting large and medium-sized arteries and remains the leading cause of mortality and morbidity in developing countries. It is now well documented that there is a causal relationship between increased serum lipid levels and the development of atherosclerotic disease. The major aim of the present study was to investigate the effect of hydroalcoholic extract of *Allium porrum*. L. (A herbaceous plant from Liliaceae family that have been used in Iranian traditional medicine as an antiatherogenic remedy) on plasma lipid levels. Rabbits were divided into 5 groups as follows: control, hypercholesterolemic control and 3 treatment groups (hypercholesterolemic diet +250, 500, 1000 mg/kg.b.w of extract) and were fed for 12 weeks. Blood samples were obtained to analyze plasma cholesterol, triglyceride, LDL and HDL cholesterol and atherogenic index (A.I.). Body weight increased in all groups throughout the treatment without significant differences among them. Plasma total cholesterol increased with respect to the control in the positive control group at the end of the treatment. Plasma total cholesterol decreased in all groups treated with *A. porrum* extract in a dose dependent fashion. Changes in the distribution of cholesterol in HDL or LDL were found and LDL-C decreased significantly in all of the groups treated with *A. porrum* extract with respect to hypercholesterolemic group. All treated animals also showed a decrease in A.I. Further research is necessary to evaluate the activity of the minor constituents and the mechanisms of these effects. However, these findings indicate that this plant may be useful for the treatment of hyperlipidemia.

Estimation of risk for developing cardiac problem in patients of Type2 Diabetes as obtained by the technique of density estimation

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In a hospital-based study conducted by Indian Council of Medical Research in 1989-92, 4637 patients of Type2 Diabetes (Non-Insulin Dependent Diabetes Mellitus) were enrolled. Various biochemical investigations and electrocardiogram (ECG) were carried out on the patients at regular intervals. The 311 patients showing ECG positive, formed the first group. The remaining patients numbering 4326 formed the second group. The observations on cholesterol and triglyceride of the patients in both the groups were considered for estimation of risk for developing the cardiac problem. The technique of density estimation employing Epanechnikov kernel, was employed for estimating bivariate probability density functions with respect to observations on cholesterol and triglyceride of the patients falling in the two groups thus formed. Using the odds form of Bayes' rule, the estimates of posterior odds were computed. It was demonstrated that if the value of cholesterol was fixed at 250 and triglyceride was increased from 209 to 254 and then to 260, the posterior odds of developing a cardiac problem increased from 0.0629 to 0.08047 and then to 0.08459. In other words, keeping cholesterol fixed at 250 and increasing triglyceride by a margin of 45 and 51 units from 209, led to respectively 1.28 and 1.34 times increase in odds for developing a cardiac problem.

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Blood lipid and glucose levels of adolescents belonging to upper income group as markers for assessing the risk of CAD/DM

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Inadequate nutrition, unhealthy dietary habits and poor lifestyle practices during childhood are the prime factors that predispose an individual, in adult life, to various degenerative diseases such as CHD, hypertension, Diabetes Mellitus and obesity. Thus, timely implementation of preventive strategies is crucial for improving the dietary patterns and lifestyle practices of our 'would be adults'.

Objectives: To study the dietary habits and physical activity pattern; and to assess the nutrient intake, blood pressure, anthropometric parameters as well as the blood lipid and Glucose levels of school going adolescents belonging to well to families.

Methodology: School going adolescents - both boys and girls (N=773), aged between 13 and 18 years, were enrolled from public schools of South Delhi. Data were gathered on dietary habits, food preferences, physical activity pattern and anthropometric measurements. One day 24 hour recall coupled with the food frequency approach was employed to obtain dietary intake data. Overnight fasting blood samples (5ml) were analysed for serum lipids (TC, LDL, VLDL, HDL and TG) and blood glucose levels. Dietary data have been analysed, both for the macro and micronutrient intake; and a scoring pattern has been developed to assess the physical activity level of the subjects.

Results: The data revealed that majority of the subjects had faulty dietary habits. The consumption of fruits and raw vegetables (salads) was in general low; while fried/processed foods and desserts consumption was quite frequent. The diets of majority of the adolescents were low in dietary fibre, vitamins and minerals. Most of the adolescents spent their free time in sedentary activities like watching TV, reading and playing videogames and participation in outdoor activities/competitive sports was fairly low. The mean Physical Activity Score (PAS) was 1.46, ranging from 1.30–1.79. Mean BMI of the subjects was 20.9 kg/m², the prevalence of overweight/ obesity being 14.9% and underweight 30.6%. The mean total cholesterol was 157.9mg/dl, LDLc-89.8mg/dl, VLDLc-17.1 mg/dl, HDLc-50.6mg/dl, triglycerides - 85.2mg/dl and fasting blood glucose-82.2 mg/dl. Nearly 8.5% of the subjects were hypercholesterolemic/borderline cases (TC>200mg/dl), 8.3% hypertriglyceridemic (TG>130 mg/dl) and 8.1% hyperglycemics (fasting blood glucose >100mg/dl). 30% exhibited SBP >120 mmHg while 16.7% had DBP >80 mmHg. The study focuses on the relationship of dietary errors and lifestyle practices with the blood lipid levels and hence the CAD risk.

Conclusion: In view of a sizeable number of the adolescents exhibiting dietary errors, poor lifestyle practices coupled with hypercholesterolemia, hypertriglyceridemia and hypertension; early screening and timely implementation of effective educational interventions leading to necessary dietary/lifestyle modifications and attitudinal change is imperative. This would help in preventing various chronic diseases, which are becoming a concerned cause of morbidity and mortality amongst our youth, particularly those from the elite group.

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Educational intervention for modifying the lipid levels of school going adolescents

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India is witnessing a rapid rise in the incidence of premature CAD. Current evidence indicates that while clinical manifestations may appear in the middle/late adult life, the initiation of CAD (atherosclerosis) begins in childhood itself and the lesion progress through several stages due to the cumulative effect of various risk factors. Elevated total cholesterol particularly LDLc has been identified to be most closely associated with the morbidity and mortality due to atherosclerotic heart disease. Since serum cholesterol levels track well from adolescence to adulthood, it is imperative to screen adolescents for hypercholesterolemia and impart need-based nutrition and health education so as to curb the rising incidence of CAD and its associated risk factors.

Aim: To study the present health status of adolescents belonging to different socio-economic groups; identify risk factors associated with the early onset of CAD; develop relevant IEC material to impart need-based education and assess its efficacy.

Methodology: A total of 300 adolescents aged between >15 to <18 years studying in schools providing educational facilities to various socio-economic segments of the society were enrolled for the study. Data were gathered on their lipid levels, B.P as well as anthropometric measurements in the pre and post intervention phase. Educational intervention was carried out in the form of four lecture-cum-discussion sessions held at weekly intervals followed by three recapitulation cum problem solving sessions.

Results: The pre and post intervention data (after a gap of ~10 months) indicated significant positive change in the lipid levels, B.P and anthropometric measurements. The mean total cholesterol of the boys and girls registered a drop of 12.33mg/dl (8.24%) and 19.32mg/dl (11.86%) respectively. In the pre intervention phase while 11.26% were high risk hypercholesterolemics (TC \geq 200mg/dl) and 25.3% borderline cases (TC >170mg/dl-<200mg/dl), in the post intervention phase the number reduced to 2.11% and 11.97% respectively. In case of the girls and boys, the LDLc dropped by 18.97mg/dl (girls) and 23.15mg/dl (boys), TG by 20.8% and 16.9%; while the HDLc registered an increase by 20.4% and 17.5% respectively. However, there was no significant change in the VLDLc levels.

Conclusions: Imparting relevant nutrition and health education with special emphasis on the prevention of CAD can go a long way in attenuating the risk factors associated with the early onset of heart disease.

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The effects of consumption of guava (*psidium guajava*) or papaya (*carica papaya*) on total antioxidant and lipid profile in normal male youth

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This pre and post study was conducted to determine the effects of consumption of guava or papaya (400 g/day) on total antioxidant status and lipid profile (total cholesterol, triglycerides, LDL-cholesterol and HDL-cholesterol) in normal male youth at 'Institut Kemahiran Belia Negara, Hulu Langat, Selangor, Malaysia'. This study was carried out for 9 weeks, which was divided into 3 phases, which were baseline phase (1 week), treatment phase (4 weeks) and control phase (4 weeks). During the treatment phase, respondents were asked to eat approximately 400 g/day guava or papaya. Meanwhile, in control phase, the same respondents were asked to stop taking guava or papaya. Blood samples were collected at the end of each phase for biochemical test. Total antioxidant status, glucose, lipid profile and antioxidant enzymes were determined using Cobas Mira autoanalyzer (Roche). Dietary intake in each phase was studied using 24-hours diet recall. There was a significant increase of total cholesterol, triglyceride and HDL-cholesterol in treatment phase compared to baseline phase and control phase ($p < 0.05$) in guava treatment. There was also a significant increase of total antioxidant status during treatment phase compared to baseline phase and control phase ($p < 0.05$) in guava treatment. There were some reductions of glutathione peroxidase and glutathione reductase but not significant in treatment phase compared to baseline phase and control phase in guava treatment. There was a significant change ($p < 0.01$) of plasma glucose level after four weeks of papaya consumption. There was significant increase ($p < 0.01$) of plasma total cholesterol and triglyceride level after four weeks of papaya consumption, but no significant increase ($p > 0.05$) in plasma HDL-cholesterol and LDL-cholesterol levels. After four weeks of papaya consumption, results showed significant increase ($p < 0.01$) in serum total antioxidant status and glutathione reductase level but showed no significant increase ($p > 0.05$) in blood glutathione peroxidase level. In conclusion, the consumptions of guava and papaya reduces oxidative stress and alter lipid profile. Thus, it could reduce the risk of disease caused by free radical activities and high cholesterol in blood.

Effects of diet modification on cardiovascular risk: results from the leipzig wholesome nutrition study

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In order to support a health-promoting nutritional behaviour according to wholesome nutrition or general dietary recommendations for Europeans a concept for a course-programme was developed. The present study focused on the question of whether there is a long-term effect of this intervention programme on cardiovascular risk profile and other parameters of health status. In a controlled randomized study with an intervention period of 1 year, 3 groups of women (age 35-70 years, $n = 56$) with moderately elevated cardiovascular risk were included. The groups were as follows: control group without intervention, wholesome nutrition/ low-meat diet according to Leitzmann and general dietary recommendations according to the European Atherosclerosis Society/German Society of Nutrition. Subjects with lipid-regulating treatment and diabetes mellitus were excluded. In the study the measurement of anthropometric parameters, blood pressure, blood lipids, inflammatory and other clinical-chemistry parameters, and the evaluation of lifestyle and dietary variables were included. The study demonstrates that diet modification in the intervention groups improved body mass index, waist-to-hip ratio and lipid profiles (total cholesterol:HDL-cholesterol). These changes were linked with an increased consumption of fibre and decreased intake of saturated fat as recorded in 7d dietary diaries. A favourable trend with respect to inflammatory parameters (high-sensitive C-reactive protein, vascular cell adhesion molecules i.e. circulating ICAM-1) and adiponectin was found. Thus, diet modification consistent with recommendations for prevention of atherosclerosis (wholesome diet) is associated with a favourable profile of lipid and inflammatory parameters.

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Ageing, cardiovascular risk profile and vegetarian nutrition

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With the aim of identifying subjects with increased risk for cardiovascular diseases, population based lipid screening projects (Lipid Study Leipzig, LSL) were initiated in the city of Leipzig, Germany. Age-dependent changes in lipid metabolism may arise as a result of mechanisms of biological ageing and as a result of factors influencing age-dependent changes. To study the possible influence of nutrition and lifestyle of vegetarians on age-dependence of lipid parameters, in the frame of LSL, 10550 subjects (3816 men and 6734 women) from the general population were compared with 419 vegetarians (160 men and 259 women). LSL was performed at community centres, work sites, at the University of Leipzig, and at meetings of the German Society of Vegetarians. The study included capillary blood cholesterol measurements and the determination of HDL-cholesterol. Furthermore, measurement of other cardiovascular risk factors and the evaluation of dietary and lifestyle factors was included in the study. The mean cholesterol and non-HDL-cholesterol concentration and the total: HDL-cholesterol ratio showed the expected age-dependence, with maximum values within the decade 60-70 years followed by a decrease in the higher age groups. Vegetarians showed lower mean total and non-HDL-cholesterol levels in comparison with the general population. Furthermore, the age-dependence of these parameters is less pronounced under the conditions of vegetarian nutrition and lifestyle. The results of the present study reveal the primary role of nutritional and lifestyle factors on population basis and that determine the lipid profile on population basis and suggest that the known age-dependent rise of atherogenic plasma lipoproteins is partly preventable.

Impact of sesame oil on nifedipine in modulating oxidative stress and electrolytes in hypertensive patients

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The aim of the study was to investigate the effect of sesame oil as sole edible oil in hypertensive patients who were on medication with nifedipine, a calcium channel blocker. A sample of 396 hypertensive patients (aged 58 ± 3.8 years; 215 men and 181 women) participated in this study. Forty patients were treated only with nifedipine while three hundred and fifty six patients were treated with nifedipine and instructed to use sesame oil in place of other edible oils for 60 days. The consumption of sesame oil remarkably reduced the (systolic and diastolic blood pressure from 166 ± 4.2 and 101 ± 3.1 to 134.2 ± 3.4 and 84.6 ± 3.0 respectively) blood pressure. The dosage of the drug also reduced, as there was a fall in blood pressure during sesame oil consumption. Plasma levels of sodium decreased while potassium and chloride increased significantly. Lipid peroxidation (thiobarbituric acid reactive substances) level significantly decreased while activities of enzymic (superoxide dismutase, glutathione peroxidase and catalase) and concentrations of non-enzymic antioxidants (vitamin C, vitamin E, β -carotene and reduced glutathione) increased in nifedipine – sesame oil group. Nifedipine group showed a significant reduction in blood pressure, lipid peroxidation and improvement in reduced glutathione, however, the values are significantly lower than nifedipine - sesame oil group. These results suggest that dietary substitution of sesame oil, in nifedipine-taking hypertensive patients, has an additive effect in the reduction of blood pressure and plays an important role in the modulation of electrolytes and in the reduction of lipid peroxidation and elevation of antioxidants.

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Triacylglycerols-induced oxidative stress and necrotic cell death in J774.2 macrophages

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It is well known that excess lipid accumulation in non-adipose tissues can lead to lipotoxicity manifested as cellular dysfunction and cell death. To date, the role of free fatty acids (FFAs) in induction of cellular apoptosis is understood to a large extent. This role involves elevation of nitric oxide (NO) and activation of the ceramide pathway. However, lipids are stored in non-adipose tissues predominantly in the form of triacylglycerides (TG), whose direct contribution to lipotoxicity is not yet clear and appears to be highly complex. The aim of this study was to determine death mechanism of macrophages as a result of exposure to TG. For this purpose commercial lipid emulsion (LE) was added to J774.2 cell culture in concentration of 1%. It was found that exposure of J774.2 macrophages to TG has led to decreased apoptosis (decreased basal caspase activity) and to increased survival within the first 24 hours after treatment with TG. In contrast, after 48 hours the TG effect culminated in massive cell death of 50% with no caspase activation as measured by DEVDase activity. Moreover, TG blocked the activation of caspase following pretreatment with 0.1 µg/ml cycloheximide for 24h, an agent that induces apoptosis, thus changing the type of cell death to necrosis. Furthermore, TG induced the generation of reactive oxygen species. Treatment with water soluble antioxidants N-acetyl-cysteine (0.5 mM) and ascorbic acid (0.5 mM) protected against the lipotoxic effect of the TG. Surprisingly, lipid soluble antioxidants had no protective effect on the cell viability. Therefore, TG may directly regulate lipotoxicity by inducing oxidative stress, which, in turn, may result in oxidation of the caspase system and the activation of necrotic cell death. This mechanism is different from that activated by FFAs. The findings contribute to an understanding of obesity physiological mechanisms that are related to lipid-induced toxicity.

Cardiovascular disease risk factors among a sample of Malay older adults aged 50 to 65 years old

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A cross-sectional study was carried out to assess the cardiovascular disease (CVD) risk factors among a sample of Malay older adults aged 50 to 65 years. A sample of 152 respondents (88 males and 64 females), who met the selection criteria, were randomly selected. The data were collected through interviews, anthropometric and blood pressure measurements, and collection of blood samples. About half of the subjects (57.9%) were in the age group of 50 to 55 years with a mean age of 55.1 years. About 40% of the subjects had a family history of CVD and about half of the subjects (51.3%) were considered as inactive. Cigarette smoking was observed among males only (18.4%). About 37% of the subjects had personality type categorized as at increased risk. The distribution of overweight (Body Mass Index or BMI 25.0-29.9 kg/m²) and obesity (BMI ≥ 30kg /m²) were 46.1% and 27.6%, respectively. The distribution of hypercholesterolemia (total cholesterol or TC ≥6.2 mmol/L) among the subjects was 25% with almost equal proportions in males (26.1%) and females (23.4%). Raised LDL cholesterol (LDL-C) was found in 42.8% of the subjects, while low levels of HDL cholesterol (HDL-C) was evident in 28.9% of the subjects. The distribution of hypertriglyceridemia (triglyceride or TG ≥ 2.3 mmol/L) among the subjects was 13.8%. The distribution of high blood pressure and high blood glucose were 65.8% and 21%, respectively. Based on the nine CVD risk factors, 36.8% of the subjects had more than five risk factors, especially males (42%). According to the classification of CVD risk, 26.3% of the subjects were at high to very high risk (36.4% for males and 12.5% for females). The mean BMI was significantly higher for females than males ($t = -3.359$, $p < 0.05$). There were no significant differences in mean TC, systolic blood pressure (SBP) and diastolic blood pressure (DBP) between both sexes. BMI correlated significantly with HDL-C ($r = -0.243$, $p < 0.05$), SBP correlated significantly with TG ($r = 0.219$, $p < 0.05$), and DBP correlated significantly with TG ($r = 0.229$, $p < 0.05$) in males. SBP correlated significantly with TC ($r = 0.290$, $p < 0.05$), DBP correlated significantly with LDL-C ($r = 0.313$, $p < 0.05$), and DBP correlated significantly with TG ($r = 0.264$, $p < 0.05$) in females. In conclusion, the study indicated that there was a high prevalence of overweight, elevated LDL-C, and high blood pressure among the subjects. Risk factors such as overweight, dyslipidemia, and high blood pressure are modifiable. Therefore, appropriate community-based intervention programmes should be reinforced to reduce the problem of high distribution of multiple CVD risk factors among older adults.

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Nutritional risks of hypertensive outpatients in Korea

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Hypertension is one of the most prevalent chronic diseases in Korea. Analyzing nutritional risks for hypertensive patients is necessary for the implementation of suitable nutrition intervention programs, in order to improve nutritional status, prevent complications, and increase quality of life. A case-control study was administered to compare nutritional risks. A case subject group of 592 (male 178, female 414) with hypertension, and a control group of 123 (male 48, female 75) without diagnostic evidence was recruited at 3 outpatient clinics and 2 community health centers in Korea. Their mean age was 64.5 years and their mean body mass index was 24.9kg/m². Differences in nutritional, dietary, and possible sociodemographic risk factors were assessed using questionnaires. Trained dietitians interviewed subjects to collect demographic, eating behaviour, and health factor relative information. Dietary intake data were also collected using a validated 98-item food frequency questionnaire. Statistical analyses were performed using SAS (ver 8.1). The hypertensive patient subjects and control subjects were not significantly different with respect to age and body mass index. For male hypertensive subjects, there were no significant differences in nutrient intakes in comparisons made with the male control group. However, female hypertensive subjects consumed less energy, calcium, iron, niacin and riboflavin in comparisons made with the female control group. Mean nutrient adequacy ratios, which reflect the quality of nutrient intake were also lower in the case subject group than they were in the control group. In hypertensive subjects, the 'Old-age' (age over 65 years), and 'Overweight' showed no risk for poor nutrition. 'Inadequate Living Expenses', 'Lower Education Level', 'Lack of Physical Exercise', 'Use of Dentures', 'Indigestion', 'Diet Non-modification', 'Lack of Nutrition Knowledge', and 'Depression' were strong variables that affected poor nutrient intake. However, 'Living Alone', 'Meal Skipping', 'Lack of Appetite', and 'Stress Level' were not associated with nutritional risks. This information is useful for effectively screening hypertensive patients who need careful nutrition management and an appropriate nutritional intervention program.

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ICCN Poster Presentations

Food, inflammation and the anti-inflammatory aspects of food

In vitro and ex vivo cyclooxygenase inhibition by a hops extract

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While there has been much research on botanical materials as potential pain-relieving Cox inhibitors, it has not yet been demonstrated that oral consumption of botanical agents can inhibit Cox-2 activity in humans. In particular it would be of interest to determine whether any botanical anti-inflammatory has Cox-1-sparing activity, in order to reduce the risk of gastrointestinal side effects. This two-stage study was designed to first screen a variety of botanicals *in vitro*, and then to select one or more promising agents to test in human volunteers.

Method: Seventeen botanical agents, putative anti-inflammatories or pain-relievers all, were evaluated *in vitro* for Cox-1 and -2 inhibitory potency and selectivity using a caco-2 cell line with ibuprofen as an active control. A promising compound, a hops extract high in alpha acids, showed a Cox-2/Cox-1 IC₅₀ selectivity ratio of 0.06, compared to 4.2 for ibuprofen. Two different formulations of a standardized hops extract (resin and powder) were compared with ibuprofen in a double-blind, randomized, *ex vivo* study. Subjects consumed hops powder extract, hops resin extract, or ibuprofen, and provided blood samples before and at intervals for 9 h following the first dose. Plasma was extracted and analyzed in a validated Cox-1 and -2 inhibition assay.

Results: There were no differences between active treatments or ibuprofen control in Cox-2 inhibitory action, as indicated by 9-hour Cox-2 Area over the Inhibition Curve (AOC); however, hops powder or hops resin extract produced a 9-hour Cox-1 / Cox-2 AOC ratio of about 0.4 (i.e., some degree of Cox-1 sparing), compared to 1.5 for ibuprofen (i.e. no Cox-1 sparing).

Conclusion: Hops exhibited Cox-2 inhibition over 9 hours equivalent to ibuprofen 400 mg but had significant Cox-1 sparing activity relative to ibuprofen. Hops extracts may represent a safe alternative to ibuprofen for non-prescription anti-inflammation.

Assessment of micronutrient antioxidants, total antioxidant capacity and lipid peroxidation levels in liver cirrhosis.

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Background: The profile of micronutrient antioxidants in serum may be helpful in assessing lipid peroxidation and inflammation in cirrhotic. Acute phase proteins (APRs) are anti infective, anti-inflammatory, procoagulant and scavengers. Saturation of transferrin (Trf) level in the liver is more susceptible to peroxidative damage of functional integrity of the cells and affects the antioxidant activity. Therefore, we hypothesized decreased intake of micronutrient antioxidant may influence total antioxidant capacity, lipid peroxidation and acute phase reactants.

Objective: To determine the vitamin E, vitamin C, total antioxidant capacity (TAC), lipid peroxidation (MDA), and acute phase reactants in patients with alcoholic and non-alcoholic cirrhosis and compared them with those of healthy controls.

Method: Forty patients with alcoholic cirrhosis as well as non alcoholic cirrhosis and 50 healthy controls were enrolled in the department of Gastroenterology and Human Nutrition, AIIMS, New Delhi. Serum vitamin E and C, APRs and MDA levels were measured and compared with those of controls.

Results: MDA and C-reactive protein (CRP) levels were significantly higher ($p < 0.000$) in alcoholic liver cirrhotics whereas CRP levels were not significant in non alcoholic cirrhotics. MDA levels were significantly higher ($p < 0.05$) in patients with non alcoholic cirrhosis. Total antioxidant capacity was increased in alcoholic cirrhosis while in non-alcoholic cirrhosis were decreased. Vitamin E and vitamin C levels were significantly lower ($p < 0.001$) in both alcoholic and non-alcoholic cirrhotics. Furthermore, transferrin (Trf) levels were significantly higher ($p < 0.000$) in both the groups as compared to healthy controls (Table).

Group (n=40)	Vit-E (µM/L)	Vit-C (mg/dl)	MDA (nM/ml)	CRP (mg/dl)	Trf (mg/dl)	TAC (µM/L)
Alcoholic cirrhosis	17.5 ± 3.62	0.26 ± 0.12	3.92 ± 1.64	1.23 ± 0.41	540 ± 65.12	1.98 ± 0.60
Nonalcoholic cirrhosis	16.8 ± 4.2	0.39 ± 0.17	3.16 ± 1.48	0.45 ± 0.13	375 ± 36.45	1.69 ± 0.18
Healthy control (n=50)	24.7 ± 4.2	0.66 ± 0.15	2.65 ± 1.45	0.42 ± 0.16	285.2 ± 20.45	2.46 ± 0.334

Conclusion: Decreased level of vitamin E and C and increased level of total antioxidant capacity indicated that breakdown of antioxidant defence could be the cause of development and progression of liver cirrhosis.

ICCN Poster Presentations

Food, inflammation and the anti-inflammatory aspects of food

Palm oil tocotrienol mixture is better than alpha-tocopherol acetate in protecting bones against free-radical induced elevation of bone-resorbing cytokines

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Ferric Nitrilotriacetate (FeNTA) generates oxygen derived free radicals, which can activate bone resorption by osteoclasts. We studied the effects of several doses of vitamin E supplementation on FeNTA induced changes in bone resorption activity and in the levels of the bone resorbing cytokines, Interleukin -1 (IL-1) and Interleukin - 6 (IL-6). 4-week old male rats were treated with intraperitoneal FeNTA 2mg/kg, and the respective dose of oral vitamin E for 3 weeks. Two forms of vitamin E, palm oil tocotrienol mixture (PVE) and pure α -tocopherol acetate (ATF) were used to compare their efficacy. Only the PVE at doses of 60 and 100 mg/kg were able to prevent FeNTA induced elevation of IL-1. Both the PVE and ATF at doses of 30, 60 and 100 mg/kg were able to reduce FeNTA induced elevation of IL-6. Bone resorption activity, as measured by urine deoxypyridinolin (DPD) levels were significantly decreased by all doses of the PVE. However for the ATF groups, reduction the DPD levels were seen only in the groups given the higher doses, i.e. 60 and 100 mg/kg rat weight. A relative increase in bone formation compared to bone resorption was seen for all the groups given the PVE. However for the group given ATF, only the higher doses of 60 and 100 mg/kg rat weight showed significant relative increase in bone formation compared to bone resorption. In conclusion; the results showed that PVE was better than ATF in protecting bone against free radicals induced elevation of bone-resorbing cytokines. PVE was also shown to be more potent than ATF in reducing bone resorption activity. Therefore the palm oil tocotrienol mixture was more potent than pure α -tocopherol acetate in protecting the bones of rats exposed to ferric nitrilotriacetate toxicity.

Soy protein isolate and isoflavones modulate serum immunoglobulin levels in rats

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The antigenicity of soy protein and soy-derived isoflavones (ISF) as well as their effect on the development of immunologic mechanisms in soy formula-fed infants has not been well understood. The purpose of this study was to use rats as a model to examine the effect of alcohol-washed soy protein isolate (SPI) and supplemental ISF from Novasoy (a concentrate) on serum immunoglobulin (Ig) contents. Pubertal Sprague-Dawley rats were fed diets containing either 20% casein or 20% SPI \pm ISF (250 mg/kg diet). At 120 days of age, the males and females from the same dietary group were mated to produce F1 pups. The F1 pups were fed the same diets as their parents, and killed at days 28, 70, 120, and 240. Serum IgA, IgE, IgG, and IgM levels in females were measured using ELISA. The rats fed the diet containing SPI alone had significantly higher IgA and IgM contents at day 28 and lower IgG level at day 240 than those fed the casein-based diet ($p < 0.05$). Addition of ISF to the SPI-based diet further enhanced the serum IgA and IgM in day 28 rats ($p < 0.01$), and markedly elevated IgG content in day 28, 70 and 120 rats compared with casein and SPI alone. However, neither SPI nor ISF had any effect on IgE, one of the allergy mediators. Overall, these results demonstrate that ISF is more antigenic than soy protein in young female rats, but both are not allergenic. (*Supported by Health Canada*)

ICCN Poster Presentations

Diet, gut microflora and health

The comparison of *Haemophilus influenza* in the throat of healthy infants with different feeding methods

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Introduction: *Haemophilus influenza* (HI) is the most commonly found pathogenic bacteria in pediatric otitis media and lower respiratory tract infections. Bacterial attachment to pharyngeal cells and proliferation may be necessary for infection. In presence of human milk, attachment of HI to pharyngeal cells and colonization may be inhibited. To evaluate the protecting role of breast milk, we investigated the incidence of HI isolated from the throat of healthy infants with different feedings methods.

Methods: Between August 2002 and March 2003, 210 healthy (70 breast-fed, 70 formula-fed, 70 mixed-fed), aged 1-6 months were enrolled to study and a throat culture was taken in all of them. The incidence of HI evaluated by using a standard microbiological procedure in *Haemophilus* Test Agar Bose (HTAB) plates.

Results: The incidence of HI in exclusively breast-fed, mixed-fed and exclusively formula-fed infants was 2.9%, 42.9% and 75.7% respectively, ($P < 0.0001$). The mean age and weight of cases in 3 groups were not statistically different.

Conclusion: These data suggest that the human milk has a protective effect in colonization of HI in the throat of healthy infants especially in exclusively breast-fed cases.

Key words: breast milk, *Haemophilus influenza*, throat culture

Symbiotic containing *Bifidobacterium animalis* and inulin increases stool frequency in elderly healthy people

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Background: the aim of the study was to investigate the effect of a symbiotic on gut microbiota and bowel habits.

Methods: a double-blind, placebo-controlled, randomized crossover study was conducted in healthy elderly people (n=49; mean age 70 ± 4 years) over a total of sixteen weeks divided into periods of 4 weeks each, (1) run-in, (2) first intervention, (3) wash-out, and (4) second intervention. During the intervention periods study participants consumed daily sachets either containing the symbiotic or a placebo. The symbiotic contained *bifidobacterium animalis* and inulin. During the study subjects regularly completed questionnaires on bowel habits, well-being, gastrointestinal quality of life and underwent a medical examination. At the end of each intervention period the volunteers reported their dietary intake using a 4-day food record and provided a fresh faecal sample for the analysis of microbial and other parameters.

Results: the habitual dietary intake remained constant over the entire period of investigation. The consumption of the symbiotic resulted in a significant increase of stool frequency compared to the placebo period (8.8 vs. 8.1 stools per week; $p < 0.05$). Among other gastrointestinal symptoms, eg. Bloating, flatulence, no differences between the treatment and placebo periods could be found. For several parameters of well-being a significant positive influence of the symbiotic treatment could be demonstrated. The characterization of the microbial composition using fluorescence in-situ hybridization and enzymatic analyses are in progress.

Conclusion: the administration of a symbiotic consisting of *bifidobacterium animalis* and inulin improves well-being and gastrointestinal quality of life in elderly subjects.

ICCN Poster Presentations

Nutrition and economics

Effects of household food expenditure on nutritional status of preschoolers in cassava producing areas of Nigeria

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In an attempt to verify the myth associated with cassava as an inferior commodity, anthropometric measurements of 437 preschoolers aged 0-5 years were taken in 378 randomly selected farm households in 3 villages of cassava producing households. Standard unit values (Z-scores) from median National Centre for Health Statistics, percentage prevalence and severities of malnutrition, stunting and wasting were calculated. Significance of difference was determined by student's t-test. The results showed that the household total food expenditure rather than household expenditure on individual food items determined the nutritional status of the preschool children. High level of cassava consumption at the household level did not have adverse effect on the nutritional status of preschool children. Rather children from high cassava consuming household had better z-score values for most indicators, because such households had higher cash income and hence higher total food expenditure than low cassava food expenditure households. Cassava products like any other food items need to be consumed along with other food items for maximum contribution to health.

Examining the aged's nutritional condition in Kermanshah Iran, 2003

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Introduction: Ageing is a gradual process indicating the effects of genetics, lifestyle, and environment during the individual's lifetime. It includes the 65 plus age group. Nutritional dispositions, leading the aged to suffer from malnutrition, may be caused by receiving inadequate nutrients or by overeating, resulting in over-fatness. Nutritional insufficiency among the aged may arise from decayed teeth, reduced appetite, decline of cellular metabolism, hormonal alteration, osteoporosis, and dementia accompanied by social, economic, and psychological factors. Hence, a study was performed to identify factors that contribute to malnutrition among the aged and also to determine the prevalence of these disorders.

Materials & Methods: The descriptive cross-sectional study utilised well-trained interviewers using standard information questionnaires. Interviewers visited households. Data collected using the questionnaire included demography and related questions to the aims of the study. Subjects were selected according to class-random sampling. The sample consisted of 306 individuals, aged 65 and over from Kermanshah.

Result: The results showed that the mean age of 178 males and 128 females was 72.38y; 8.5% of them were in a low socio-economic group. 57.5% of subjects expressed that they had to change their diets as a result of an existing disease, 56 persons consumed less than two meals a day, 178 individuals ate fruit, vegetables, and dairy products, and 140 persons were not able to eat food properly due to oral problems. About 160 subjects were taking more than three different medications. 13.7% of the aged had good nutritional status, 24.8% had average nutritional status but were at high risk of malnutrition, and 61.4% were exposed to severe malnutrition.

Conclusion: This study suggests that nutritional evaluation must be done throughout a person's lifetime regardless of health status in order to distinguish between those who may require prevention of nutritional disorders in society, especially those at high risk. Offering pasteurised milk to elementary school students is a result of similar studies.

ICCN Poster Presentations

Nutrition and economics

The nutritional status of pregnant women in the Vaal Triangle, Gauteng, South Africa

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Background: A study completed in 2001 formed part of a clinical intervention trial under controlled conditions to examine the iron status of the pregnant and lactating women in the Vaal Triangle. The main purpose of that study was to determine the dietary intake and iron status of the sample population (n=431). Based on that study there is convincing evidence of poor dietary practices by pregnant women. According to Ramachandran (2002) low dietary intake in pregnancy will have adverse effects on the health and nutrition status of both the mother and her offspring. According to Norton (2002) there is strong epidemiological evidence of an association between maternal weight gain during pregnancy and low birth weight (LBW), especially in undernourished women.

Aims: The main purpose of this study is to develop a cost effective, nutrient-dense food multimix for pregnant women in order to improve their nutritional status during pregnancy and to have healthier pregnancy outcomes.

Methodology: According to the study by H.Kesa (2001) and Norton (2002) validated QFFQ's was used and statistically analysed. Trained fieldworkers conducted interviews with the help of food models to estimate portion size.

Results: According to the study by H.Kesa (2001) the top ten items most often consumed by pregnant women were, in descending order: fresh milk, tea, coffee, cold drink, maize meal, fruit juice, bread rolls, magou (a fermented non-alcoholic drink), rice and sugar. Daily intakes (mean \pm SD) for pregnant women were: 8425.71 \pm 2279 kJ, 73.18 \pm 23 g protein, 62.29 \pm 23.7 g fat, 292.45 \pm 72.2 g carbohydrate, 9.74 \pm 3.8 mg iron. According to the blood samples 50% of pregnant women IDA. According to Norton (2002) majority of women with LBW babies are from developing countries where women begin pregnancy in a nutritionally disadvantaged state.

Conclusions: Based on the results of the previous study, it is clear that food insecurity and malnutrition are evident in pregnant women in the Vaal Triangle.

Implications: The development of a multimix will attempt to examine a cost-effective means to medium and long-term sustainable food based solutions to food and nutrition security of low-income, pregnant women in the Vaal Triangle in order to prevent malnutrition during pregnancy.

A rapid chromatography procedure for the isolation of lactoperoxidase from acid whey

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Introduction: Lactoperoxidase (LPO, EC 1.11.1.7) is a major cationic enzyme which is found in bovine milk. It was isolated from bovine milk acid whey by a simple and rapid purification procedure. The number of chromatography steps required by the previous procedures led us to examine the use of a cation – exchanger resin, phospho cellulose in the isolation of lactoperoxidase from bovine milk acid whey. Recently, the interest in the industrial purification process has increased considerably because the lactoperoxidase system can be used as a biopreservative in many food and dairy products.

Methods: Batchwise chromatography on a cation – exchange, phosphocellulose was carried out for isolation of lactoperoxidase from bovine milk acid whey using 50 mM phosphate buffer (pH7) and a linear gradient of NaCl from 0.04M to 0.4M. The enzyme was eluted in buffer solution containing 0.4 M NaCl. The elute solution was the pellet obtained by centrifugation for 15 min at 12000g, was dissolved in the same phosphate buffer. The isolated enzyme then dialysed overnight against 100 vol of the above buffer.

Results: the enzyme was purified 800 fold to a purity index (A 412 nm/A 280 nm) of at least 0.7 with a yield of 58%. At the end, 26 ml solution of enzyme was obtained from 2800ml of acid whey with specific activity of 32 U/ mg protein.

Discussion: Although the purity index of the purified enzyme by the above method is less than of previous procedures, but the procedure described in this paper is rapid and is easily adapted to large quantities of bovine acid whey with a good yield.

Key Word: lactoperoxidase, chromatography, whey.

ICCN Poster Presentations

Nutrition and economics

Prediction of child growth status at birth (a model)

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Objective: many environmental and familial factors influence child growth. The aim of this analytical cross-sectional study was to determine the effects of ecological and demographic factors on 6-36 month age children's growth at 10 health and medical centers of Asadabadi region (North-Western Tabriz) during January to February 2002.

Methods: At first 1560 children were selected randomly by using familial fold number. Then we classified them to two groups: case groups; growth failure children (n=200) and control groups; normal growth children (n=150) by using anthropometrical and growth charts (NCHS) indicators and Gomez method. Then a questionnaire was completed for each child by interviewing the mother and using health records including weight and height of child birth, weight and height of mother, weight gain during pregnancy, mother's and father's literacy, mother's and father's ages and so on. Data was analysed with X² and Anova methods. The research was approved and supported by Tabriz University of Medical Sciences- Iran.

Results: Significant correlations were found between weight and height of a child at birth ($p<0.001$), weight and height of mother ($p<0.05$), weight gain during pregnancy, ($p<0.05$) and mother's and father's literacy ($p<0.03$) with child growth.

Conclusion: By using of this data and with attention to available demographic and ecological variables we designed a model that may predict future child growth status at birth.

ICCN Poster Presentations

Food and the child

A diversified diet may reduce school age children stunting in North Western Morocco

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Problem position: Morocco is undergoing a nutritional transition phase when stunting, micronutrient deficiencies coexist with chronic malnutrition in the same household. Strategies based on supplementation and food fortification are launched but food based ones need more attention from policy makers. Food diversification is one way to prevent and protect simultaneously in transitional stages. The nutritional status of school age children has rarely been assessed in Morocco though school is the suitable frame for nutrition education.

Objectives: To evaluate the nutritional status of school children in urban and suburban areas of Kenitra and propose a food diversity index. Associations between this index and different nutritional indicators will be studied.

Subjects and methods: 306 preadolescent children aged from 12 to 16 from seven schools are recruited and observed. A medical team has assessed the anthropometry and physical examinations. Blood was withdrawn by venipuncture. Hemoglobin concentrations were determined by auto analysis using colorimetry. Food consumption data was evaluated by a food frequency questionnaire for the past week. Z scores for the height-age, weight-age and body mass index were calculated by Epi info 2000. The food diversity index: FDI was defined as the probability a child has consumed every day a diet including four food groups (cereals, dairy products, meat and fish, fruits and vegetables).

Results: Stunting affects 25% of children, whereas 7% are emaciated. Obesity is not a problem in this age group (less than 1%) although it is emerging in the adults. Anaemia is found in 31.6% using Hemog <11.5g/dl. According to the FDI used, only 17% of the children adequately diversify their diets. Stunting is associated to FDI (OR= 1.87, CI= 0.75- 4.89) though not statistically significant.

Conclusion: Nutritional status of preadolescent children was not better than preschool children. Their food is not always diversified. Consequently school health and nutrition programs are needed to educate children and the household.

Green tea consumption enhances survival of epithelial ovarian cancer patients

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Aim: To investigate whether green tea consumption post-diagnosis can enhance survival of patients with epithelial ovarian cancer.

Methods: A prospective cohort study was conducted in the community, Hangzhou, P. R. China. A cohort of 309 patients with histopathologically confirmed epithelial ovarian cancer, who were recruited in the study during 1999-2000, were followed for a minimum of three years. The variables measured included their survival time and the frequency and quantity of tea consumed post diagnosis. From the original cohort 294 (95.1%) subjects, or their close relatives, were traced and interviewed using a structured questionnaire in 2003. The actual number of deaths was obtained and the hazard ratios were calculated. Cox proportional models were used to compute adjusted hazard ratios (HR) and associated 95% confidence intervals (CI). These models were adjusted for age at diagnosis, locality, BMI, parity, stage at diagnosis, histo-pathologic grade of differentiation, cytology of ascites, and the presence of residual tumor after surgery.

Results: Increasing frequency and quantity of tea consumption were associated a longer survival in Chinese women with epithelial ovarian cancer. The survival experiences were different between tea drinkers and non-drinkers ($p < 0.001$). There were 109 (79.6%) out of 137 tea-drinkers who survived to the time of interview, compared with only 77 women (49.0%) still alive among the 157 non-tea drinkers. Compared with non-drinkers, the adjusted hazard ratios were 0.6 (95% CI 0.4-0.9) for tea-drinkers, 0.3 (95% CI 0.2-0.8) for consuming at least one cup of green tea per day, 0.4 (95% CI 0.2-0.8) for brewing at least one batch of green tea per day, and 0.3 (95% CI 0.2-0.8) for consumption of 500g or more dried tealeaf per year. The corresponding dose response relationships were statistically significant.

Conclusion: Regular consumption of green tea post-diagnosis can enhance epithelial ovarian cancer survival. There are no previously published studies of ovarian cancer survival and tea consumption. This study has the potential to benefit many women who are diagnosed with ovarian cancer.

ICCN Poster Presentations

Food and the child

The relationship between dietary carotenoids and prostate cancer risk in Southeast Chinese men

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To investigate whether dietary intake of lycopene and other carotenoids has an aetiological association with prostate cancer, a case-control study was conducted in Hangzhou, southeast China during 2001-2002. The cases were 130 incident patients with histologically confirmed adenocarcinoma of the prostate. The controls were 274 hospital inpatients without prostate cancer or any other malignant diseases, who were matched to the age of cases. Information on usual food consumption, including all vegetables and fruits, was collected by face-to-face interview using a structured food frequency questionnaire. The risk of prostate cancer for the intake of carotenoids and selected vegetables and fruits rich in carotenoids was assessed using multivariate logistic regression, adjusting for age, locality, education, income, body mass index, marital status, number of children, family history of prostate cancer, tea drinking, total fat and caloric intake. The prostate cancer risk declined with increasing consumption of lycopene, α -carotene, β -carotene, α -cryptoxanthin, lutein and zeaxanthin. Tomatoes, pumpkin, spinach, watermelon and citrus intake were also inversely related to the risk of prostate cancer. The adjusted odds ratio for the highest quartiles compared with the lowest were 0.18 (95% CI: 0.08-0.41) for lycopene, 0.43 (95% CI: 0.21-0.85) for α -carotene, 0.34 (95% CI: 0.17-0.69) for β -carotene, 0.15 (95% CI: 0.06-0.34) for α -cryptoxanthin and 0.02 (95% CI: 0.01-0.10) for lutein and zeaxanthin. The dose response relationships were also significant, suggesting that intake of lycopene and other carotenoid rich vegetables and fruits may associate with a reduced risk of prostate cancer.

Nutritional profile of preschool children of Gurgaon district of Haryana (India)

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The present study was conducted to assess the nutritional status of pre-schoolers. Three hundred pre-school children (150 male, 150 female), aged 4-5 years were selected from six villages of Gurgaon district, Haryana. Intake of cereals, pulses, other vegetables and roots and tubers, fruits, GLV, fats and oils and sugar and jaggery was significantly ($P < 0.05$) lower than RDA. Intake of foodstuffs was non significantly different among boys and girls. Daily mean intake of energy, protein, niacin, vitamin B12, calcium and vitamin A was significantly higher in boys than girls and was below RDA except fat, which was higher than RDA. Mean intake of thiamin, folic acid, ascorbic acid and iron was almost similar in boys and girls and was significantly lower than RDA. Poverty was also found to be important contributing factors in creating imbalance in diets. Hence mothers of pre-school children should be guided to include all food groups in proper amount in the diets of their children for improving their nutritional status.

ICCN Poster Presentations

Food and the child

Soy proteins - an ideal functional food for growth promotion

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Introduction: Soy though a native food of South East Asia, it is a new under exploited food in the India context. Growth promoting effects of soy in health particularly among women and children is much-sought information under the current nutritional scenario in India, hence the objective of this research.

Methodology: Defatted soy flour to replace the legume protein in the school lunch diet of preschool children (1200) was studied over a period of one year. Anthropometrics parameters, blood hemoglobin levels, clinical picture, physical and mental abilities of children formed the criteria for evaluation. In another attempt grade II malnutrition children (400) of 1-2 years of age were supplemented with the developed soy protein isolate (SPI) based food mix at a level (62g) to fill the calorie gap in their home diet and their growth parameters monitored over a period of one year.

Results: Significant ($P < 0.01$) improvement in the heights, weights and the hemoglobin levels of children given soy flour substituted lunch was observed. A decrease in the manifestation of clinical symptoms, significant improvements in the physical ability attributes and in the mental ability scores were evident. A proportionate increase with increases in the levels of substitution was also observed. Among the grade II malnutrition children given SPI based food mix, a significant improvement in their height (supplemented vs. control: 4.5 cm vs. 0.92 cm), weight (5.05 kg Vs 0.84 kg), arm, chest and head circumferences (0.29 cm vs. 0.07 cm; 1.30 cm vs. 1.09 cm and 1.24cm vs. 0.19 cm) respectively were recorded. 90.5 % of children in the supplemented group shifted to normal grade and the remaining 9.5 to grade I status. Their morbidity pattern and cognition improved remarkably.

Conclusion: Considering the cost effectiveness of soy, this result on child growth undoubtedly signifies soy as the ideal functional food of the era for the promotion of good health of future generation.

The use of a putative lactagogue plant on breast milk production in Simalungun, North Sumatra, Indonesia

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Food beliefs about pregnancy and lactation are widespread amongst traditional women. These include the use of various plant foods to stimulate lactation. We have previously reported, on the basis of focus group studies, that lactating women in Simalungun, North Sumatra Indonesia have a tradition to consume the 'Torbangun' plant, as a soup for one month after parturition. They believe that Torbangun stimulates breast milk production. More than this, Torbangun soup is considered to return the mother to a healthy state after delivery. Torbangun is thought to serve several purposes, not only to enhance breast milk production, but to decrease the risk of placental retention ('act as a uterine cleansing agent'), and restore energy and strength lost during parturition. The tradition has been practiced for hundreds of years, and adherence is still strong. An intervention study was conducted in Simalungun North Sumatra Indonesia on 75 lactating women. Subjects were randomly assigned into three groups: Moloco (reference group), Fenugreek or Torbangun. The subjects were provided with either Moloco+B12TM sugar coated tablets, Fenugreek capsules or Torbangun soup. Moloco+B12TM tablets and Fenugreek capsules are supplements used by lactating women in Indonesia and in European countries, respectively, in the belief that they stimulate breast milk production. All subjects took the assigned supplement from day 2 after birth for one month. It was observed that Torbangun improved the quantity by 10% and retained the quality (in regard to macro- and micronutrient composition) of breast milk. The use of Torbangun might be suitable for lactating women in general.

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Food and the child

Dietary intake of macro and micronutrients in children: does recurrent illness reduce intake?

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Introduction: Approximately one third of children in Sri Lanka suffer from undernutrition. Recurrent infections that may lead to reduce dietary intake are thought to be an important cause of undernutrition in children.

Objectives: To compare dietary intakes of macro and micronutrients in children with recurrent infections and healthy controls.

Methods: 364 children, aged 5-10 years, who were recruited from the Children's hospital, Colombo, Sri Lanka for a study on iron and infection had their dietary intake assessed during a period of 8 weeks. Children with a past history of recurrent upper respiratory tract infections (URTI) with clinical and laboratory evidence of URTI during the observation period were the infection group (n = 180), while children without infections were controls (n = 184). A 24 - hour recall of the preceding day's diet was obtained at baseline, week 4 and week 8 (on 3 days) using a dietary data questionnaire incorporating common foods consumed in Sri Lanka. Food composition tables specially prepared for assessment of Sri Lankan diets were used to calculate nutrient intakes.

Results: Children in both groups were of similar low socio-economic status. Analysis of dietary data indicated that children with infection and controls had lower intakes of energy, protein, carotene and ascorbic acid than recommended dietary allowances for their age groups. No significant differences were noted in average intakes of nutrients/day between infection and control groups; energy: infection group; 974 ± 198 kcal, controls; 979 ± 109 kcal (P = 0.80), protein: infection group; 29.6 ± 8.5 g, controls; 28.8 ± 7.4 g (P = 0.37), iron: infection group; 11.0 ± 3.7 mg, controls; 11.2 ± 4.0 mg (P = 0.52), ascorbic acid: infection group; 10.3 ± 12.4 mg, controls; 11.7 ± 12.6 mg (P = 0.32) and vitamin A: infection group; 143.0 ± 118 µg retinol activity equivalents (RAE), controls; 149.6 ± 117 µg RAE.

Conclusions: Children with URTI and healthy controls had similar dietary intakes. Recurrent mild infections may not be a cause of undernutrition in 5-10 year old children. Acknowledgements: International Life Sciences Institute, USA

A comparison of the smoking habits of Aboriginal mothers and non-Aboriginal mothers while breastfeeding.

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Women of childbearing age who smoke expose their unborn foetus and then their children to the effects of passive smoking. In addition maternal smoking has been shown in numerous epidemiological studies to be negatively associated with both the initiation and duration of breastfeeding. In general, women who smoke are less likely to initiate breastfeeding and to breastfeed for shorter periods. In Australia estimates from the 2001 National Drug Strategy Household Survey (NDSHS) show that about 3.1 million Australians (19.5% of people aged 14 years and over) smoke tobacco on a daily basis. The same survey found that almost half of the Aboriginal population surveyed reported that they smoked on a daily basis.

Objective: To document the smoking practices of Aboriginal mothers living in Perth during pregnancy and during the subsequent year while feeding their infants.

Method: Two cohorts of mothers were followed from the time of delivery for 12 months (Aboriginal mothers) and six months (Non-Aboriginal mothers) to obtain details of infant feeding practices. The cohorts consisted of a total of 455 Aboriginal and 556 Non-Aboriginal mothers

Results: Prior to and during pregnancy, 67% of the Aboriginal and 18.3% of Non-Aboriginal mothers smoked regularly. For Aboriginal mothers the rate appeared to decline slightly with the length of breastfeeding, but the trend was not significant. Amongst Aboriginal women there was no difference in the percentage of smokers and non-smokers who initiated breastfeeding. While fewer Aboriginal women who smoked were still breastfeeding at 24 weeks postpartum, compared with non-smokers (58% vs 64%), this difference was not significant. In the cohort of Non-Aboriginal very few of the smokers continued to smoke while they were breastfeeding, most claimed to have stopped or to have only an occasional cigarette away from their infant.

Conclusions: The percentage of women smoking in this study is consistent with rates reported in the 2001 National Drug Strategy Household Survey. The high level of smoking while breastfeeding by Aboriginal women is a matter for public health concern.

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Food and the child

Increasing breastfeeding rates in Australia

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Breastfeeding is acknowledged as providing the best start in life. In 2003, a review by the National Health and Medical Research Council of Australia's dietary guidelines for infants, children and adolescents endorsed the recommendation of the World Health Organization that exclusive breastfeeding of infants continue until around six months of age. Further, it recommended as national targets for breastfeeding an initiation rate in excess of 90 per cent and for infants aged 6 months that 80 per cent be breastfed. Breastfeeding rates in Australia fell to a low in the 1960's with initiation rates as low as 50%. Since that time rates have increased again and in 1996 the Australian Government introduced a National Breastfeeding Strategy. In 1992-1993, the first Perth Infant Feeding Study, a cohort of 556 mothers, reported that 83.8 per cent (95% CI = 80.7 – 86.9) of infants were breastfed on discharge from hospital. In 2002-2003, the Perth Infant Feeding Study was repeated using the same hospitals and survey tools. The second Perth Infant Feeding Study used a cohort of 587 mothers and found 93.8 per cent (95% CI = 91.9–95.7) of infants were breastfed on discharge from hospital. The 10 per cent increase in breastfeeding initiation in the past decade has achieved the national breastfeeding targets. A comparison between the results of the first and second Perth studies found that significant increases in breastfeeding prevalence had occurred at the 5 per cent level across all socio-demographic groupings: maternal age, maternal education level and maternal country of birth. The largest increases were seen in mothers born outside of Australia, younger mothers and mothers who had completed high school but were not tertiary educated. Known demographic shifts in the Australian population for maternal age and education level may account for 2-3 per cent of the increase while changes in the migration patterns may also have contributed to the increase. Breastfeeding promotion must now concentrate on increasing duration.

Iron bioavailability of some Cameroon traditional complementary foods

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Iron "in vitro" bioavailability was assessed in main Cameroonian traditional complementary foods identified during enquiries amongst mothers with weaning babies up to 30 months by and "in vitro extrinsic tag method. Total iron levels were generally ranged between 4.68 ± 0.5 (in fermented maize gruel) and 51.51 ± 3.73 mg/ 100g dry matter (in maize meal with a vegetable, *Corchorus olerius* based sauce). Non haem iron values were high compared to haem iron values calculated by difference (between total and non hem iron) and ranged from 3.11 ± 0.09 (in sweet potato with pear) to 47.64 ± 4.68 mg/ 100g dry matter (in maize meal with a vegetable, *Corchorus olerius* based sauce). Dialysable iron values expressed in % of non hem iron ranged between 0.89 ± 0.13 and 18.68 ± 2.11 % (in mashed Irish potato with fish) were enhanced with lime juice and significantly reduced by legumes (beans, soy, and peanut), egg and egg yolk. An Irish potato-based diet was the best source of dialyzable Iron. Iron intakes were sufficient for most balanced diets to cover iron recommended daily intakes from 7 months of age.

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Food and the child

Breakfast patterns of primary school children in an informal settlement

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This study forms part of a larger project where a cost-effective and culturally acceptable novel food product will be developed as a supplement to breakfast for primary school children, aged six to 13 years old. Baseline measurements indicated that the nutritional status of the children in this school, were 17.4% underweight, 12.7% wasted and 18% stunted. The objective of this pilot study was to determine the breakfast patterns of the randomly selected subjects in the school in Eatonside. A questionnaire was drawn up, tested and completed by the children (n=175, 29% of total school population) in a class situation. The data were captured on an Excel spreadsheet and analysed for means and standard deviations. The results showed that 91% of children ate breakfast before going to school, and the breakfast consisted mainly of tea and bread (62%), maize meal porridge (25.5%) and the rest consumed mostly rice and potatoes. Breakfast cereal is only consumed by 1.2% of the children. Over weekends, most of the children (86.8%) consumed tea and bread and 13% do not eat any breakfast. The results confirm that the primary school children in this study eat breakfast before going to school, but the nutritional adequacy of the breakfast consumed is questionable. Further research is recommended to analyse the dietary intake and food consumption patterns in order to develop a suitable novel food product.

Junk food consumption: an indicator of changing dietary habit in Iranian children

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Introduction: Widespread consumption of junk foods deprives children of necessary nutrients during the critical first three years of life. Urbanization and media propaganda have caused traditional nutritious snacks to be replaced by low-quality junk foods.

Materials & Methods: To assess the extent of this problem in Iran, this study was conducted as part of the Anthropometrics National Indices Survey (ANIS) in 1998. In this study, 16418 under- three- year old children (18493 urban and 7925 rural) were chosen to determine their dietary intake (type and daily/weekly frequency) by a food frequency questionnaire. This included 51 food items from the four major food groups and from butter and oil, junk foods, fruit juices, and traditional food items (dried raisins and berries). The data were collected during interviews with mothers and analyzed by SPSS software.

Results: Consumption of junk food during the preceding week was observed in 47.1% and 51.0% (6-11 month- old) and in 90.3% and 88.7% (12-23 month- old) of urban and rural children, respectively. Whereas conventional snacks were consumed by 36.2% and 23.7% (12-23 month-old) and 34.7% and 28% (12-35 month- old) of urban and rural children. Weekly frequency of consumption of junk food was higher than major food items such as meat and eggs (9 vs.3 times weekly).

Conclusion: Replacement of conventional snacks (mainly natural products) with industrial and processed products is attributable to industrialization and urbanization, increased media coverage, and lifestyle changes in both urban and rural regions. We recommend education of the parents on making wiser choices for children's snacks, as this is a major component of their diet.

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Food and the child

Malnutrition and soil-transmitted helminthiasis among Orang Asli children in Selangor, Malaysia

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Objective: The aim of this study is to determine the prevalence of malnutrition in children living in endemic areas of soil-transmitted helminthes.

Methods: An observational study was carried out on 281 Orang Asli children aged 2-15 years in eight villages in Selangor, Malaysia. Assessment was carried out using anthropometric measurements and examination of blood and faecal samples. The Z-score for *weight-for-height* was used to denote underweight as an overall indicator of malnutrition. *Height-for-age* Z-score was used as an indicator for stunting while *weight-for-height* Z-score for wasting. Faecal samples were collected and screened for soil-transmitted helminthiasis using Kato-Katz technique. Albumin estimation was carried out on blood samples using standard technique.

Results: The overall prevalence of mild and significant underweight was 32.1% and 56.5% respectively. The prevalence of mild stunting was 25.6% while another 61.3% had significant stunting. The overall prevalence of mild and significant wasting was 39.0% and 19.5% respectively. The mean albumin level was 44.81 ± 5.75 g/L and 28.0% of the children with albumin level below 35 g/L. The overall prevalence of ascariasis, trichuriasis and hookworm infection were 61.9%, 98.2% and 37.0% respectively and of these 19.0%, 26.0% and 3.0% of the children have severe infection of the respective worms.

Conclusion: Thus, the high prevalence of malnutrition in these children due to severe infection of ascariasis, trichuriasis and hookworm infection could not be ruled out.

Biochemical measurements and anthropometry as indicators of nutritional status measuring the prevalence of malnutrition in primary school children living in an informal settlement

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The main objective of this study was to determine the level of malnutrition in a primary school (aged six to 13 years old) in an informal settlement to gather information for planning and implementing a school feeding programme. Blood was drawn from 80 children. Quantitative Food Frequency questionnaires were completed in an interview situation with the parents (n=80). Anthropometric measurements included weight-for-age, BMI-for-age and height-for-age. Zinc and ferritin levels were lower than the normal range for children in this age group. The mean dietary intake indicated that the children took in less than 71% of their daily energy needs when compared to the EAR's. Food most commonly purchased and consumed were maize meal, tea, sugar and oil with animal protein 12th on the top 20 foods purchased list. With regard to anthropometric indices, 17.4 % were underweight (weight-for-age below -2SD from the reference NCHS median), 12.7 % were wasted (BMI-for-age -2SD) and 18 % stunted (height-for-age -2SD). Comparing the biochemical and dietary intake results, it can be seen that the energy intake is lower and protein higher than the EAR's per day. The high protein intake could be utilised as energy and not as much for growth purposes. The low zinc and ferritin confirms the low intake of green vegetables, fish and whole grain products as reflected by the top 20. This may have contributed to the prevalence of malnutrition in the sample. By making use of biochemical and anthropometric measurements a more complete picture of the malnutrition could be identified.

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Food and the child

The long term effects of soy-based formula on isoflavone concentration of plasma and urine, and growth and recognition development at 10 and 20 months old infants

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Background: Soy-protein formulas are widely used for feeding babies with cow-milk allergy. Soybeans contain phytochemicals which are biochemically active component, isoflavones. The safety and long-term effects of isoflavones in soy-based formulas has been questioned recently.

Objective: We investigated the effects of soy-based formula on isoflavone concentration of plasma and urine, and growth and recognition development in 10 and 20 months old infants.

Design: After the preceding study of 4 months of infants, thirty-three healthy infants were participated the follow-up study. Experimental groups were the breast milk (n=7, BM), the breast milk for 4 months thereafter soy-based formula (n=6, BM+SBF), the soy-based formula (n=9, SBF), and the cow's milk-based formula fed group (n=8, CBF). Dietary and anthropometric assessments, and infant development test (gross motor, fine motor, personal social, language, cognitive adaptive) were carried out.

Results: The measurements of weight, height, head and chest circumference at 10 and 20 months of age were all in normal growth range in comparison with Korean of pediatric growth chart. No significant differences were found for the consumption of daily nutrients and the recognition development among the four groups. Plasma concentrations of daidzein and genistein at 10 months (107.8 ± 3.5 , 112.8 ± 3.7 and 137.0 ± 8.7 , 143.3 ± 9.1 ng/ml) and 20 months (27.1 ± 6.2 , 28.3 ± 6.5 and 32.7 ± 1.4 , 34.2 ± 1.4 ng/ml) of BM + SBF and SBF group were significantly higher than those of other experimental groups ($p < 0.05$). Also, urine concentrations of daidzein and genistein at 10 months (9.82 ± 3.3 , 9.34 ± 3.1 and 11.01 ± 2.5 , 10.53 ± 2.4 µg/ml) and 20 months (4.88 ± 1.8 , 4.67 ± 1.7 and 9.49 ± 2.6 , 9.08 ± 2.5 µg/ml) were significantly higher in both BM+SBF and SBF group than those of other experimental groups ($p < 0.05$).

Conclusions: These data suggest that soy-based formula could be used for long-term feeding.

Nutritional status of 0-36 month old children in the Zabol cities centres

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Aims: many environmental and familial factors influence nutritional status. The aim of this analytical cross-sectional study was determination of nutritional status and the effects of some ecological and demographic factors on 0-36 months age children growth.

Methodology and results: 553 women with at least one 0-36 months old child were randomly selected from 5 health and medical centres by using familial fold number during May to July 2001. The nutritional status of 600 children under three years old was determined by using anthropometrical and growth charts (nchs). Then a questionnaire was completed for each child by interviewing the mother and using health records. Data on weight and height of the child, mother's age, duration of breast feeding and so on were collected. Data was analyzed with χ^2 and Anova methods. The research was approved and supported by Zahedan University of Medical Sciences, Iran. On the basis of Gomez (expected weight for age=ew/age) and Waterlow (height for age=h/age and expected weight for height=ew/h) classification, 59.2, 47 and 28.2% of children were malnourished, respectively. The mean duration of breast-feeding was 14 months. A significant correlation was found between the age of termination of breast feeding and the nutritional status of children (ew/age, $p=0.007$; and h/age, $p<0.001$ respectively).

Conclusion: the results indicate that with increasing the length of breast feeding the greater the prevalence of malnourished children.

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Food and the child

Iron deficiency anaemia as an adjunct to soil-transmitted helminthiasis among Orang Asli children in Selangor, Malaysia

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Objective: The aim of this study is to determine iron status in children living in endemic areas of soil-transmitted helminthes.

Methods: A cross sectional study was conducted on 281 Orang Asli children aged between 2 and 15 years from eight Orang Asli villages in Selangor, Malaysia. Faecal samples were collected and examined for *Ascaris lumbricoides*, *Trichuris trichiura* and hookworm using Kato-Katz technique. Blood samples were also collected for estimation of haemoglobin, serum ferritin, serum iron and total iron binding capacity (TIBC) and analyzed using standard techniques.

Results: All children were infected either by *A. lumbricoides*, *T. trichiura* or hookworm and almost 19%, 26% and 3.0% of the children had severe infection of ascariasis, trichuriasis and hookworm infection respectively. The mean hemoglobin, serum iron and serum ferritin concentrations were in the lower limits of normal with values of 11.5 ± 1.9 g/dL, 10.9 ± 5.43 μ mol/L and 21.36 ± 16.9 μ g/L respectively. Correspondingly, mean TIBC was in the upper range of normal, 69.45 ± 11.37 μ mol/L. The percentage of children with low haemoglobin, serum iron and serum ferritin concentrations were 41.5%, 55.0% and 28.4% respectively and high TIBC was found in 51.1% of the children. Further analysis showed that mean haemoglobin and serum iron concentrations were low in the infected compared to the non-infected children and the difference was not significant. The mean serum ferritin and TIBC in the infected children and the non-infected children showed inconsistent results.

Conclusion: Soil-transmitted helminthiasis is a possible contributory factor to iron deficiency anaemia in these children.

Correlates of children's eating attitude test scores (CHEAT) among a sample of female primary school children

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The findings were part of a pilot study on maternal influences on weight and eating behaviors of 8-9 years old primary school children. Specifically, the findings will focus on the children's conceptualization of dieting and the factors that correlate with the scores of children's version of the Eating Attitude test (ChEAT). A total of 107 primary school girls (8-9 years old) completed the measurements on eating behavior (ChEAT, food neophobia scales and dieting experience), self-esteem, body image, dietary intake, weight and height. The most frequent response associated with dieting was 'skip meals' (78%), followed by 'eat very little' (55%) and 'do not eat or reduce fried foods' (49%). Exposure to weight loss advertisements in the media (75%) and observation of dieting among mothers (60%) were the main sources of information on dieting for the girls. Our findings indicate that the majority of the girls (92%) were able to define the concept of dieting, mostly in relation to food consumption. Thirty eight percent (38%) of the girls scored 20 and more on the ChEAT and 46% of them reported dieting with reducing sugar and sweets (73%), skipping meals (67%), reducing fat foods (60%) and snacks (53%) as most frequent methods practiced. In general, girls with higher ChEAT scores (restrictive eating behaviors) had lower self esteem, were more unwilling to try new foods (food neophobic), chose smaller figure for desired body size and were more dissatisfied with their body size. Although the small sample size may limit the generalization of the findings from this study, the obtained information can be a start to future research on body image and eating disorders among children in Malaysia as at present published information in this area is very limited.

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Food and the child

Factors contributing to academic achievement among a sample of Indian and Malay school children in Malaysia

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The relationship between health and nutrition and academic achievement of the school age population in less developed countries has been of interest to many researchers. This is due to the frequent observation that many children do not complete primary school and those who have completed, do not do as well as children in developed countries. Thus, the aim of this study was to determine the factors that contribute to academic achievement among primary school children. The study was conducted in Hulu Selangor district which was randomly selected from 9 districts in the state of Selangor. A total of 6 schools which satisfy the criteria of A school (population > 1000 students) and/or have majority Malay and Indian students were randomly selected from a list of 34 schools in the district. The sample consisted of 332 children (Indians – 209 and Malays – 123) in standard 2 (8-9 years old). The children were measured for their heights and weights and their parents were interviewed to assess dietary, demographic and socioeconomic information and their involvement in children's education. Stool and finger-prick blood samples were obtained from the children to determine the presence of worm and hemoglobin levels, respectively. Final examination results for four subjects (Mathematics, English and Malay language – comprehension and composition) were obtained from the schools and the scores were reported as percentage of total score (% TS). All statistical analyses were done using SPSS 11.0. Preliminary analyses indicated that %TS correlated significantly with several demographic (number of children), socioeconomic (household income, income per capita, food and non-food expenditures and food security status) and nutrition (hemoglobin levels and height-for-age) indicators. A multiple regression analysis will be conducted to obtain a combination of factors that best predict academic achievement among this sample of school children.

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Clinical nutrition decision making

Legumes: the most important dietary predictor of survival in older people of different ethnicities

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Introduction: Nutrition plays an important role in the maintenance and improvement of human life expectancy. The 'Food Habits in Later Life' (FHILL) is a cross-cultural study conducted under the auspices of the International Union of Nutritional Sciences (IUNS) and the World Health Organization (WHO). Baseline data on food habits, health status and social variables were collected from five cohorts aged 70 and over (Japanese in Japan, Swedes in Sweden, Anglo-Celtic in Australia, Greeks in Australia and Greece).

Objective: To identify protective dietary predictors amongst long-lived elderly people (n=785) from the FHILL population after controlling for ethnicity.

Methods: The validated FFQ were used to collect data on food intakes in all cohorts except Japanese where the 3d weighed food record method was employed. Intakes in gram/week were calculated by multiplying the serving size by the weekly frequency of intake. These values were further translated into gram/day and were adjusted to 2500 kcal (10,460 kJ) for men and 2000 kcal (8,368 kJ) for women. Food items were grouped into nine food groups based on key features of the Traditional Mediterranean Diet (vegetables, legumes, fruits and nuts, cereals (including starchy roots), dairy products, meat, fish, monounsaturated: saturated ratio, and ethanol). All-cause mortality data were obtained from up to seven years follow-up. Alternative Cox Proportional Hazard model adjusted to age at enrolment (in 5-year interval), gender, and smoking was developed to analyse the survival data. Each Cox model was tested against controlling for cohorts' location and ethnicity.

Results: Only for legumes intake was the result plausible, consistent and statistically significant across collective FHILL cohort's data. There is a 7% - 8% reduction in mortality hazard ratio for every 20g increase in daily legume intake with adjustment for location/ethnicity (RR 0.92; 95% CI 0.85- 0.99) and without adjustment for location/ethnicity (RR 0.93; 95% CI 0.87 - 0.99).

Conclusions: This longitudinal study shows that a higher legume intake is the most protective dietary predictor of survival amongst the elderly, regardless of their ethnicity. The significance of legumes persisted even after controlling for age at enrolment (in 5-year interval), gender, and smoking. Legumes have been associated with long-lived food cultures such as the Japanese (soy, tofu, natto, miso), the Swedes (brown beans, peas), and the Mediterranean people (lentils, chickpeas, white beans).

The effect of supermint oil on pain severity after Caesarean section

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Background and objective: Pain is common after surgery and common to all people from the beginning of creation. Also Caesarean section is the most common obstetric operation causing pain particularly due to flatulence. A number of analgesics have been used to relieve pain after Caesarean section.

Methods: In this bi-variable, double blind, clinical trial, 107 woman (47 control and 60 cases) were studied. The cases received 40 drops of supermint every 20 minutes three times just after serum disconnection. The controls received placebo.

Findings: The results indicated that pain severity in the experimental group was significantly reduced at second 40 minutes (p <0.002), 60 minutes (p<0.001) and 120 minutes (p<0.001) after intervention.

Conclusion: According to the research result, the hypothesis of the study was strongly confirmed.

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Novel foods in clinical practice

Total antioxidant capacity and selected flavonols and carotenoids of some Australian and Fijian fruits and vegetables

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The consumption of fruits and vegetables has been reported to improve health and reduce the burden of disease conditions in part probably because of the provision of various forms of phytochemicals with antioxidant properties present in these foods. The major classes of phytochemicals in foods with antioxidant properties are the carotenoids and polyphenols (such as flavonoids and anthocyanins). Selected Australian and Fijian fruits and vegetables were analysed for their total antioxidant capacity (TAC), total polyphenols (TPP), total anthocyanins (TAT), flavonols and carotenoids. Results for the Australian foods showed that blueberries contain the highest TAC (560 mg/100g), TPP (310 mg/100g) and TAT (14 mg/100g). Red onions (42 mg/100g quercetin, 0.4 mg/100g kaempferol) and baby spinach leaves (30 mg/100g quercetin, 6.0 mg/100g kaempferol) are rich in flavonols. For the Fijian foods, sweet potato leaves contain the highest TAC (650 mg/100g), TPP (270 mg/100g) and flavonol (46 mg/100g quercetin). Ginger orange-yellow (360 mg/100g TAC, 320 mg/100g TPP), and ginger white (320µmg/100g TAC, 200 mg/100g TPP) contain substantial amounts of TAC and TPP respectively. Purple beans (44 mg/100g quercetin), ginger orange-yellow (28 mg/100g quercetin) and spring onions also (38µmg/100g kaempferol) contain good amounts of flavonols.

D-Psicose, a rare sugar that provides no energy and additionally beneficial effects for clinical nutrition

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D-Psicose (D-ribo-2-hexulose), a C-3 epimer of D-fructose, is a "rare sugar" present in small quantities in commercial mixtures of D-glucose and D-fructose obtained from the hydrolysis of sucrose or isomerization of D-glucose. Because of the very small amounts of D-psicose in natural products, few studies of D-psicose metabolism in mammals have been conducted. Recently, we developed a new method to produce D-psicose enzymatically on a large scale, making it possible to conduct scientific studies. In this study, we examined (1) the metabolic effects of D-psicose, (2) the available energy of D-psicose and (3) acute and subchronic toxicity to gather basic data regarding the safety of using as a new sugar substitute. (Experiment 1) We investigated the absorption and excretion of D-psicose when orally administered (5g/kg body weight) to Wistar rats, and the fermentation of D-psicose was measured as cecal short-chain fatty acids (SCFA) when fed to rats in controlled diets (0-30%). Urinary and fecal excretions of D-psicose over the 24 h were 11-15% of dosage for the former and 8-13% of dosage for the latter. Rats fed on D-psicose diets showed SCFA production. (Experiment 2) Wistar rats received 7 g daily of a basal diet to which fixed amounts of D-psicose (0.5-2.0 g) were added for 20 days. Body energy gain did not increase with D-psicose. One gram of D-psicose produced a net energy gain of 0.007 kcal and the energy value of D-psicose was effectively zero. (Experiment 3) Wistar rats were orally given D-psicose in dose of 8-20 g/kg. The calculated LD₅₀ value was 16.3 g/kg. Another Wistar rats were fed diets containing 0-40% of D-psicose for 34 days. Body weight gain and food intake were more extensively suppressed by the higher D-psicose diets. These results suggest that D-psicose displays nutritional characteristics unlike other monosaccharides such as D-glucose or D-fructose and provides no energy for growth. D-Psicose is not a toxic sugar but should be used carefully, if at all, as a dietary fiber-like substance or sweetener in food manufacturing.

ICCN Poster Presentations

Novel foods in clinical practice

Dietary advice inclusive of walnut supplementation assures adequate intakes of n-3 polyunsaturated fats in the dietary management of type 2 diabetes mellitus

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Evidence-based nutrition principles for the treatment of type 2 diabetes mellitus recommend that <10% of energy should be derived from saturated fats (A level evidence) and that polyunsaturated fat (PUFA) intake should be ~10% of energy intake, with <30% total fat when weight loss is required.¹ Low fat intakes can be achieved with standard low fat dietary advice, but this does not guarantee the type of fats will be in the correct proportions.² The aim of this study was to compare the nutrient intakes resulting from general low fat dietary advice and low fat advice plus the integration of 30g walnuts per day under energy balance conditions. Thirty eight adults (14 females, 24 males) diagnosed with type 2 diabetes mellitus in the previous 2 years and not on insulin therapy were randomly allocated to either standard low fat dietary advice or low fat advice that then differentiated between food groups delivering different types of dietary fat and included 30g walnuts per day. Both groups were advised of the benefits of regular fish consumption. Separate dietitians with similar and long-term experience in diabetes management provided the advice for the two groups, and another two conducted diet history assessments and analysed the dietary data. Differences in fatty acid intakes were assessed and food sources of fatty acids were identified. Comparisons between groups were conducted using repeated measures analysis of variance. After 6 months, there was a significant treatment effect on the dietary polyunsaturated to saturated fat ratio between the control and intervention groups (0.6 vs 1.8, $p < 0.001$). The intake of α -linolenic (18:3n3) acid was substantially greater in the intervention group (3.6 ± 1.9 g/day vs 1.4 ± 0.2) and the n-6:n-3 ratio was more favourable and less variable (5.7 ± 1.4 vs 7.5 ± 3.6). By providing 50% of total n-3 PUFA intakes in the intervention group, walnuts played a significant role in producing a more favourable fatty acid intake in a low fat diet for the management of type 2 diabetes mellitus.

1. ADA Diabetes Care 2003;26:S31-S61.

2. Tapsell LC et al Aust Pacific Journal Clinical Nutrition (in press).

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Microclustered water and hydration

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In 2003 the Chinese Health Care Science and Technology Society organized an international cooperative research project on "Hydration and Health" to compare distilled water (DW) and a US patented microclustered water (MW), called "VIVO", which was awarded by US National Nutritional Foods Association as the "Best Nutritional Beverage in Year 2002". Recent bioelectrical impedance analysis (BIA) studies also showed that diabetics had a lower ratio of intracellular water (ICW) / extracellular water (ECW). A total 336 type-2 diabetics (plasma glucose level >7.0 mmol/L) from five hospitals were recruited in a randomized, double-blind trial. All the subjects received 250 ml of MW or DW twice daily for 4 weeks. To avoid over-dose absorption, subjects were advised to not take medications within 30 minutes after consumption of the test waters. BIA (RJL, USA) and other clinical markers were performed weekly. It was observed that MW consumption improved cell water distribution (ICW/ECW), basal metabolism rate (BMR), phase angle (PA) and cell capacitance (CP) during the 4 week testing period. In comparison with the rate change from baseline, the P value (MW vs DW) of ICW/ECW, BMR, PA and CP were 0.04, 0.003, 0.005 and 0.003, respectively. In this study, about 45% of subjects had higher plasma glucose levels (>8.3 mmol/L). In comparison with the means of above four BIA measurements at the end of experiment, the P value (MW vs DW) were 0.025, 0.022, 0.007 and 0.009, respectively. Two repeating NMR analysis showed that the half-width of the oxygen¹⁷ NMR spectrum were 64 and 67HZ, respectively, approximating normal saline, plasma and fresh natural spring water, while NMR values of DW and most purified waters exceeded 100 HZ. The relative small size of the water cluster may be one of the mechanisms which lead to improve cell structure and function.

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Novel foods in clinical practice

Suitable nutrients necessary in early years and its later consequences

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There is compelling evidence that micronutrient deficiency of zinc, magnesium selenium and manganese, vitamins A& B and E can profoundly affect Health and immunity in human being. In Kenya this is a major problem because of overcooking of vegetable and consumption of overpolished grains eg, wheat, rice and maize and poor consumption of fruits. Commercial supplements are alarmingly expensive to an average Kenyan or even one living under the poverty line. Our organisation has therefore been advising the whole community on how to use locally available food sources rich in vitamins A, B complex , C, D, E and minerals like zinc, alluminium, magnesium and selenium as part of the daily intake. The method has proved to be highly effective and successful in reducing both micro nutrient and macro nutrient deficiencies. The King Baudouin foundation (Kenya)- health promotion through infection control program has developed a health meal using locally available grains to counter problems like eliminating fatigue (both mental and physical), control of opportunistic infection, eliminating indigestion, muscle and joint pain, reducing skin infection and allergy control and finally promotion of nerve sensitivity(neuralgia).

ICCN Poster Presentations

The merging of neurobehavioural and nutritional sciences

Knowledge, attitudes and practices (KAP) of diet prescription among university students of Ahwaz, Iran

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Objective: This study was conducted to determine KAP of diet prescription among male and female university students of Ahwaz, one of the 7 major cities of Iran.

Design: KAP questionnaires which contained information about nutrients, food groups, weight loss/gain and obesity were completed by students.

Subjects: 257 healthy male students (21 ± 1.2 y) and 266 healthy female students (21 ± 0.8 y) were recruited from all faculties of the city.

Results: 94% of female students were on diet vs 17% of male students. Only 32% of female students utilized dietitians compared with 8% of male students. Of the subjects, 43% reported that genetic inheritance is the first cause of obesity vs 25% for dietary factors and 4% for psychological factors. 30% realized protein as the most important factor in an appropriate dietary pattern in compared with 4% for fat.

Conclusion: All of the male and female subjects needed more nutritional information. It is necessary for educational authorities and dietitians to accelerate their efforts to students for providing sound nutrition information.

Effects of breakfast on memory in healthy young adults

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Background: Carbohydrate and protein drinks have been shown to improve memory in healthy young adults at breakfast. However whether these effects are related to elevations in blood glucose or to provision of energy or to taste stimulation is unknown.

Objective: The objective of this study was to determine the different effects of isoenergetic carbohydrate or protein drinks compared with placebo (Sodium Saccharin) drink on memory in healthy young adults at breakfast.

Design: After an overnight fast, 20 healthy male and female, aged 22 ± 1.2 y consumed 50 g carbohydrate (Glucose) or 50 g protein (Casein) or a placebo (50 g water and 3mg Sodium Saccharin) on 3 separate mornings. Short term memory tests were administered before and 60 min after ingestion of drinks. Plasma glucose was also measured.

Results: The memory performance enhanced significantly in glucose ($P < 0.0001$), protein ($P < 0.0001$) and placebo ($P = 0.01$) drinks. Only in glucose breakfast, the variation in blood glucose levels was correlated to memory score elevation ($r = 0.541$, $P = 0.014$).

Conclusions: Like glucose and protein drinks, the consumption of an energy free drink (50 g water and 3mg Sodium Saccharin) can enhance memory 60 min after ingestion, independently of blood glucose increase or provision of energy in healthy young adults at breakfast.

ICCN Poster Presentations

Evidence based nutrition

Serum and urinary levels of retinol and tocopherol of Japanese women

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The urinary excretion and serum levels of retinol (Ret) and tocopherol (Toc) of 33 female university students were measured. Blood samples were taken early in the morning after an overnight fast. Twenty-four-hour urine (24hU) and 2nd-spot urine (2ndU) in the morning were collected for analyses. Ret and Toc were extracted with hexane from serum and urine and measured by high-performance liquid chromatography. Serum and urinary levels of the kidney function parameters examined were within the normal ranges for the Japanese. The mean serum levels of Ret and Toc were 642 ng/ml and 7.71 µg/ml, respectively and the Ret level showed a positive correlation with the level of Toc. Urinary excretion concentrations over 24 h (24hU) of Ret and Toc were 635 pg/ml and 2.23 ng/ml and the total amounts of excretion were 539 ng/day and 1.91 µg/day, respectively. In urinary 2nd-spot excretion (2ndU), the concentrations were 755 pg/ml for Ret and 2.77 ng/ml for Toc and the total excretion amounts of Ret and Toc were 129 ng and 459 ng for the total volume of 2ndU, respectively. Serum levels of Ret and Toc were not correlated with urinary excretion in 24hU and 2ndU. The urinary excretion concentration of Ret or Toc was not statistically different between those in 24hU and 2ndU, respectively. Urinary concentration of Ret in 24hU correlated with the total amounts of Ret in 24hU, and with the urinary concentration of Ret in 2ndU. Also, 24 h urinary concentration for Toc was correlated with the total amounts of Toc in 24hU, and with the urinary concentration of Toc in 2ndU. Urinary Ret concentration of 24hU or 2ndU was correlated with the concentration of Toc excretion in the 24 h or 2nd-spot urine. Urine excretion concentrations of Ret and Toc showed a positive correlation with the levels of urinary creatinine and urea nitrogen of the kidney function index. This study shows that the urinary excretion of Ret and Toc was independent of their serum status, and that the urinary excretion concentration and total amounts of Ret and Toc of 24hU can be estimated from those of 2ndU.

Serum levels of amino acids of Nepalese living in the south-central rural region

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Malnutrition is common health problem in Nepal particularly in rural areas. Poor nutritional status of children in rural areas is well correlated with the high infant mortality (urban: 50 and rural: 79). The serum levels of protein and amino acids provide useful information about nutritional status. We carried out a nutrition survey using the 24-hr recall method and blood sampling in subjects (males 69, females 100, aged 15-80) living in the south-central rural region. The serum amino acid levels were determined by high-performance liquid chromatography (HPLC). The daily mean intakes of protein, fat were 43.2 ± 14.8 and 21.4 ± 10.5 g for males and 40.1 ± 16.2 and 21.7 ± 10.2 g for females, respectively. The mean amounts of total energy intake were 1906 ± 505 and 1714 ± 570 kcal for males and females, respectively. The percentage of animal protein consumed were 19.7 ± 17.2 and 17.2 ± 13.9 % for males and females, respectively. Eighty percent of the total energy was taken from carbohydrate, 11.0 % from fat and 9.3 % from protein. The serum levels of total amino acids, total essential amino acids (EAA) and total non-essential amino acids (NEAA) tended to be higher than the normal range. However the ratio of EAA/NEAA was somewhat lower than the normal range. The serum levels of total aromatic amino acids (AAA) and total branched-chain amino acids (BCAA) were higher than the normal range. The ratio of BCAA/AAA (Fisher's ratio) was significantly low compared with the normal range. Examining the individual amino acids show that the serum levels of serine (Ser), glycine (Gly), alanine (Ala), arginine (Arg) and phenylalanine (Phe) were markedly higher than the normal range. These results showed that the pattern of serum amino acids in Nepalese differed from those in the normal range, possibly due to the difference in the dietary intake.

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Evidence based nutrition

Anthropometric measurements of preschool children as effected by socio-economic factors

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During preschool age period, children have special nutritional needs because of their extensive growth and development. The growth pattern of a child is a useful criterion for judging his nutritional status. Anthropometry can be used in health programmes to monitor health and nutritional status of individual children. During preschool age the growth rate is relatively more. Keeping this in mind a study was conducted to determine the anthropometric measurements of preschool children (4-5yrs) of Gurgaon district of Haryana (India). Data was collected from 300 preschool children randomly selected from six villages namely Vazirabad, Jharsa, Chakarpur, Badshahpur, Teekli and Palra. The mean height and weight of boys were 87.49cm and 13.65 kg and of girls were 84.67cm and 12.81 kg, which are significantly lower than reference value. Among boys and girls, weight was found significantly higher in boys than girls whereas height, was almost similar. On the basis of mid arm circumference, 76% were healthy, 18.3% were on the borderline and 5.7% were suffering from malnutrition. Sub-optimum nutritional status of the preschool children might be due to lower intake of energy, protein and iron rich foods. While studying the effect of socio economic factors on anthropometric measurements of children it was observed that height and weight of children was affected by caste, income, type of house, size of family, land holding, mother's education and father's education. Therefore it is suggested that preschool children and their mothers may be encouraged to take balanced diet for proper growth and development.

The correction of neutrophilic link of immune activity in rats by lipid nutrients

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It is well known that considerable changes of immunological axes could be generated by diet. For instance the diet rich in omega 3 and omega 6 polyunsaturated fatty acids has immunomodulating effects. In this study the influence of lipid nutrients (Super EPA and Phosphatidyl Choline, Thorne Research Inc., USA) on neutrophilic link of immunity of rats with model of immunodeficiency status (MIDS) was investigated. Super EPA contains omega-3 fatty acids (eicosa-pentaenic and docosaheksaenic) with total value 56.2%. Phosphatidyl Choline contains 35% of phosphatidylcholine with omega 3 and omega 6 fatty acids. The research has been done on 28 healthy female rats that were divided into 4 groups. 1st – intact group, 2nd group with MIDS, 3rd group with MIDS and receiving Super EPA, 4th group with MIDS and receiving Phosphatidyl Choline. The intact group of rats was provided with usual diet. Other 3 groups were provided with hyper-calorie diet to induce MIDS. Immunological analysis has been done on neutrophils of blood. Phagocytic activity of neutrophils in relation to latex particles has been estimated by phagocytic index value; level of oxidative metabolism of neutrophils using HCT test. Received data have been statistically evaluated. The experimental results show that rats with MIDS have decreased value of immunological rates (decline of total phagocytosis and oxygen metabolism level) in comparison with intact group. In groups receiving Super EPA and Phosphatidyl Choline reliable increase of immunological rates was registered. As we know, insertion of polyunsaturated fatty acids omega 3 and omega 6 in phospholipids of cell membranes, in our case phosphatidylcholine, provides functional plasticity of membranes and normal physiological and biochemical processing in membranes. Probably Super EPA is more effective than Phosphatidyl Choline in its impact on oxidizing process in cell membranes apparently because of enrichment by omega 3 fatty acids. The results argue in favour of both lipid nutrients efficiency in correction of immunodeficiency states associated with impairments of neutrophil functional activity.

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Evidence based nutrition

Physical activity and calcium consumption are important determinants of lower limb bone mass in elderly women

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Although there is general agreement that increased dietary calcium consumption and exercise can slow bone loss in elderly women the amount required to have this effect in an elderly population remains uncertain. This study was devised to examine the effects of calcium consumption (CC) and physical activity (PA) on bone mass in an elderly female population. Using a cross sectional study design a population-based sample of elderly women mean age 75±3y had measurements of hip and heel bone mass measured using DXA (Hologic 4500A) (n=1076) and quantitative ultrasound (QUS, Lunar Achilles) (n=1363) respectively. Calcium consumption and physical activity were measured by a validated habitual food frequency and activity questionnaire respectively. Dose response effects of PA and CC on bone mass were examined using ANOVA. Division of the PA and CC into textiles best described the dose response effects. High PA compared to medium or low PA was associated with increased hip BMD and heel QUS (total hip BMD 3.4%; QUS Stiffness 2.7%). High or medium CC compared to low CC was associated with an increased total hip and trochanter BMD of 2.9% and 2.2% respectively with no effect at the QUS heel site. PA and CC were dichotomized at these cut points and the effects on BMD examined. The combination of high PA and CC, achieved by 24% of the population, was associated with a total hipbone density 5.7% higher (36 % of 1SD) than those individuals in the other three groups. Stiffness was 2.7% (17 % of 1 SD) higher in the high PA and CC group than in the low PA and CC groups. Lifestyle factors play an important role in maintenance of lower extremity bone mass. If the whole population undertook and achieved a high physical activity calcium consumption lifestyle the population risk of hip fractures may be expected to be reduced by about 17% in this age group.

Calculation of vitamin A activity from provitamin A carotenoids: what factor should we use?

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When converting the quantity of provitamin A carotenoids to retinol equivalents, it has been standard practice to divide the quantity of beta-carotene by 6 and the quantity of other provitamin A carotenoids by 12. The recent revisions to the US dietary reference intakes propose reducing these conversion factors to 12 and 24 respectively. This recommendation was influenced by two considerations. Firstly, a careful Dutch study that found that the relative absorption of beta-carotene from a mixed vegetable diet was only 14% of beta-carotene in oil. Secondly, the view that fruit, which has higher bioavailability, made only a small contribution to provitamin A intake in the US. The variability of bioconversion of provitamin A carotenoids between foods has long been recognised. It has been studied from two difference angles. The absorption of beta-carotene from green vegetables, including leaves, and carrots have been studied in developed countries. Generally low absorption is found, although it is better from cooked carrots than spinach. Many, but not all, randomised controlled trials in less developed counties find that papaya, mango, sweet potato, pumpkin and sometimes carrots are effective in raising serum retinol levels in populations with low baseline levels. In some studies, some foods have been as effective as capsules of retinol. The results with green leaves are variable. How should these finding be used to decide on a conversion factor? In Australia, pumpkins, fruit and dairy products provide nearly 25% of the provitamin A in the diet. By contrast, leaves and stalks contribute 2% and peas and beans another 2.2%. Carrots and other roots (eg. Sweet potato) contribute 44.4%. In the Dutch study mentioned above, the diet tested contained green beans, broccoli, spinach, green peas, Brussels sprouts, vegetable mix and vegetable-based salads and soups; 43% of beta-carotene was derived from green leaves. Using the results of this trial and following the US proposal of setting a 12:1 conversion factor would probably underestimate the average bioavailability of beta-carotene in Australia. These considerations suggest that it may no longer be appropriate to set a single conversion factor to calculate vitamin A intake for use in all countries.

ICCN Poster Presentations

Evidence based nutrition

Changing dietary patterns of the young: impact of fast foods

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Introduction: Catering to the needs of a swift-paced society, fast foods are becoming an integral part of the lifestyle for the younger population.

Objectives: To study the food preferences and fast food consumption of the young (WHO).

Methods: Dietary patterns and fast food intake of 120 adolescents and young adults drawn from the fast food clientele of 9 popular fast food outlets was studied. Structured questionnaires were used for data collection. Chi square and Pearsons correlation was applied to study the significance of the results

Results: Dietary patterns of 120 subjects aged 16-21 years (both males and females) indicated that 65% of them were missing one/more meals and 62% of them were not carrying packed food to school/college. The frequency of eating at the school/college canteen was reported to be 'daily' by more than 50% of the subjects. Eating at places other than the canteen was reported by 62.5% of the subjects. Pizzas, burgers, ice-creams, soft drinks, French fries, sandwiches and patties were the fast foods most commonly consumed exhibiting a trend of snacks replacing the normal meals. While only 16% were 'low fast food eaters', 63% were 'moderate' and 21% 'high fast food eaters' (energy intake from fast foods being <10%, 10-30% and \geq 30% of the total day's intake). A high energy intake from fast foods was associated with a high total daily energy intake. Adequacy of nutrient intake for seven essential nutrients from fast foods was analyzed on the basis of Nutrient Adequacy Ratios (NARs). For each nutrient, the NAR was calculated as a ratio of the nutrient intake per 100 kilocalories of energy intake from fast foods to its respective RDA per 100 kilocalories of RDA of energy. Grade points of 1, 2 and 3 were given for NAR values of <0.66, 0.66 - <1 and >1 respectively. The consolidated score for seven nutrients (Fast Food NAR) ranging from 7-21 was found to be 'poor/fair' (7-11/12-16) for 94% of the subjects, reflecting an inadequate intake of essential nutrients from fast foods.

Conclusion: Excessive consumption of fast foods, which are nutritionally imbalanced, may adversely affect health and enhances the vulnerability to degenerative diseases.

Nutrition and health status of rural adolescent girls in selected ICDS blocks of Delhi and Rajasthan

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Adolescent girls need special care in view of their present and future roles. The only national programme targeted towards the developmental needs of these girls is the Adolescent Girl (AG) scheme of Integrated Child Development Services (ICDS). The present study has been undertaken in ICDS blocks of Delhi (*Alipur, Kanjhawala and Mehrauli*) and Rajasthan (*Deeg*) to assess the baseline nutrition/health status and related knowledge of rural adolescent girls in these areas.

Methods: 181 girls (aged 11-21 years) comprised the sample and the dietary intake data were gathered by one day 24 Hour Recall coupled with Food Frequency Questionnaire. Data on weight/height/BMI were gathered and hemoglobin status was assessed by cyanmethemoglobin method. An interview schedule was employed to elicit knowledge relating to nutrition and health.

Results: Data indicate that the diets were cereal based and monotonous; 58.4% of subjects were found to have intake less than 75 percent of RDA while a substantial proportion of them had inadequate nutrient intake (NAR<0.66) with respect to most of the micronutrients especially iron (93.4%), vitamin A (75.7%) and folic acid (81.8%). The incidence of anaemia (hemoglobin level <12 g/dl), thinness ('BMI for age' <5th centile) and stunting ('height for age' <3rd percentile) was 93.2%, 35.9% and 30.4%. Further, a large majority of the subjects had inadequate knowledge relating to immunization, colostrum/exclusive breast-feeding, childcare practices as well as that relating to prevention of deficiency diseases.

Conclusions: The nutrition/health needs of the rural adolescent girls must be addressed in a holistic manner (providing food supplementation, imparting nutrition/health education as well as skills in income generation). A comprehensive programme like AG scheme, if implemented effectively, has the potential not only to break the intergenerational cycle of malnutrition but also result in improved knowledge and empowerment of these girls to face their challenging roles.

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Evidence based nutrition

Effect of high fibre fruit (Guava - *Psidium guajava* L.) on the serum glucose level in induced diabetic mice

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Water-soluble dietary fibre was found to decrease postprandial glucose concentrations in type 2 diabetes mellitus subjects. This study was designed to investigate the effect of high fibre fruit (guava - *Psidium guajava* L.) on serum glucose level in induced diabetes mellitus mice. A total of 40 male mice were used in the study and the duration of the study was 5 weeks. Mice were divided into 4 groups (10 mice per group); they were normal control, diabetic control, diabetic with guava treatment and diabetic with glibenclamide treatment. After 2 weeks of stabilization phase, three groups of mice were induced to have diabetes mellitus (except normal control) with streptozotocin. During the 5 weeks study, normal and diabetic control group were given only normal diet (basal diet), diabetic with guava treatment received additional 0.517 g/day of guava, meanwhile for the diabetic with glibenclamide treatment group, they were forcedly given 5 mg/kg of glibenclamide daily. Fasting blood were taken weekly through a cut in the tail and analysed enzymatically. Results showed that there was a reduction in blood glucose level in diabetic with guava treatment group in week 3, 4 and 5 with changes in glucose level of -12.3%, -24.79% and -7.9% respectively as compared with the diabetic control group. Comparisons between the mean of blood glucose level in diabetic with guava treatment group and diabetic with glibenclamide treatment group shows that the mean was significantly different in week 4 ($p=0.029$) with changes in blood glucose level of 25.88%. This study showed that supplementation of 0.517g/day guava could reduce fasting blood glucose level but the mean was not significantly different ($p>0.05$). Guava is a tropical fruit that contain high dietary fibre (soluble and insoluble) and could have health potential in the management of blood glucose level in diabetic subjects. Therefore further studies are needed to investigate the different doses of guava that will give more promising results.

The effect of weekly dose of iron supplementation for 16 and 20 week on the iron status of adolescent girls in Iran

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Introduction: Iron deficiency and iron deficiency anemia are among the most important public health problems in the world, with evident adverse effects on physical, behavioral, and work capacity of individuals. Infants and pre-school children, adolescents (especially girls), women of reproductive age and pregnant women are at increased risk. Globally 26% of adolescents in developing countries are anemic. In Iran according to a national survey, in 1992, 30% of people between 3 and 65 years were anemic (based on hemoglobin measurement). Iron supplementation is an important strategy for the prevention and treatment of iron deficiency anemia and can produce substantial improvements in the functional performance of iron deficient individuals and populations and weekly dose of iron supplementation may be an effective means of increasing iron status.

Materials and methods: This clinical trial study was carried out to compare effectiveness of weekly dose of 150 mg of ferrous sulphate for 16 and 20 weeks in adolescents' girls. Hemoglobin, hematocrit, and Serum ferritin concentrations were measured at baseline and after 16 and 20 wk of supplementation. 448 teenager girls were included and data analyzed by using EPI6 software.

Results: Hemoglobin concentrations increased significantly after 16 and 20 wk supplementation. Based on the results, before supplementation mean of hemoglobin and hematocrit was 12.8 (gr/dl) and 38% and after 16 weeks supplementation was 13.9 (gr/dl) and 40.6% and then after 20 weeks was 13.9 (gr/dl) and 40.8% respectively. Mean hemoglobin of girls after 16 weeks supplementation was significantly higher than before supplementation. Mean hemoglobin increased 1.1gr/dl after 16 weeks and 1.2 gr/dl after 20 weeks. The difference between before and after intervention was statistically significant ($P<0.0005$) but the difference between 16 and 20 weeks was not significant.

Conclusion: Because weekly supplementation with iron is effective at improving iron status, this option should be thoroughly explored in the context of programs for the prevention and the treatment of iron deficiency and anemia. But weekly iron supplementation was found to be a practical, effective, and inexpensive method for improving iron status in adolescent school girls.

ICCN Poster Presentations

Technologies in clinical nutrition practice

Developing a self-administered computer assisted dietary assessment tool for use in primary healthcare practice: perceptions of nutrition and computers in older adults with T2DM

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Introduction: With the computerised analysis of food nutrient composition and partially self-administered food record interfaces, dietitians can now focus time educating and counselling their clients. Many such dietary computer programs are progressing toward increased involvement of the client for a self-administered dietary assessment. The degree of involvement is however limited by the program structure and design. The aim of the study reported in this paper is to evaluate the perceptions, beliefs and attitudes of the client in terms of their use of computers in society and to assess the preferred program design features and attributes. Analysis of this data allows for the development of the program structure and interface for a self-administered diet history program.

Methods: A telephone-based questionnaire and focus groups were employed to evaluate the beliefs and perceptions of the clients. Thirty-seven male and female adults with type 2 diabetes mellitus (T2DM) volunteered from a previous dietary intervention study. Each participant attended only one focus group session. Participants were asked to express their opinions on a variety of interface features including preference for the use of text or graphics. Subjects were also shown a range of existing dietary assessment programs and asked to state their visual perceptions of each. Data was coded based on responses to computer use, software features, dietary assessment and nutrition programs.

Results: The sample consisted of 24 male and 12 females with a mean age of 60 years. All had T2DM and at least one additional lifestyle disease to be managed by diet. Only three subjects had never used a computer. A preference toward text was found with photographs preferred only for determining food portions. Use of computers appeared to influence the degree of comfort and level of complexity of computer interfaces with those of minimal experience preferring simplified screen layouts.

Conclusion: A self-administered dietary assessment program using the diet history concept can be utilised, yet the complexity of the interfaces differs from an interview by the dietitian. The current study concurred with the literature older persons are willing to learn computer technology, yet place a wider degree of importance on personal support. Development of a self-administered diet history program must ensure simplicity of the interface design.

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Obesity

The relationship of plasma leptin to anthropometrical and biochemical markers of overweight primary school students

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Obesity is become an epidemic globally. The prevalence of obesity among children and adults has increased substantially over the last few decades in many part of world especially in developing countries. Childhood obesity is one of the foremost issues, as it becomes a noteworthy sign or predictor for adulthood obesity. The purpose of this cross sectional study was to observe the relationship between leptin, body composition (BMI, %Bfat, Fat Mass), lipid profiles (TC, TG, HDL, LDL) and blood pressure (Sys & Dia) among urban school children. A total of seventy-nine subjects (males 38 and females 41) were selected on a voluntary basis, after having obtained an informed-concern from the subjects and parents. Anthropometrical, body composition, lipid profiles, blood pressure and leptin (ELISA) measurements were measured according to the standard procedures. Overweight and obese are based WHO 1995 (BMI-for-age $\geq 95^{\text{th}}$ percentile = Obesity, 85^{th} percentile \leq BMI-for-age $< 95^{\text{th}}$ percentile = at risk for obesity). All data analyzed using SPSS and are presented as mean \pm SEM. The results shows that 17.7 % were overweight, 49.4 % were obese and the rest were normal (32.9 %) BMI for their age. Majority of subjects were Malays (87.3 %) and followed by Indian (11.4 %) and (1.3 %) Chinese. Pearson correlation test showed a significant positive correlation between leptin and BMI ($r=0.441$, $p<0.01$), % Bfat ($r=0.431$, $p<0.01$), Fat Mass ($r=0.455$, $p<0.01$), lipid profiles (TG, $r = 0.226$, $p<0.05$). No correlation observed between leptin and blood pressure in this present study. Circulating leptin concentrations are influenced by BMI, % Bfat, F-Mass and TG. Though leptin is not correlated with blood pressure, it is known that blood pressure is commonly associated with increased body weight and other health parameters. Appropriate educational intervention programs (nutrition, physical activity and weight management program) should be introduced at early stage to decrease childhood obesity and other health problem among school children.

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Body mass index is not a significant predictor of survival amongst older people

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Introduction: As the population ages, more attention for emergent problems of health and disease in the elderly is needed. The International Union of Nutritional Sciences (IUNS) subcommittee on Nutrition and Ageing, in conjunction with the World Health Organization (WHO) global program for the elderly, embarked on the 'Food Habits in Later Life' (FHILL): a cross-cultural study to test key hypotheses in relation to food habits, health status and social variables in the elderly in 1987. That obesity is associated with increased morbidity and mortality requires specific consideration with advancing years.

Objective: To investigate whether the so-called a healthy BMI (a widely used and simple tool to measure body fatness), between 20-25 kg/m², predicts 7-year survival amongst elderly (aged 70 years and over) from long-lived cultures namely Japanese in Japan, Swedes in Sweden, Anglo-Celtics in Australia, and Greeks in Greece and Australia.

Methods: Baseline data of height and weight were used to calculate BMI from FHILL study participants (n=785). BMI was classified as low (BMI<20), healthy (20 \leq BMI<25), overweight (25 \leq BMI<30), and obesity (BMI \geq 30). Healthy BMI was used as a reference point. All cause mortality from up to seven years follow-up was used as study endpoint. Each Cox Proportional Hazard model was adjusted to age at enrolment (in 5-year intervals), gender, smoking and general health status and was developed to analyse the survival data.

Results: Having a low BMI or being underweight/undernutrition (RR 1.45: 95% CI 0.85-2.58), being overweight (RR 1.16; 95% CI 0.75-1.78), or being obese (RR 0.97: 95% CI 0.55-1.74) did not significantly reduce or increase mortality as opposed to being in a healthy BMI group in the FHILL population.

Conclusions: The FHILL study shows that mortality advantage conferred by having healthy BMI was not evident amongst elderly from longevity cultures. Body fatness, following adjustment for age at enrolment, gender, smoking, and general health status, was not found to be a significant predictor of 7-year survival. Further research may provide better understanding of the relation between optimal BMI and survival amongst older people.

ICCN Poster Presentations

Obesity

Impact of exercise on nutritional status and health profile of urban obese women in Hisar City

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Obesity is one of the major public health problems among women in the developing countries of the world today. The present study was conducted to study the impact of exercise on nutritional status and health profile of urban obese women. Seventy middle aged, obese female respondents belonging to middle and high income groups were selected purposively from various yoga centers Hisar city using the criteria of Body Mass Index and Waist to Hip Ratio. The study revealed that majority of the respondents were educated and were either housewives or in service. Majority of the respondents belonged to high-income group and were married having three to five children. Most of them had BMI in range of 30 to 35 and were Grade II obese. High blood pressure was highly prevalent among the obese respondents followed by arthritis and gout. Most of the respondents had family history of obesity and other related degenerative diseases. Consumption of all the foods except cereals and green leafy vegetables by obese women was higher than in diets of obese women as compared to RDA except intake of β carotene, riboflavin, niacin and iron. Intake of various nutrients was considerably lower in diets of non-obese respondents than of obese respondents. Cereals and their products followed by fruits and sweets were the foods preferred among various food items by majority of obese women. The energy balances was observed to be positive in obese women and negative in case of non-obese women. Non-significant difference was observed as regard to time spent on various activities between the obese and non-obese women. The concentrations of blood glucose, total cholesterol, HDL-cholesterol, LDL-cholesterol, VLDL-cholesterol triglycerides and ratio of total cholesterol and HDL-cholesterol, were observed to fall within the normal range in both non obese and obese women but these values were significantly higher in obese respondents than in non obese respondents. Energy intake was significantly correlated with total cholesterol, HDL and LDL-cholesterol and a negative correlation with VLDL-cholesterol in obese women whereas fat intake was significantly correlated with blood glucose. BMI and waist to hip ratio were positively correlated with blood pressure, blood glucose and lipid profile of obese women. Physical exercise done by obese women for one hour daily for three months had a significant effect on anthropometric measurements except WHR, energy expenditure, energy balance, time spent on light and moderate activities, blood pressure and all the parameters studied in blood except triglycerides. Thus, it may be concluded that exercise treatment for three months had a significant effect on nutritional status and health profile of obese women. Hence, the study recommends reduced energy intake and increased physical activity by obese women to combat obesity.

Mediterranean diet improves lipid profiles over three months

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Objective: To assess the effect on lipid profiles of a Mediterranean type diet which has previously been shown to be effective at weight loss over 3 months.

Background: Increasing foods rich in Monounsaturated fat (MUFA) may be preferable to the usually prescribed low total fat diets for weight loss. A Mediterranean diet which is high in MUFA but not energy-dense has been shown to be effective at weight loss both short term (3 months) and long term (12 months). This study looks at the changes in lipid profile in those individuals who had no lipid lowering medication before or during the diet program and remained compliant with the diet for 3 months.

Methods: A Mediterranean diet program has previously been shown to be effective at weight loss both short term and long term. Approximately 28% of individuals remain compliant with the program for the recommended 3 months and those individuals are more likely to achieve long-term weight loss at 12 months. Fasting lipid levels were tested before commencing the diet and on completing 3 months of the program. Those individuals who were on lipid lowering medication before or during the 3-month program were excluded from the study.

Results: 155 patients were included in the study of whom, 31(20%) were male. Mean age 55 yrs, starting weight was 88.9 kgs and starting BMI 32.3. Mean weight loss was 7.6 kgs. Mean total cholesterol (TC) reduced minimally from 5.59 mmol/l to 5.55 mmol/l at three months. Mean triglyceride level reduced by 31.6% from 1.58 mmol/l to 1.08 mmol/l and high-density lipoprotein-cholesterol (HDL) increased by 9.6% from 1.46mmol/l to 1.60mmol/l. Low-density lipoprotein-cholesterol (LDL) remained essentially unchanged from a mean of 3.47mmol/l before the diet to 3.43mmol/l after 3 months.

Conclusion: A Mediterranean diet is effective for weight loss over three months and has early favourable effect on HDL and Triglyceride levels and a neutral effect on TC and LDL levels.

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Obesity

Successful long-term weight loss with a Mediterranean style diet in a primary care medical centre

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Objective: To assess the long term (1 year) effectiveness of a weight loss programme which is based on a Mediterranean type diet and has previously been shown to be successful over the short term (3 months).

Background: Increasing foods rich in Monounsaturated fat (MUFA) may be preferable to the usually prescribed low total fat diets. A Mediterranean diet which is high in MUFA but not energy-dense may be more effective at long-term weight loss than a low total fat diet.

Methods: A Mediterranean diet has previously been shown to be effective over three months in a study following 100 consecutive patients attending a weight loss programme at a Primary Care Medical Centre. The same 100 patients were followed up 15 months after commencing the diet programme, to assess long-term effectiveness of weight loss

Results: 41 people were available for follow up. 22 of those contacted attended the surgery for review and 19 chose to be reviewed by telephone. 24 patients had maintained at least some of their weight loss, with a mean weight loss of 8.18% of starting body weight at 15 months follow up. 17 patients regained all of the weight that they had lost; 75 % (n=18) of the 24 people who had maintained at least some of the weight loss had completed the full, three-month programme. Twenty-six of the 28 people who completed the full programme were contacted. Twelve (46.2%) had maintained or lost even more weight while 6 (23.1%) had regained some but not all of their lost weight.

Conclusion: The Mediterranean type diet is very effective for weight loss both in the short term and at 15 months follow up. Long term follow up of this diet programme is at least as effective as any diet or diet and drug therapy published. Individuals completing the recommended 12-week program seem to have more effective long-term weight loss. This type of diet is an alternative to current practice and is amenable to a primary care Medical Practice.

Overweight/obesity situation and the relation to lipid disorders and hypertension in women aged 20 to 59 years old in Ba Dinh district, Hanoi City

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The research was carried out in Ba dinh district, Hanoi. The results of the research on 724 women from 20-59 years old indicated that the prevalence of overweight (BMI > 25.0) was rather high (16.6%), the prevalence of pre-obesity and obesity grade I was 15.5% and 1.1%, respectively. The prevalence of overweight was increased with increasing age, the highest prevalence was observed among women 50-59y old (19.9%). The percentage of women with waist/hip ratio >0.85 was 33.6%. The habits of consuming energy-rich foods such as fat, sugar were risk factors of overweight and obesity. Moreover, the time set aside for light activities (eg., watching television) in the overweight group was significantly higher than that in the normal group. Risks of overweight also increased in subjects whose family members were overweight and obese. The overweight group had the rate of hypertension of 13.3%, higher than the normal group did (4.2%). The prevalence of women who had biochemical indicators exceeding the limit in the overweight group was high. The prevalence of women who had cholesterol >5.2 mmol/l was 17.5% and glucose in blood >7.0 mmol/l was 8.2%. The prevalence of women who had HDL-C lower than the normal limit was 9.2%. Especially, 65% of women had the triglyceride level exceeding the normal limit.

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Obesity

Genetic linkage of uncoupling proteins (UCP2 and UCP3) with body weight regulation

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Body weight depends on the balance between energy intake and energy expenditure. The discovery of the novel UCPs (UCP2/UCP3) in 1997 led to an explosive reinvestigation of thermogenesis, fuel utilization and possibility that these new gene products might be genetically linked to certain metabolic disorders. Also, UCPs might be targets for therapeutic interventions for obesity, Type II diabetes, pathophysiological cachexia conditions (e.g. AIDS, cancer) and above all their utility in the search for drugs to combat obesity. The UCP2 (a gene transcribed in various tissues) is located on chromosome 7 of the mouse and chromosome 11 of humans, near to region linked to diabetes and obesity (QTL linkage to hyperinsulinemia and high plasma Leptin levels). UCP3 (a gene transcribed predominantly in skeletal muscles of rodent and human) is very close to UCP2 gene location. These two genes have an organization similar to that of UCP1 gene. The exon 8 ins/del polymorphism of UCP2 appears to be associated with childhood-onset obesity. The UCP2 / UCP3 genetic locus may play a role in childhood body weight. All physiological situations involving notable changes in energy balance (fasting, over eating, infections, most hormones and neuromediators such as catecholamins and Leptin) alter the expression of the UCP2 and UCP3 genes thus pointing the role UCPs in energy expenditure. Some studies showed that level of UCP2 and UCP3 increased during starvation without changing heat production and suggested that these genes are involved in diet - induced thermogenesis. The expression of UCP2 by using fat - rich diet was specifically elevated in white adipose tissues in strains of mice that are relatively resistant to the diet - induced obesity and diabetes, but not in obesity - prone mice. Phenotypes of mice with targeted disruption of the UCP3 gene were at the very least, disappointing from the perspective of metabolic control of body weight and glucose homeostasis. It has been shown that the changes in UCP2 and UCP3 gene and protein expression are involved in the regulation of substrate utilization in post traumatic insulin resistance and systemic EGF administration of rats. Expression of UCP2 and UCP3 seems to be related to lipid metabolism. However the molecular mechanisms regulating these genes are currently under investigation and after 2 to 3 years of research the role of UCPs in metabolism, oxidation of lipids and other substrates and the control of body weight is still relatively unclear.

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Obesity

Assessing changes in quality of life among obese participants in Kelantan, Malaysia

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The prevalence of obesity is increasing worldwide and becoming a great concern because it is associated with a number of negative health outcomes such as increased risk for type II diabetes, gall bladder disease, hypertension and heart diseases. Quality of life has become a buzz word in most of the health studies nowadays. There has been numerous weight loss studies suggesting that obesity is associated with impaired health-related quality of life. The objective of this study is to evaluate the magnitude of changes in quality of life before and after experiencing 12 weeks weight reduction program. The respondents consisted of 60 volunteers seeking treatment for losing weight through behavioural modification approach. All subjects underwent intervention consisted of downsizing their daily meal consumption and snacking, behaviour modification, physical activities such as aerobic dance and brisk walking plus dietary counselling. Participants were divided into small groups to stimulate motivation and interaction amongst them in order to achieve their weekly target weight. Quality of life of participants was assessed using the SF-36 questionnaire before and after intervention (end of program). Mean BMI at baseline was $34.8 \pm 5.2 \text{ kg/m}^2$ (range 28.10 kg/m^2 to 47.4 kg/m^2). Average weight loss from entry was $6.34 \pm 3.85\%$ with maximum $19.06 \pm 2.8\%$. There was a significant difference of means ($p < 0.05$) for anthropometric variables and quality of life scores between baseline and post-intervention. Nutrition knowledge by using standard questionnaire also was administered during their first visit and at the end of the program. Clearly, there was a significant difference ($p < 0.001$) for the nutrition knowledge scores during pre and post-intervention. Their nutrition knowledge improved as well as their quality of life when they completed the program. In conclusion, practical weight loss practices such as increased activity physical, dietary modification, changes toward healthy lifestyle and group support are effective for weight loss and yield significant health and psychological benefits in obese participants.

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Obesity

Gender and ethnic differences of Mexican children's attitudes toward a drawing of an obese peer

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Background: In the Mexico-US border, in 1999, 35% of the children aged 6-11 y were over the 85th percentile body mass index from NCHS. Among Mexican-Indian migrant children on the Mexico-US border the overall prevalence of overweight and obesity was 38%. In the USA studies have been conducted to identify how children acted toward the drawing of an obese child. Studies in the USA have shown that children liked the drawing of an obese child the least. However, no studies have been published on the attitude toward an obese child among Mexican children.

Objective: We explored the relationships of stereotypes of obesity to sex and ethnicity in 433 Mexican children attending elementary public schools at a Mexico-US border city.

Methods: School-based sample of children evaluating different qualities of children. Participants included 433, 9 to 14 year old girls and boys attending upper-middle and lower-middle income Mexican public schools. Children ranked six drawings of same-sex children with obesity, various disabilities, or no disability (healthy), in order of how well they liked each child.

Results: Ratings were generally more favourable for the wheelchair child and the average weight than for the obese condition in both girls and boys. However, girls liked the obese child less than boys did, $p < 0.0001$. Girls above BMI at 85th percentile were generally more favourable for the obese child, $p = 0.07$. Indian children liked the obese child more than non-Indian children; however, this was not statistically significant.

Conclusion: These results should be considered when designing general health education and obesity prevention programs at school levels.

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Obesity

Effects of macronutrients on cardiovascular and metabolic responses in NIDDM (non-insulin –dependent diabetes mellitus) and healthy subjects

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We compared the cardiovascular [cardiac output (co), heart rate (hr), stroke volume (sv), mean arterial pressure (map), systolic blood pressure (sbp), diastolic blood pressure (dbp)] and metabolic responses [blood sugar, insulin, norepinephrine] to carbohydrate, protein and fat in 10 healthy subjects (4 woman, 6 man: age 36.6 ± 5.8 yr, range 30-48, BMI 24 ± 1.2 kg/m², range 22-25) and 15 NIDDM (non-insulin-dependent diabetes mellitus) patients (4 woman, 11 man: age 38.9 ± 5.2 yr, range 29-47, BMI 24 ± 1.6 kg/m², range 21-26.6). Cardiovascular measurements were carried out before meals and 2 hours postprandially (15,30,60,90,120 min) while metabolic measurements were followed 3 hours postprandially (15, 30, 60, 90, 120,180 min). Insulin increased significantly following intake of carbohydrate, protein and fat in both groups ($p < 0.05$). Baseline norepinephrine was significantly greater in healthy subjects [750(SE 22) Pg/ml] than in NIDDM [199 (SE 9)] ($p = 0.001$). Norepinephrine increased significantly following intake of the carbohydrate, protein and fat in NIDDM and healthy subjects ($p < 0.05$). The values for norepinephrine before and after intervention were different between two groups. Baseline blood glucose concentration in NIDDM patients was greater than healthy subjects [134(SE 6.5) vs 86 (SE2) mg/dl] ($p = 0.001$). Blood sugar concentrations increased significantly postprandially in healthy subjects (0.05,0.02,0.01). In NIDDM blood sugar concentrations increased after intake of carbohydrate and protein ($p = 0.005, ns$ respectively) but gradually decreased after fat ($p = 0.01$). In healthy subjects macronutrients caused marked and gradually developing postprandial increases in cardiac output. While in NIDDM co rose after intake of macronutrients but these increases were not significant except 30 min after protein ($p = 0.004$). In healthy subjects sbp and map rose after the ingestion of macronutrients ($p < 0.05$) and dbp had no changes. In NIDDM after the ingestion of macronutrients, there was a fall in systolic blood pressure and mean arterial pressure but this was only significant after fat ($p < 0.05$). Dbp had no changes after carbohydrate and protein but after fat fell ($p < 0.05$). There were considerable differences in the speed of development and the pattern of the cardiovascular and metabolic responses between NIDDM and healthy subjects ($p < 0.05$). Finally we concluded diabetes in the early stages cause change metabolic system and then involved cardiovascular system.

The effect of food frequency on serum glucose, triglyceride and total cholesterol in niddm patient

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Objective: The aim of this semi-experimental, crossover, perspective study was to assess the effect of low and high frequency diets on fasting serum glucose, total cholesterol and triglyceride after eating a standard breakfast (B.T.T) on non-insulin-dependent diabetes mellitus (NIDDM) patients.

Material and method: In the experimental, we studied 12 NIDDM patients (6 males, 6 females aged 25-54 years). They were on isocaloric prescribed diets for 6 weeks and they followed the diets over the period of the study. The number of meals which patients consumed in high and low frequency diet periods was as following: $7/96 \pm 0.11$ meals/day for high frequency diet and 4 ± 0.8 meals/day for the low frequency diet. The general data was acquired from questionnaire and 3 days food records. The analysis of energy, carbohydrate, protein and fiber intake was carried out by an EPI program. Serum variables were determined at the beginning and end of each diet period.

Results: The fasting serum glucose at the end of high frequency diet period was reduced significantly compared with the baseline data ($P < 0.02$) and the low frequency diet ($P < 0.05$). The fasting total triglyceride at the end of high frequency diet was reduced significantly compared with low frequency diet ($P < 0.05$). The differences between fasting total serum cholesterol at the end of high frequency diet compared with baseline and low frequency diet was not significant.

Conclusion: this result shows that high frequency diet reduces fasting serum glucose and triglyceride.

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Obesity

Relation between calcium and magnesium intake and obesity

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Aims: Nowadays there is much evidence available about the relation between dietary calcium and human body weight control mainly in the case of adults. According to data from the literature increasing Ca-intake results in a smaller amount of body fat. On the other hand, there is only very limited data in the literature available on the magnesium intake of overweight people. This has been studied in the case of 10 to 14-year-old obese students and those with high body fat %.

Methods: The survey of dietary habits was carried out with a self-administered questionnaire. A detailed registration of food and drinks consumption in three days (two weekdays and one Sunday) was requested. The survey was completed with a personal interview in order to achieve more accurate data processing. The data of the questionnaires were processed with the help of the X diet-planner program. The study involved 80 students (40 obese, 40 controls).

Results: In this study the calcium and magnesium-intake of students is less than the recommended value (Ca: 1000mg/day; Mg: 350mg/day). Calcium intake in the obese group was significantly lower than in the control group ($\Delta = 17\%$) ($P < 0.05$). Daily calcium intake is especially low in case of the very obese children (BMI>30). The consumption of milk, dairy products, vegetables and fruits is decreasing, the consumption of sweets and soft drinks is increasing. In some cases of extreme obesity we find a very little calcium intake (300-400 mg/day), whilst its lowest value in the control group was 640 mg/day. Magnesium intake in the obese group is significantly lower than in the control group ($\Delta = 21\%$) ($P < 0.05$).

Conclusions: There is more and more evidence that diets with low calorie content and rich in calcium may provide protection from obesity. It is not enough to increase calcium intake, the sufficient intake of magnesium is also crucial because otherwise cardiovascular imbalance can occur. This is a further excellent argument why the healthy, well-balanced diet has to include low fat content dairy products.

Dietary intake, lifestyle factors and nutritional status of Indian adult males in Kampung Indian Settlement, Batu Caves, Selangor

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A study was conducted to determine the dietary intake, lifestyle factors and nutritional status of adult Indian male residents of Kampung Indian Settlement, Batu Caves, Selangor. A total of 91 adult Indian males who fit the criteria of selection were selected as respondents for the study. Data were collected using a questionnaire and anthropometric measurements. The respondents ranged in age from 25 to 59 years old with a mean income of RM1699.56 \pm 1251.60 per month. All but one was married with 1 to 6 children. More than forty percent of the respondents were either categorized as overweight (37.4%) or obese (5.5%). However all respondents had waist to hip ratio (WHR) of less than 1.0 and were categorized as having "low risk" for android obesity. A total of 61 (67.0%) respondents were current smokers and the mean number of cigarettes smoked was 10.9 \pm 5.8 cigarettes per day. Sixty-eight (68) or 74.7% of the respondents consumed alcohol and of these a majority (42.2%) were consuming alcohol 2-3 times per week. Only 24 (26.4%) of the respondents were regularly exercising but of these more than a third (37.5%) were exercising less than 3 times per week. Most respondents (93.4%) consumed rice as their staple food every day. In general, respondents were observed to have high intakes of protein, vitamin A, calcium and vitamin C, which were above 2/3 of the Malaysian RDA. The mean percentage caloric contributions of carbohydrate, fat and protein to the total caloric intake were 60.6%, 25.4% and 14.1% respectively. The respondents' weight management knowledge was generally poor with a majority (71.4%) scoring less than 50% of the total score. The study recommends a nutritious diet and healthy lifestyle promotion program to motivate respondents to change their lifestyle and dietary habits.

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Obesity

Prevalence of general and central obesity in Zahedan university of medical sciences students, Iran

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Aims: Obesity is a major nutritional and public health problem linked to poor health outcomes. An index that can be used for overweight and obesity is the body mass index (BMI). BMI is used as an index for determining the total body fatness or general obesity. In determining the risk factors for health, both amount and location of adipose tissue is important. For evaluation of central obesity, the waist-to-hip ratio (WHR) can be used. To highlight the importance to young people's health, we studied BMI and WHR of students at Zahedan University of Medical Sciences.

Methodology and Results: 720 students (428 females, mean age 20.95 ± 2.41 and 292 males, mean age 23.25 ± 4.62) were selected using stratified sampling. The students were weighed on Seca scales without shoes and minimum clothes. Height, waist and hip were also measured and BMI and WHR calculated. The results show the mean and SD for BMI in females and males was 21.62 ± 3.14 and 21.70 ± 2.97 , respectively. Statistically, there were no gender differences between mean BMIs ($p < 0.72$). Mean and SD for WHR in females and males was 0.78 ± 0.06 and 0.83 ± 0.06 , respectively. Statistically there was a gender difference between mean WHR ($p < 0.0001$). 18.3% of students were underweight, 68.5% were in the normal weight range, 12.9% were overweight and 1.3% were obese. 39.5% of females and 3.1% of male students had central obesity.

Conclusions: Some of the female and male students were malnourished and a high percentage of female students had central obesity. This study suggests there is a need for nutritional programs and promotional life style modification programs.

Examining effectiveness of Ahmadreza Movahedi's metabolic theory and model for weight control

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Is it possible to establish a dietary program for weight loss or gain in which hypothalamus may not be stimulated in decline or increase Basal Metabolic Rate? The purpose of this study was to examine Ahmadreza Movahedi's metabolic theory and model for weight control. 18 healthy males and females (25 to 50 years old) were assigned to three groups. Group A experienced the Weight loss metabolic program, they decreased 10% of their normal daily calorie for three days (action phase) and returned to their normal daily calorie for one day (changing return phase) (We called this 3 and 1 day cycle). They observed it for twelve days and for the second twelve day period they decreased 15% of their normal daily calorie for the action phases and returned to their normal daily calorie minus 5% for the changing return phases. The decreases for the remaining twelve -day periods were 20%, 25%, 30%, for the action phases and 5%, 10%, 10%, for the changing return Phases alternatively. The program went on so that at the last nine twelve -day period the calorie decreased for action phases was 30% and for the changing return phases was 10%. Group B followed weight gain metabolic program just like the program for weight loss group except that they increased the percents instead of decrease. Group C was as control group. The total period for the experimental and control groups was 60 days. To analyze data T test was used. Results: Group A decreased their body weight from 86.5 kg to 79.3 kg that was significant. Group B gained 2.16kg that was significant. No significant change in body weight was seen in control group. Theory: It is possible to establish a proper diet program for regulating relationship among hypothalamus, Basal metabolism, routine metabolism and calorie consumption to modify body weight (i.e weight loss and weight gain). Model : By modifying the amount of calories consumption in each meal for a given period of time (i.e for three days: The action phase) and observing the previous dietary habit for a short period of time (i.e for one day: Changing return phase) with progressive changes in the calorie of action phase and return phase and follow the cycle for a long period of time (i.e for one or two months), it is possible to regulate human metabolic rate properly so that one may lose his/her excess weight (or gain weight) without any side effect. The amount of calories that is to be modified and the periods in each cycle, may be varied according to one's individual differences .The next step is to establish a new dietary habit for the reference part of the cycle.

ICCN Poster Presentations

Obesity

Food intake and physical activity patterns of obese children in primary schools in Kuching, Sarawak, Malaysia

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The purpose of this study is to determine the food intake patterns and physical activities among Chinese obese children in primary schools in Kuching, Sarawak, Malaysia. In this study, 60 obese school children were selected, 36 of them were males and 24 were females. The ages of the students were between 10 and 11 years old. This study was a cross-sectional study. All of the respondents were measured anthropometrically (height and weight) and were interviewed using a questionnaire, which included questions on socio economic status, 24-hour dietary recall (3 days), food frequency patterns (FFQ), and their daily physical activities. Data were analyzed using the SPSS computer software version 10.0. The results of this study showed that the respondents' heights ranged between 150cm to 159.9cm while their weights ranged between 60kg and 69.9kg. Their mean Body Mass Index was $27.5 + 3.2\text{kg/m}^2$. Majority (83.3%) of the respondents came from families with the family size of 5 to 8 persons, with the number of siblings of 3-4 persons. Most of the respondents' fathers were working in the private sectors while their mothers were mostly housewives. The majority of the subjects came from middle-income families with an average monthly income of RM2,500. From this study, the daily calorie intake of the subjects were found to be very low (mean of $1299.17 + 385.84$) while their energy expenditure was high (mean of $1855.11 + 267.6$). Thus a mean negative energy balance (-572.22) was obtained. However, from other dietary data, the general nutrient intakes of the subjects were found to be unsatisfactory. Food habits like skipping meals, late night supper, eating snacks while watching TV are practiced by many respondents. The Pearson Correlation Tests showed significant relationships between socioeconomic status with BMI ($P < 0.05$) and total energy expenditure with BMI ($P < 0.05$). In conclusion, these obese children who came mainly from middle-income families, are quite active physically. However their overall intake pattern are unsatisfactory and this contribute to their overweight problems.

A randomised controlled trial of 4 different commercial weight loss programmes in the UK in obese adults: body composition changes over 6 months

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The growing rise in obesity and the search for solutions has led to an increase in the number of commercial weight loss programmes with differing approaches. However there is limited information available by which their efficacy has been compared in controlled studies. The 4 diets tested in this study were chosen to represent different approaches. These were the Slim-Fast Plan (a meal replacement approach), WeightWatchers Pure Points Programme (an energy controlled diet with weekly group meetings), Dr Atkins' New Diet Revolution (a self-monitored low carbohydrate eating plan) and Rosemary Conley's "Eat Yourself Slim" Diet & Fitness Plan (a low fat diet and a weekly group exercise class). The primary outcome measure was percentage of fat loss over 24 weeks, measured using dual energy x-ray absorptiometry. A total of 293 healthy people entered the randomisation process: 79 (27%) men and 214 (73%) women with an average body mass index of 31.7 kg/m^2 (range 27-38) and average age of 40.3 years. The results indicated that all the diets tested were effective and did produce significant weight and body fat loss compared to controls. On average men lost 9.12 kg (23% of initial body fat) and women 5.2 kg (16% of initial body fat). However, there was considerable variation in body fat loss within each diet group. This led to the average differences between the diets being quite small and not significant. No attempt was made to standardise energy intake across the groups and therefore the effects seen are due to the subjects own interpretation and compliance with the diet plan they were given. This study demonstrates that loss of body fat is possible using a variety of commercially available strategies, including the Atkins diet. However, the range of fat loss demonstrates that some subjects actually lost very little fat and some a great deal. This indicates that not every approach will suit everyone equally. If commercial weight loss programmes are to be used effectively more information is needed to direct individuals to the best strategy to suit their needs.

ICCN Poster Presentations

Obesity

Development of a life-size photo guide to food serves

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Background: Under reporting or misreporting of food and beverage consumption is a common problem in determining dietary intakes. This problem is compounded when an individual client's concept of serve and portion size differs from that used by health professionals. Methods for determining serve sizes include plastic food models, food packaging, artwork and measuring vessels, but the range of foods depicted is often small and these visual prompts are not usually given to the client to take home. The need for a comprehensive, portable guide to food and beverage serves was identified.

Project extent and design: A literature search failed to identify any Australian photographic guides to food serves. In clinical practice, a comprehensive guide is required. More than 350 foods and beverages were selected to represent unbranded, popular items from six food core groups. A target energy value for one serve was assigned to each food group. Using XYRIS dietary analysis software and manufacturers data, target weights for each item were determined to match the target kJ values. Items were selected or prepared to match the target weight. Items were photographed with a 3.3 mega pixel digital camera and vernier measures recorded. Using Photoshop V6, images were 'cleaned' and life-size draft prints were checked to confirm that the image was a true life-size representation.

Outcome: The images' value as an aid in explaining energy equivalents and serve sizes was tested with adults and children in a private dietetic practice during a 2-year trial period. Symbols to highlight undesirable, high saturated fat items were added. In response to client requests for take-home copies of the images, a full colour 185-page guide with more than 300 life-size photos representing 345 foods and beverages with an index of nutrient composition was published. The publication is a portable nutrition communication aid with application in obesity management, cardiovascular disease, diabetes and general nutrition. Further evaluation with low literacy groups and those from non-English speaking backgrounds is planned.

Reduction of the postprandial glucose and insulin response in serum of healthy subjects by an arabinoxylan concentrate isolated from wheat starch plant process water

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Background: During wheat starch processing soluble constituents of flour such as proteins, pentosans, and minerals are dissolved in the process water and usually used for animal feeding. However, the pentosan fraction mainly consisting of arabinoxylans may be useful in human nutrition to lower the glycemic index of cereal products. Therefore, a new process for concentrating and purifying the pentosans has been developed. The resulting soluble dietary fiber concentrate has been studied for its ability to reduce the postprandial glucose and insulin response in healthy volunteers.

Methods: After enzymatic, fermentative, mechanical treatment, cross flow ultrafiltration and spray-drying a product containing 60 % of arabinoxylan-enriched dietary fiber was obtained from wheat starch plant process water. The metabolic effect of the concentrate was investigated in two double-blind controlled studies with 11 (study 1) and 15 (study 2) healthy volunteers, respectively. At two mornings within a week each subject consumed isocaloric test meals (365 kcal) in a randomised order, one of them containing 6 grams of the arabinoxylan concentrate delivered via rolls. For measuring serum glucose and insulin blood samples were collected over the subsequent two hours.

Results: The postprandial glucose response expressed as incremental area under curve was reduced by the arabinoxylan concentrate, in study 1 significantly (by 24 %, $P < 0.05$), in study 2 in tendency ($P = 0.051$). The postprandial insulin response showed significant reductions in both studies (by 9 % and 20%, $P < 0.05$).

Conclusion: A spray-dried arabinoxylan concentrate administered via rolls in a breakfast is a soluble dietary fiber effective to lower the postprandial blood glucose and insulin response.

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Clinical nutrition: diagnosis and management

Surveying the absorption level of complexes ethyl and methyl –3-hydroxy-pyran 4- on and its comparison with zinc sulphate available from market, by using the invitro method.

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Zinc deficiency may lead to many symptoms on human body. Zinc sulphate has been used against diseases caused by zinc deficiency for many years. That is why various studies have been done to produce more appropriate compounds of which the complexes malthol and ethylmalthol are the best examples. These compounds produce new complexes with zinc, which have suitable lipophilicity. So they seem to have suitable intestinal absorption and to be appropriate replacement for zinc sulphate. Our purpose in this project is to investigate the intestinal absorption of this type of complexes to evaluate the substitutability of these complexes with zinc sulphate, considering In vitro conditions. Solutions with concentration between 0 and 1000 microgram/litre were prepared by using complexes and zinc sulphate. The intestinal absorption at the different times were measured at constant concentration by using E.G.S method, and the optimum time of maximum absorption was obtained. Then solutions with the different concentration were prepared to obtain the optimum concentration. This study showed that in spite of higher absorption level of zinc sulphate compared to ethylmalthol-Zn, statistically there is no significant difference in zinc sulphate compare to malthol-Zn complex for the two compounds complex malthol. Consequently from the two complexes only complex ethylmalthol-Zn is comparable with zinc sulphate, which leads us to conclude that probably more lipophilicity of complex Ethylmalthol-Zn compared to complex Malthol-Zn caused its higher level of absorption.

ICCN Poster Presentations

Clinical nutrition: diagnosis and management

Efficacy of calcium supplementation and weight-bearing exercise in reducing rate of bone loss in postmenopausal Chinese women – a two-year randomized controlled trial

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Calcium intake and physical activity are recognized as two modifiable determinants of bone mineral density (BMD). The objective of this randomized controlled trial was to evaluate the efficacy of calcium supplementation and weight-bearing exercise in reducing rate of bone loss in postmenopausal Chinese women who were not on hormone replacement therapy. We randomly assigned 205 postmenopausal Chinese women (mean age, 59 ± 3 years) to control (n=100), calcium (1200 mg calcium carbonate, n=70) or calcium-exercise group (4 hours of brisk walking per week in addition to 1200 mg calcium carbonate) for 24 months. BMD was the main outcome and was measured at baseline and subsequently every six months for two years using dual-energy X-ray absorptionmetry (DEXA). The one-way within subjects ANOVA analysis indicated the control group experienced significant bone loss at all the skeletal sites (p<0.05). There was no significant bone loss for either the calcium or calcium-exercise group. Using ANOVA repeated measures, the percentage of bone loss in the control group was significantly higher when compared to the calcium or calcium-exercise group, at the total body (control -0.77%, calcium -0.14%, calcium-exercise +0.37%; p<0.05), lumbar spine L2-L4 (control -0.74%, calcium 0.34%, calcium-exercise +0.69%; p<0.05), femoral neck (control -1.24%, calcium +0.90%, calcium-exercise +2.62%; p<0.05) and total hip (control -2.21%, calcium -0.26%, calcium-exercise +2.24%; p<0.05). The mean percentage change in BMD in the calcium-exercise group was significantly different from the calcium group at the femoral neck and total hip but not at the total body or lumbar spine L2-L4. The average daily duration of exercise was positively correlated with the changes in BMD at the femoral neck (r=0.83, p<0.001). In conclusion, adequate calcium intake and regular moderate exercise were effective in reducing rate of bone loss in postmenopausal women. A follow-up study should however be formulated to delineate whether the positive effect observed in the calcium and calcium-exercise group persists in a longer duration of study.

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Clinical nutrition: diagnosis and management

Body composition assessed by impedance changes very early with declining renal graft function

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Background: Kidney transplant (Tx) restores renal filtration, but it does not achieve the function of two native kidneys, and with time it may slowly involute back to chronic renal failure. We hypothesised that the study of body composition by bioelectrical impedance analysis (BIA) might highlight differences for body compartments among Tx with good, borderline and bad filtration rates.

Methods: Thirty Tx patients (19 males, 11 females) were studied at 62.4 ± 26.6 months post-surgery and divided into three groups depending on creatinine clearance (crCl): good (crCl > 65.0), borderline ($35.0 < \text{crCl} < 65.0$) and bad (crCl < 35.0). BIA was assessed three times in a year, and the hemodialysis (HD) group (n = 11) was evaluated both pre- and post-HD session. Total body water, extracellular water (ECW), intracellular water (ICW), Na:Ke exchange rate (Na:Ke) and phase angle were studied. A healthy group (n = 11) was studied too.

Results: BIA showed no differences between healthy controls and good Tx while both borderline and bad Tx presented a significantly higher ECW and Na:Ke and lower ICW than either good Tx or normal controls. Also, borderline and bad Tx was not different from pre-HD session.

Conclusions: A good graft kidney manages to restore and maintain normal body composition, overcoming potential CsA and corticosteroids side-effects. On the contrary, even at mild renal dysfunction level, a change in body compartments is already observed, which approaches the composition of chronic renal failure patients with further graft filtration deterioration.

Nutritional status and body composition evolution in early post-renal transplantation - is there a female advantage?

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Background: Chronic renal failure is associated with metabolic derangements, affecting protein, amino acids and lipids, and usually, these patients follow a restricted diet. Kidney transplant (Tx) patients enjoy a recovery of renal function, but their therapeutics may entail significant changes on general metabolism. We present the anthropometrics results during the first three months after successful Tx, for males and females, and we compared them with a healthy group.

Methods: Eighteen patients (11 males and 7 females) were studied. Anthropometry was assessed before Tx, at month 1 and at month 3 post-Tx. Body weight (Wt), body mass index (BMI), triceps (TSF), biceps (BSF), subscapular (SCSF) and suprailiac skinfolds (SISF), midarm circumference (MAC), midarm muscle circumference (MAMC), corrected arm muscle area (CT.AMA), total body muscle mass (MM), body density (D), fat-mass (FM) and fat-free mass (FFM) were studied. The healthy group was evaluated three times in a year interval.

Results: Pre-Tx, males presented lower Wt, BMI, TSF, BSF, SCSF, SISF, MAC, MAMC, CT.AMA, MM, FM and FFM than controls while females displayed no differences. By the third month, males showed only a partial recovery and females displayed higher TSF and SCSF than controls.

Conclusions: Uremic males before Tx displayed undernutrition indexes. During the first three months post-Tx males showed an incomplete recovery of anthropometric parameters. Quite differently, females started at pre-Tx close to normal, but they significantly increased body weight and fat content. We suggest that nutritional requirements post-kidney grafting may be significantly different in males as compared to females.

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Clinical nutrition: diagnosis and management

Sequential body composition analysis by impedance early post-kidney transplantation.

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Background: Phase angle studied by bioelectrical impedance analysis (BIA) correlates with morbidity and mortality among hemodialysis (HD) patients, and intracellular water (ICW) volume is a reliable surrogate of protein metabolism. While chronic renal failure patients present a significantly disturbed body water composition, no studies have been done on its behaviour following kidney grafting. We report the changes associated with a successful kidney transplant (Tx) on body composition evaluated by BIA, during first months post-surgery.

Methods: Twelve Tx patients (7 males, 5 females) were studied. Each patient received triple-drug immuno-suppressive therapy. BIA was assessed before Tx, at month 1 post-Tx and at month 3 post-Tx. Total body water (TBW), extracellular water (ECW), intracellular water (ICW), Na:K exchange rate (Nae:Ke) and phase angle (PA) were studied. An healthy group and a HD group were evaluated three times in a year interval, and HD group was evaluated both before and after a dialysis session.

Results: When we compared body composition before Tx with month 1 post-Tx, TBW, ECW and Nae:Ke increased, while ICW and PA decreased significantly. When we compared month 1 with month 3 post-Tx, we observed that ECW decreased, while ICW and PA increased. On comparing month 1 post-Tx with the healthy group, Nae:Ke was greater and PA was lower at month 1; at month 3, only TBW was greater among Tx patients.

Conclusions: Our study shows that following successful grafting, kidney transplant recipients reach a new body water composition equilibrium, which is rapidly attained during the first period post-surgery. More importantly, BIA showed that the different body water compartments of kidney transplant recipients quickly match the constitution of normal individuals, overcoming both potential drug therapy side-effects and a suboptimal glomerular filtration as compared to two-kidney healthy controls.

Determination of 25-hydroxyvitamin D by competitive protein-binding assay and ¹²⁵I-based radioimmunoassay method: a validation study

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Vitamin D is an essential component in the regulation of calcium and bone metabolism. Vitamin D status can be assessed by measuring the serum concentration of 25-hydroxyvitamin D [25(OH) D]. This can act as a clinical indicator of vitamin D deficiency and bone health status. The aims of this study were: (1) to establish the coefficients of variation (CVs) of different 25 (OH) D assay procedures of animal and human sera, (2) to determine whether purification of serum extracts improved accuracy in a competitive protein-binding assay (CPBA) and a commercially available ¹²⁵I-based radioimmunoassay (RIA) kit for the assay of 25(OH) D and (3) to compare these two different assays techniques. Intra- and inter-assays CVs of 25(OH) D, for low, medium and high values of standard serum samples for CPBA ranged from 9.9 to 12.8%, compared to 3.8% to 8.1% for RIA. There was a highly significant difference between purified and non-purified extracts in the CPBA, whereas no significant difference was found in the RIA in assaying various human and animal sera. Mean (and SD) concentrations of 25(OH)D_{CPBA} and 25(OH)D_{RIA} were 39.72 (SD 19.78)nmol/L and 51.85 (SD 21.10)nmol/L respectively. Comparison between the two methods by the Bland-Altman approach (n=120) showed that the estimate of 25(OH) D level measured by RIA was 12.13nmol/L higher than by CPBA, with the 95% limits of agreement for paired observations by the two methods ranging from -16.91 to 41.17nmol/L. In general, the mean serum 25(OH) D level measured by RIA was significantly higher by an average of 37% (95% CI: 29% to 46%) than that measured by CPBA (paired *t*=9.75; *P*<0.0001). In summary, a purification step in CPBA is considered as essential to assess the circulating 25(OH) D. Our results show that using the two different methods produce greatly differing estimates of the 25(OH) D levels, so careful cross-calibration needs to be performed when comparing vitamin D status in studies using different assay techniques.

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Clinical nutrition: diagnosis and management

Dietary intakes and plasma antioxidant vitamins levels in Korean elderly with diabetes

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This study was done to compare the antioxidant status between Korean diabetes and healthy control elderly by determining dietary intakes of antioxidant vitamins, their plasma levels and total antioxidant status(TAS). Diabetic subjects were 122 elderly persons over 60 years, visiting public health center, and control subjects were 96 healthy elderly persons living in Ulsan metropolitan city of Korea. Subjects were matched by age, gender, smoking and drinking status. The subjects were interviewed to collect data on disease history, vitamin supplement use, diet therapy and health-related behaviors by means of questionnaires. Their dietary intakes were assessed by semi-quantitative food frequency questionnaires (SFFQ) and nutrient intakes were analyzed by FFQ computer program. Plasma vitamin C level was determined by spectrophotometric method while other antioxidant vitamins were determined by HPLC. Plasma biochemical indices were measured by automatic blood analyzer. Plasma TAS level measured with a Randox kit using the trolox equivalent antioxidant capacity method. Fasting plasma glucose and HbA1c levels were significantly higher in diabetes than in control subjects. Plasma total cholesterol level of diabetes was not significantly different from that of control subjects, however plasma HDL cholesterol level of diabetes was significantly lower than that of control group. The average vitamin A and β -carotene intakes of diabetes were significantly higher than those of control subjects. There was no significant difference in plasma vitamin C, β -carotene, TBARS levels between two groups, but plasma vitamin A, E and TAS levels were significantly higher in diabetes than in control group. However, when diabetic subjects were divided sub-groups according to the status of using diet therapy and vitamin supplement, there were no significant differences of energy-adjusted vitamins intakes and plasma vitamins levels between in diabetic subjects without diet therapy or vitamin supplement and in controls. Overall results might indicate that Korean diabetic patients had better antioxidant status compared to control subjects since they had higher interest on healthy eating for their health or prevention of diabetic complications and thereby consumed more antioxidant nutrients.

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Vitamin D deficiency in burned children: causes and consequences

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Children who sustain burn injury of at least 40% total body surface area are at risk to develop vitamin D deficiency. These children do not receive routine vitamin D supplementation on hospital discharge and by 14 months post-burn median serum level of 25-hydroxyvitamin D was 31 nmol/L, range 0-75, lower limit of normal 37 nmol/L (n=12). These levels remained low at 2 years post-burn (n=12, median 20 nmol/L, range 7-45) and at 7 years post-burn (n=11, median 25 nmol/L, range 12-37). Serum 1,25-dihydroxyvitamin D levels fell by 7 years post-burn and were below normal in half of the patients. Thus the vitamin D deficiency appears progressive. One cause of vitamin D deficiency is the failure of skin of burned patients to produce sufficient vitamin D to sustain normal levels of 25-hydroxyvitamin D in response to ultraviolet light. Thus burn scar is deficient in vitamin D precursor 7-dehydrocholesterol, having a mean of 774 ± 622 (SD) ng/cm² of skin compared to 1821 ± 970 ng/cm² in control subjects (p<0.016). While normal controls convert $25 \pm 10\%$ of 7-dehydrocholesterol to pre-vitamin D₃, both burn scar and adjacent normal-appearing skin convert only about 5% of 7-dehydrocholesterol to pre-vitamin D₃ (p< 0.004). Thus the failure to provide vitamin D supplements to burn patients following discharge puts them at risk for vitamin D deficiency. Furthermore, there is an inverse relationship between serum levels of 25-hydroxyvitamin D and lumbar spine bone mineral density Z-scores, as determined by dual energy x-ray absorptiometry using pediatric software, r=0.53, p<0.05, in 11 subjects seven years post-burn. Therefore, burned children should be followed prospectively for vitamin D deficiency and supplementation of 400 international units per day should be prescribed on discharge. Follow-up studies will be necessary to determine whether this amount of supplementation is sufficient to maintain normal serum levels of 25-hydroxyvitamin D.

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Clinical nutrition: diagnosis and management

Altered amino acid profiles in patients with CVA (cerebrovascular accident) undergoing enteral nutrition enriched with taurine

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Background: Low levels of plasma taurine in patients undergoing enteral nutrition have been reported. However very little is known for the role of taurine on the plasma amino acid levels in patients undergoing enteral nutrition (EN).

Objective: This study aims to assess the effects of taurine supplementation on the levels of amino acid in patients undergoing enteral nutrition.

Design: Eighteen patients with CVA were selected, then they were randomly assigned to either taurine supplemented group or control group. Taurine supplemented group composed of ten patients, was fed enteral nutrition formula with 1g/day of taurine for four weeks. The estimation of anthropometric and biochemical data, plasma and urinary amino acid concentrations, atherogenic index, and dietary intake was performed.

Results: Taurine supplementation significantly decreased plasma amino acid concentration of methionine, tyrosine, phenylalanine, γ -aminobutyric acid, while increased plasma hydroxyproline in patients with CVA. Free urinary amino acids excretion of 3-methylhistidine, phenylalanine, isoleucine, alanine, γ -aminobutyric acid, valine were decreased in patients with CVA after taurine supplementation.

Conclusions: These data suggest that taurine supplementation has important effects in catabolic patients with CVA, and more research is required to explain the apparent benefits of dietary taurine.

Calcium, magnesium and total protein level in the serum of healthy individuals in the Western Province of Saudi Arabia.

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The level of calcium, magnesium and total protein were estimated in the serum of randomly selected healthy Saudi individuals living in the Western province of Saudi Arabia of different ages and sexes as part of total project to evaluate the standard biochemical parameters to serve as a national standard. A total of 276 healthy individuals were used in this study. Measurements of calcium, magnesium and total protein were carried out using Kodak Ektachem 500 Analyzer. The mean concentration of calcium was found to be 9.82 mg/dl which is higher than the international established standard 4.4 mg/dl, magnesium was 2.04 mg/dl compared to 2.4 mg/dl, whereas total protein concentration was 7.78 g/dl compared to 6.9 g/dl. It seems that there are some deviation in the parameters studied compared to the International value.

ICCN Poster Presentations

Clinical nutrition: diagnosis and management

The relationship between maternal anthropometric measurement and birth weight

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Introduction: Birth weight is believed to be directly related to maternal nutritional status. In developing countries, monitoring gestational weight gain involves considerable difficulties due to poor health services. Moreover, there is lack of information about pre-pregnancy. Weight under these circumstances, screening with measurement that require only one contact with the mother, such as weight for height and mid upper arm circumference, can be a very helpful and efficient means of assessing maternal nutritional status. The purpose of the present study is to examine the relationship between maternal W.F.H and M.U.A.C with birth weight.

Material and methods: A sample of 226 healthy pregnant mothers was selected. Weight, height, MUAC and other anthropometric measurements were taken before delivery. Infant birth weights were taken before delivery. Weights for height of mothers were calculated by using Haick's formula.

Results: The results indicate that there is a strong relationship between birth weight and maternal WFH ($P < 0.007$) and also between MUAC and birth weight ($P < 0.0003$). Mothers who attained 120% of IBW at term delivered baby's with higher birth weight ($P < 0.0001$). Mothers with MUAC lower than 23.2cm delivered baby's with lower birth weight ($P < 0.002$).

Conclusion: The forgoing results confirm the usefulness of WFH and MUAC as an indicators of maternal nutritional status and predictors of birth weight. We also conclude that nutritional intervention aiming at the attainment of 120% of WFH by pregnant mothers can significantly lower the risk of insufficient birth weight.

Prevalence of general and central obesity in diabetic patients referring to the diabetic clinic of Zahedan, Iran

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Aims: obesity is a growing public health problem worldwide. It is considered as the most important risk factor for type2 diabetes. Central obesity carries a particularly high risk. We sought to estimate the prevalence of overweight, obesity, and central obesity in type 2 diabetic patients referring to the diabetic clinic of zahedan.

Methodology and results: a random sample of 384 subjects (222 women, 162 men) was studied. Age, sex, family history of diabetes, and physical activity were obtained, height, weight, waist and hip circumferences were measured. Body mass index (bmi) was used as indicator of obesity, and the waist to hip ratio (whr) was used as an indicator of central obesity. The prevalence of overweight, obesity, and central obesity were 44.6 %, 36.5%, 100% (women) and 50.6%, 7.4%, 25.3% (men).

Conclusion: the prevalence of general and central obesity in subjects is high. Patients must be aware of risk of associated disease and encourage to adopt a healthy lifestyle. Treatment of obesity is an important therapeutic goal in the management of patients with type2 diabetes mellitus.

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Clinical nutrition: diagnosis and management

Lipid lowering effect of dietary fibre supplementation through food based approach

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Introduction: In developing countries like India, the incidence of cardio-vascular diseases is on a rise. Nutrition plays an important role in the genesis of coronary artery disease (CAD). Changing lifestyles have led to an increased intake of fast foods that are usually high in energy (total fat) and low in fibre. Role of dietary fibre in the management of CAD has been highlighted in many studies; however, data on the type and amount that may prove to be beneficial in the treatment of hypercholesterolemia, particularly in the Indian situations with the existing dietary habits, are scanty.

Objectives: To study the dietary behaviour of hypercholesterolemic patients and to assess the impact of dietary fibre supplementation on blood lipid levels.

Methodology: A sample comprising of 112 hypercholesterolemic subjects (both males/females) aged between 30 and 76 years were enrolled for the study from the Cardio-thoracic centre of AIIMS. They were randomly divided into 3 groups and given dietary fibre supplementation in the form of guar-gum (15g/day), Bengal gram flour (50g/day) and Soya flour (50g/day) for a period of 4-8 weeks. The patients were advised to continue with their usual diets and life-style practices during the period of the study. Their dietary intake, body mass index and blood lipids were assessed both before and after the dietary fibre supplementation.

Results and Discussion: The data indicated a reduction in the total cholesterol (mean ↓ 13%) and triglyceride (mean ↓ 16%) levels of the enrolled patients. The LDLc of the patients given guar-gum, soya flour and Bengal gram flour supplementation dropped by 18mg/dl, 15mg/dl and 8mg/dl respectively. Only the group on guar-gum supplementation registered an increase in HDLc by 6.0mg/dl. In all the groups, the hypocholesterolemic effect of dietary fibre was more pronounced among high-risk hypercholesterolemic than borderline cases.

Conclusion: Dietary fibre supplementation can help in bringing a favourable change in the lipid profile of hypercholesterolemic patients. However, as a long-term measure counselling of the hypercholesterolemic and the masses in general for inclusion of dietary fibre rich foods in their daily diets to bring about a behavioural change can help in curbing the present epidemic of CAD and the related complications.

Recommendations: Optimal amounts of dietary fibre rich food sources particularly whole grain cereals, husked pulses, fruits and vegetables (preferably with edible peels) should become a regular component of the daily diets in order to keep the degenerative diseases at bay.

Assessment of free L- carnitine levels in type II diabetic women with and without complications

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Considering the important role of carnitine in fatty acid and glucose metabolism, levels of blood lipids and free fatty acids are increased in patients with complications. Taking in to account the importance of the control of diabetes, in the present descriptive – analytical study, the levels of serum free L-carnitine, blood glucose and lipids were studied. Thirt-three diabetic women with complications (case group), and 18 diabetic women without complications (control group), of the same age group (30-65 years), which were selected by the simple sampling method, were assessed. Study results indicted that the mean serum free L-carnitine concentration in the case group, was significantly lower than its mean concentration level in the control group, 39.70 ± 1.72 vs. 53.42 ± 0.93 $\mu\text{mol/L}$, respectively ($PV < 0.001$). The mean serum free L-carnitine levels in the diabetic patients with complications, was lower than the diabetic patients with no complications. It could be supposed that this difference might be due to increased carnitine acylation, increased acyl-carnitine excretion, or its decreased renal reabsorption. This difference may be the result of rising in the carnitine requirement in diabetic patients, with diabetic complications. On the basis of the study results, carnitine supplementation in diabetic patients, especially in patients with diabetic complications, might be useful.

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Clinical nutrition: diagnosis and management

Zinc supplementation altered phospholipids' fatty acids pattern in young healthy women

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The aim: The evaluation of the influence of the zinc daily food ration (DFR) supplementation on fatty acid profile of plasma phospholipids.

Material and methods: The study covered a group of 40 women, mostly female students (average age 22.5 ± 0.8 years) from the Mid-West part of Poland. The study was carried out from 2001-2003. Students were supplemented with 25 mg of Zn⁺². The supplementation carried on for 50 days with daily dose 25mg Zn/day. Fatty acid methyl esters were analysed by the gas chromatography (Hewlett Packard - 6890 Series) with flame-ionisation detection method, after being separated by the high precision thin layer chromatography. U Manna-Whitney'a test was used to confirm statistically significant differences at $p=0.05$. Consent for the study was obtained from the Ethical Committee, Medical Academy, Poznan, Poland.

Results: A dominant group of fatty acids in plasma phospholipids were saturated fatty acids, which composed about 50% of the sum of all fatty acids (range from 53.4% to 58.0%). Polyunsaturated fatty acids occurred in the range from 24.9% to 28.1% (half amount of the saturated acids), whereas the monounsaturated fatty acids content presented one third of fatty acids content (range from 16.4% to 17.9%). The statistically significant changes of the % content were observed: decrease of the amount of saturated fatty acids - (57.3 ± 3.36 vs 55.1 ± 3.29 ; $p=0.0017$) and increases - of the polyunsaturated fatty acids (25.2 ± 2.94 vs 27.1 ± 3.17 ; $p=0.0034$), of the alpha-linoleic acid (0.34 ± 0.06 vs 0.40 ± 0.06 ; $p=0.0019$) and of the arachidonic acid (3.92 ± 0.71 vs 4.82 ± 1.09 ; $p=0.0001$).

Conclusions: The zinc supplementation of daily food rations of women may influence on the change of fatty acid profiles in blood plasma phospholipids, among others LCPUFA.

Nutritional preferences of opiate addicted patients during the methadone maintenance treatment

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Background: The literature data as well as clinical observation of addicted persons indicate the preference of sweet products consumption. Some authors suppose that the sweet taste preference may be a marker of increased risk of opiate and alcohol dependence development. The aim of this study was to estimate the frequency of fat and sweet food consumption that stimulates the Brain Reward System (BRS) in 48 participants of methadone programme. The main goal of this programme was not only to improve the physical and mental health of opiate dependent persons, but to limit their improper nutritional habits as well.

Material and methods: The study included 36 men aged 20-46 year and 12 women aged 21-33 year. The opiate (morphine, heroine) dependence duration ranged from 3 to 24 years. The evaluation of the diet and the assessment of nutritional status were performed three times: 1st examination -before treatment, 2nd examination -after 2 months and 3rd -after 9 months of methadone maintenance treatment. Food consumption quality was estimated with the use of the Questionnaire of Frequency Intake Food Products. The statistical calculations were performed by using STATISTICA v. 6.0 program with the application of factor and cluster analysis. Three clusters were created. They included food products consumed: A- occasionally, B-rarely, C-often.

Results: The examined opiate abusers preferred sweet taste. The frequency of sweet products consumption was the highest in the early stage of methadone programme. In the first examination most of sweet products were found in cluster A, whereas in the third examination in cluster C. The analysis of 24-hour recall showed that mono- and disaccharides always provided much more that recommended 10% of energy (20% in the first and 15% in the third examination).

Conclusions: The opiate abusers intuitively chose the products that stimulate BRS. The diminished frequency of disordered nutrition habits and behaviour was observed during 9 months' methadone maintenance treatment programme conducted in opiate dependent patients at Medical College Jagiellonian University in Krakow, Poland.

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Clinical nutrition: diagnosis and management

The study of food habits and its correlation with serum lipids profile in NIDDM patients at two hospitals of Tabriz

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Background: Diabetes mellitus is a disease characterized by high glucose level resulting from defects in insulin secretion, insulin action, or both. Prevalence of diabetes increases with increasing age and its prevalence in adults is slightly higher in women than in men. Diabetes mellitus is one of the most important risk factors for coronary heart disease.

Objectives: The present study was conducted to determine food habits and their correlation with serum lipid profiles in diabetics patients (TypeII) at Sina and Asadabadi Hospitals affiliated to Tabriz Medical Science University-Iran.

Method: 118diabetic patients (89 women and 29 men) aged 52 ± 10 years old were selected by simple random sampling at two Hospital of Tabriz. Food patterns were estimated by using of 24 hour recall for three consecutive days and daily nutrient intake was calculated by using food composition software. Daily energy and nutrient intakes were compared with RDA. We determined their correlation with serum lipids profile by using correlation test.

Result: Mean \pm SE of energy (Kcal), carbohydrate (gr), protein (gr), fat (gr), fibre (gr), cholesterol (mg), saturated fatty acid (gr), monounsaturated fatty acid (gr), and polyunsaturated fatty acid (gr) were 95.68 ± 2.68 , 103.27 ± 2.55 , 115.95 ± 3.42 , 73.43 ± 2.60 , 80.03 ± 3.55 , 67.26 ± 5.30 , 58.72 ± 2.21 , 56.61 ± 4.14 and 47.57 ± 3 respectively. Mean \pm S.E of fasting blood sugar (mg/dl), 2 hours plasma glucose level (mg/dl) cholesterol (mg/dl), triglyceride (mg/dl) and high density lipoproteins (mg/dl) were 178.47 ± 7.19 , 272.62 ± 8.58 , 229.66 ± 4.96 , 271.74 ± 20.33 and 49.16 ± 3.53 respectively. We found that daily energy, total fat, and cholesterol intake had direct correlation with serum lipids ($P < 0.05$). There were no other significant correlations between daily nutrient intakes with serum lipids.

Conclusion: Based on the results of present study, education about decreasing daily calorie and any kind of fat intake emphasized.

Resting metabolic rate in people taking atypical antipsychotic medication.

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Objectives: Weight gain is a significant clinical issue for people prescribed atypical antipsychotic medication. This is particularly true of those medications known to promote the greatest weight gain, namely olanzapine and clozapine. To date there have been no published guidelines to assist clinicians to choose appropriate resting metabolic rate (RMR) prediction equations to estimate energy expenditure. The objectives of this study were to measure RMR via indirect calorimetry in a group of men taking clozapine and to determine whether RMR for this population can be accurately predicted using previously published regression equations.

Methods: Eight males who had completed at least six months treatment with the atypical antipsychotic, clozapine participated in this study. Body composition was determined via the deuterium dilution method and RMR was measured using a ventilated hood system (Deltratrac II). Comparisons between measured RMR and predicted RMR using five different equations were undertaken. Bland and Altman plots were used to assess the agreement between measured and predicted RMR.

Results: Participants were all diagnosed with chronic paranoid schizophrenia and characterised as follows: age: 28.0 ± 6.7 years (mean \pm SD); clozapine dose: 456.3 ± 142.5 mg/day; waist circumference: 108.1 ± 19.3 cm; BMI: 29.8 ± 6.8 kg.m²; %BF: 30.0 ± 9.5 . The mean measured RMR for the group was 1825 ± 408 kcal/day. The Harris and Benedict (1919) and Schofield (1985) equations systematically overestimated RMR by 16%. Bland and Altman plots showed that the equations of Owen (1987) and Jensen (1988) over predict RMR at the lowest RMR value (1266kcal/day) by 15% and 32% respectively. However, at the highest RMR value (2287kcal/day), the equations of Owen (1987) and Jensen (1988) over predicted RMR by only 9% and 3% respectively. Estimations of RMR using the equation of Movahedi (1999) were too variable for clinical use.

Conclusions: The difficulty in recruiting participants to this project demonstrates the importance of having confidence in a chosen prediction equation to estimate RMR. It is not feasible to routinely test RMR to determine energy expenditure for assistance with weight management. When estimating energy requirements as part of a weight management program in men who have been taking clozapine, predictions of RMR from the equations of Harris and Benedict (1919) and Schofield (1985) should to be reduced by 280 kcal/day.

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Clinical nutrition: diagnosis and management

Effect of half replacement of breakfast's bread with a low glycemic index food on blood glucose response in type 2 diabetic subjects

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Low glycemic index foods have beneficial effects on glycemic response in type 2 diabetic subjects. However, there is no consensus about the effect of these foods while consumed with other type of foods. In this study we examined the effect of half replacement of bread in mixed meal with apple on glycemic response in patients with type 2 diabetes. This clinical trial consisted of 16 diabetic subjects aged 42-60 years with fasting blood glucose ranging from 126 to 180 mg/dl. Mean duration of diabetes was 4.6 ± 5.1 years on average. Subjects received the experimental breakfast on 2 occasions with one week interval. On the first day of the study subjects had their regular breakfast. Type and amount of the food items in their breakfast were recorded then. The next week patients had a breakfast in which half of their regular breakfast bread was replaced with the same unit of apple. Venous blood samples were collected before (after 12 hours fasting), 60, 120 and 180 minutes after consumption of the breakfasts. Plasma glucose was measured using enzymatic method (glucose oxidase) and incremental area under the 3 hours glycemic response curve was calculated. The data were statistically analysed by paired t-test. Regular breakfast items of our study subjects included tea, bread, cheese, tomato and cucumber, which provided 279 ± 39.5 kcal energy on average. Mean carbohydrate, protein and fat intakes were 41.4 ± 8.2 gr, 17.2 ± 1.6 gr and 5 ± 0 gr respectively. With the breakfast containing apple the incremental area under glycemic response curve showed significant reduction in comparison with regular breakfast ($p < 0.02$). Peak glucose level was also significantly lower with the breakfast containing apple ($p < 0.01$) than with the regular breakfast. It seems that half replacement of bread with the same unit of apple in breakfast can reduce glucose response in type 2 diabetic subjects.

Prevalence of anaemia among pregnant and lactating women in India, 1950 – 2002

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Objectives: The compendium prepared by the authors is an attempt to compile the information on prevalence of anaemia among pregnant and lactating women, dietary intake of iron, analysis of trends and regional variations as well as identification of gaps in knowledge and potential areas for further research.

Methods: Information about prevalence of anaemia and dietary intake of iron from 1950 to 2002 has been collected from major studies carried out in last five decades as well as individual research papers published in various national and international journals. Information collected were analyzed (percentages) for regional level, state level and district level. Appropriate weights have been used for estimating the prevalence at regional levels as well as analysis of trend over the last 50 years.

Results: Approximately 165 research papers were published on prevalence of anaemia among pregnant and lactating women and around 70 research papers on dietary intake of iron by them in last five decades. Some major task force studies were also carried out on the subject. The overall prevalence of anaemia among pregnant and lactating women is around 85%. The highest prevalence of anaemia is in the eastern region (88%) of the country and the lowest in the southern region. The anaemia level was 81% during 1950-90 which slightly increased to 84% from 1991 onwards. For pregnant and lactating women the intake was 37 and 49% of RDA respectively.

Conclusion: The existing programme of Government of India for Prevention and Control of Nutrition Anaemia for pregnant women needs to be reviewed in the light of continued high prevalence of anaemia in the group.

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Clinical nutrition: diagnosis and management

Assessment of serum iron and iron deficiency anaemia in sample of pregnant woman at delivery in Iran

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Objective: Iron-deficiency anaemia (IDA) is a public health problem in the developing and even industrialized countries. Pregnant women and children under 5 years of age are among the high-risk populations. Our main objective in this study was to obtain the prevalence of anaemia and IDA at the end of pregnancy.

Design and Methods: We analyzed the blood of 378 pregnant mothers in the labor room in Hamadan (west of Iran) hospitals. Haemoglobin concentration (Hb), red blood cells count (RBC), serum iron (SI), total iron binding capacity (TIBC), transferin saturation, SI/TIBC \times 100, and serum ferritin and other haematological indexes were analyzed. Then a questionnaire for epidemiological data, level of education, etc was filled out through interview.

Results: The mean values of haematological indexes were as follows: Hb 13.35 \pm 1.36 g/dl; mean corpuscular hemoglobin concentration 32.38 \pm 1.45%; mean corpuscular volume 90.3 \pm 7.09 fl; mean corpuscular haemoglobin 29.36 \pm 2.78 pg; transferin saturation 20.4 \pm 9.5 % and serum ferritin 41.74 \pm 32.51 ng/ml. Four point eight per cent (18 out of 378) of the mothers were anemic at the time of the study according to low serum hemoglobin (Hb <11 g/dl); 12.2% (46 out of 378) of the subjects had low serum ferritin (SF <12 ng/ml); 11.4% (43 out of 378) were Iron-deficient and 2.4% (9 out of 378) of the mothers had iron deficiency anaemia .

Conclusions: The prevalence of IDA was 2.4%, which is not the same as the prevalence found in other areas of Iran and Asia. It was concluded that the prevention programs for Iron-deficiency anaemia in Hamedan have been successful for pregnant women.

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Food processing and human health

Consumer understanding and use of Nutrition Information Panels

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Providing adequate information on food labels to enable consumers can make an informed choice is one of the objectives of the *Australian New Zealand Food Standards Code*. In the recently revised Code several labelling changes have been introduced including mandatory nutrition information panels (NIPs). To assess the impact of these labelling changes, Food Standards Australia New Zealand (FSANZ) has conducted research on consumer attitudes towards and knowledge and use of food labels. NIPs were one of the most widely used label elements with over two thirds of consumers reporting their use, either most of the time or when buying a food for the first time. The majority indicated that NIPs were clear and easy to understand and they were sure they could trust the information. NIPs were mostly used when selecting breakfast cereals followed by dairy products, then fats, butters and spreads. The study demonstrated that most consumers did not have difficulties in reading and interpreting the nutrient information contained in NIPs on single products. However, when comparing two similar products using the NIPs, consumers generally did not consider the overall nutritional value of the foods, focussing on one nutrient only, primarily fat. Given the choice, many consumers opted for a product slightly lower in fat over one where the difference in another nutrient was greater in magnitude and significance. This suggests that consumers might have difficulties assessing the overall nutrient composition of a food and in judging the relative differences between nutrients. More consumers used the 'per serve' column than the 'per 100g' column when selecting the 'healthy choice' between two NIPs for similar products. Where the serve size was not the same, this may have led to unintended choices as the 'per 100g' column should be used for product comparison. The survey findings have indicated that for consumers to benefit from the labelling provisions contained in the Code, they need to be able to understand and interpret the food labelling information.

Fortification of Turkish traditional bread with vitamins-minerals and evaluation in vulnerable group diets

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Bread is one of the staple foods for Turkish people to provide daily recommended dietary allowances. An average 350-400 grams/day of bread is consumed and about 50% of daily energy is taken from bread. In low economic income groups, this ratio is about 60-70%. The adverse effects of vitamin and mineral deficiencies in individuals have been clearly shown by much national and local research. Vulnerable groups such as babies, growth-developing children and lactating expectant women are strongly affected from nutrient deficiencies. In this context, traditional bread is fortified and nutrified with vitamins-minerals according to recommended dietary allowances, dietary patterns, determined nutrient deficiencies of public, process losses and daily bread consumption levels of adults and 1-18 years of age individuals. In the study vitamins C, B1, B2, B6, B12, folic acid, niacin; minerals of iron, zinc, calcium is added to type 650-750 wheat flours by ultra micro capsules. The formulations were optimized according to the organoleptic properties. The chemical analyses were carried out for the final product and provided to adults and 1-18 years of age individuals for consumption. Vitamin and mineral levels were determined respectively by HPLC and atomic absorption spectrophotometry. Widespread consumption of nutrified bread it is expected to overcome the vitamin-mineral deficiencies related to unbalanced and insufficient nutrition in our country.

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Food processing and human health

The effect of light and temperature on stability of vitamin A in the fortified vegetable oils (hydrogenated and nonhydrogenated)

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One of the nutritional problems in developing countries is lack of some micronutrients, especially vitamin A, which causes 500000 children to die in developing countries annually. Besides, lack of vitamin A has led to skin diseases, xerophthalmia, anemia, etc in humans. One of the solutions to help solve this problem is the fortification of food products with vitamin A. This vitamin is fat-soluble, therefore in this research, sunflower liquid and hydrogenated blend oils were chosen as the carriers for vitamin A. During this study vitamin A-Palmitate (200IU/gr) was added to the samples and after packaging, the hydrogenated oils were stored at the ambient temperature (20-25 degree centigrade) or at 45. The liquid oil samples were stored at the above-mentioned temperatures both in darkness and exposed to light, for the period of 6 months. All fortified samples were examined bi-monthly for determination of stability of vitamin A and peroxide values, up to 6 months. Also all fortified samples were used for cooking (rice) and frying (potatoes) to determine the effects on these processes on stability of vitamin A. According to the results, the lowest stability of vitamin A was observed in liquid oil samples, which were exposed to light, and about 50 percent of vitamin A was lost after 6 months. On the other hand, the highest stability of vitamin A was observed within the hydrogenated oils, which were stored at the ambient temperatures, as about 95 percent of vitamin A was stable after 6 months. Cooking and frying processes caused vitamin A losses to 5 and 10 percent respectively. Also, the changes in peroxide values and stability of vitamin A were in opposite directions, i.e. by increasing of peroxide values in the fortified oil samples, vitamin A was decreased. These observations show the importance of original quality of oil for maintenance of stability of vitamin A. Considering the results obtained from this study, Fortification of the liquid and hydrogenated oils with vitamin A is recommended as a practical and efficient way of coping with vitamin A deficiencies in the diet. The fortified oils and fats must be packaged properly and stored away from light.

Cholesterol reduction of tallow by refining process and β -cyclodextrin treatment

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Lower consumption of saturated fat and cholesterol has been indicated to reduce serum cholesterol and risk of chronic diseases specially heart disease, hypertension, stroke and renal disease. Due to high contents of saturated fat and cholesterol in tallow, its consumption is limited. In this study we investigated the effects of the refining process and β -cyclodextrin (β -CD) treatment of tallow on the reduction of cholesterol and its other characteristics. Samples of tallow after rendering and filtration were subjected to refining process (neutralization, bleaching and deodorization). β -CD treatment was applied between bleaching and deodorization, according to the conditions reported by other researchers for lard (5% β -CD, 1:1 ratio of fat to water, stirring at 450 rpm at 30 C and centrifuging at 1000g for 15 min). After each process, acid value, peroxide value and cholesterol content were determined and the results were compared with the values before treatment. Fatty acid composition of tallow was also investigated before and after processing. It was found that, β -CD treatment alone can reduce cholesterol content to 81% whereas refining and β -CD treatment together reduce cholesterol content significantly by 90%, without any changes in the fatty acid composition ($p < 0.05$). It can be concluded that application of suitable technology will lead to products with better nutritional quality. Tallow processed in this way may be used directly or as a blend with other oils.

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Food processing and human health

Watermelon juice concentrate

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Production of watermelon is in great amount in Iran during summer time. Consumption of this fruit is recommended by health and nutrition authorities. Findings from USDA scientists indicate that watermelon contains high levels of lycopene - an antioxidant that may help the body fight against cancer and other chronic diseases. Thus it can be considered as a functional food – one that may help prevent certain diseases. However, production of this fruit in some parts of the country is in excess of its consumption, so large amounts are spoiled and wasted. Therefore, in this study we tried to process two kinds of watermelons and to formulate their juice and concentrate which preserves its flavor, appearance and nutrient contents. Seventy two Charleston Gray and local variety of Khorasan watermelon samples were analyzed. Water content of local watermelon and Charleston Gray were $55.9\% \pm 3.1$ and $58\% \pm 1.12$ respectively, rind $34.3\% \pm 0.7$ and $31.8\% \pm 1.56$ (N.S), seeds $4.8\% \pm 1.29$ and $2.3\% \pm 0.32$ ($P < 0.002$) and pulps were $4.9\% \pm 1/39$ and $7.9\% \pm 0.45$ ($P < 0.001$). Sixty different formulae from a mixture of watermelon juice and food additives (30 formulae of each variety) were prepared and their organoleptic characteristics underwent preliminary investigation by category scale. Three formulae from each variety were selected (A, B and C) and their organoleptic characteristics were evaluated. The suitable formula for each variety was nominated by test panel. The formula A of Charleston Gray variety including 100ml juice, 4g sugar and 0.1g citric acid with 68.3% acceptability and the formula B of local variety including 100ml juice, 5g sugar and 0.2 g citric acid with 30.4 % acceptability were selected as preferred samples. The selected formula of Charleston Gray variety was concentrated (up to Brix 54) and packed. Changes of chemical, microbial and organoleptic characteristics in different condition (room, refrigerator and freezer) during 0, 15, 30, 45, ... 90 days storage were determined. Ninety days storage in different temperatures did not cause notable changes of chemical, microbial and organoleptic characteristics.

Influence of cooking practice on antioxidant properties and phenolic content of selected vegetables

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Green leafy vegetables, fruits, legumes and vegetable oils are excellent sources of antioxidant components. In Asian countries, most of vegetables undergo cooking process rather than eaten raw. Cooking practices may affect the antioxidant content and properties in vegetables. Therefore, this study was carried out to determine the effect of cooking practice (blanching) on antioxidant properties (total antioxidant and free radical scavenging activities) and total phenolic content of selected cruciferous vegetables. The total antioxidant and free radical scavenging activities, and the total phenolic content of the fresh and blanched vegetables were determined using β -carotene bleaching, DPPH free radical scavenging and Folin-Ciocalteu methods, respectively. Red cabbage, Chinese cabbage, cabbage, mustard cabbage and Chinese white cabbage were used in this study. The results indicated that red cabbage and mustard cabbage had the highest total antioxidant activity, while Chinese white cabbage and red cabbage had the highest free radical scavenging activity. Red cabbage had the highest total phenolic content among all the tested fresh vegetables. The loss of total antioxidant activity was highest in Chinese cabbage (40%) after 15 min of blanching followed by red cabbage (28%), cabbage (27%), Chinese white cabbage (19%) and mustard cabbage (9%). Red cabbage had lost a total of 40% scavenging activity, followed by Chinese cabbage (38%), cabbage (36%), mustard cabbage (23%) and Chinese white cabbage (11%). Except for cabbage and mustard cabbage, this study revealed that 10 min blanching time had significant effect ($p < 0.05$) on the antioxidant properties and phenolic content of all vegetables studied. However, only Chinese cabbage showed an increase ($p < 0.05$) in total phenolic content after 15 min of blanching compared to other vegetables. In conclusion, minimal heat treatment through blanching process is recommended to prevent the major loss of antioxidant properties and phenolic content for selected cruciferous vegetables.

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Food processing and human health

Comparison of β -carotene, total phenolic, and antioxidant activity of jute mellow (*Corchorus olitorius L.*) leaf tea with green teas

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In recent years, the health benefits of foods have gained much attention. Natural antioxidants in foods, such as β -carotene and phenolic compounds, are among the most interesting bioactive compounds. The protective influence of diets rich in fruits and vegetables against certain diseases have been attributed partly to their antioxidant content. Jute mellow or moroheiya leaves are extensively consumed as a nutritive and health vegetable in several countries because of their abundant content of carotenoids, vitamins and minerals. The fresh leaves of jute mellow were found to exhibit high antioxidant activity. However, the antioxidants β -carotene and total phenolics are greatly influenced by processing, yet no investigation on the impact of processing conditions on β -carotene, total phenolic, and antioxidant activity of the jute mellow leaves has been conducted. Production of dried leaves and consumption as tea is a popular process. The purpose of this study was to investigate whether the three different processing conditions (toasted at 55°C for 2 hours, blanched and then roasted at 70°C 45 min, and roasted at 70°C 45 min) of making teas affects the amount of β -carotene, total phenolic, and antioxidant activity. The study also compared the amount of these compounds with those of Japanese and Chinese green teas. The antioxidant activities of the tea extracts were evaluated using α - α -diphenyl-1-picrylhydrazil (DPPH) radical scavenging activity and the β -carotene bleaching methods. The total phenolic compounds and β -carotene levels were determined using the Folin-Ciocateu and spectroscopic methods, respectively. The results indicated that tea processing conditions significantly reduced the antioxidant capacity of jute mellow leaf tea extracts and β -carotene content of jute mellow leaf tea compared with fresh jute mellow leaves, whereas no effect on the level of phenolics. The β -carotene and total phenolic content of all jute mellow leaf tea were between 4200 ± 492 to $5200 \pm 212 \mu\text{g}/100\text{g}$ and 396.70 ± 2.05 to $475 \pm 4.81\text{mg}/100\text{g}$, respectively. All jute mellow leaf tea extracts exhibited 74.89 ± 1.20 to $80 \pm 1.23\%$ inhibition on β -carotene bleaching and 69.73 ± 2.16 to $75.38 \pm 0.06\%$ on DPPH radical scavenging activity, significantly lower than those of Japanese and Chinese green tea extracts (92.43 ± 0.13 and $88.79 \pm 0.43\%$, respectively).

The effects of uncooked powdered food on nutrient intake, body fat and serum lipid compositions in hyperlipidemic patients

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This study was designed to investigate the effects of weight reduction and changes in serum lipid composition using a commercial uncooked powdered food (UPF) diet on 27 obese hyperlipidemic women over a period of 12 weeks. We just replaced common breakfast and dinner of the subjects with UPF. Their dietary intake status was evaluated by 24-hour recall method. Their body compositions were measured using body fat analyzer. Also we conducted hematological, clinical and lipid profile analysis of blood. The intake of energy, lipid and protein has significantly decreased as people started to take UPF, but the intake of vitamins and minerals has decreased except iron. Due to the energy intake decrease by taking UPF, weight, body fat and waist circumference significantly decreased. Among those who lost weight the percentage of body fat was high. We judged that the process of losing weight was successful in obese hyperlipidemic women. Serum HDL-cholesterol gradually increased and serum total, LDL-cholesterol, triglyceride levels showed gradual decrement. When obese hyperlipidemic women replaced two of three meals with UPF for 3 months, we were able to see useful changes like decrement of body fat and serum lipid. Complete assessment of UPF may be difficult based on these conclusions, but if people take a normal meal once and replenish iron from taking UPF twice a day, we assume that replacing balanced regular meal with UPF may not be a problem in nutritional status. Our results show that UPF are effective in the diet therapy of obese hyperlipidemic women.

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Food processing and human health

A tomato puree enriched in 6% tomato skin leads to a higher absorption of lycopene and β -carotene than a classical tomato puree in healthy subjects

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Background: epidemiological studies reported that a high tomato intake is associated with a lower incidence of colorectal and prostate cancers. This beneficial effect could be related to a high intake of carotenoids such as lycopene or β -carotene.

Objective: because tomato skins, usually eliminated during classic tomato puree processing, are a source of lycopene and β -carotene, the aim of this study was to assess whether a tomato puree enriched in tomato skins (6%) induced a higher absorption of these carotenoids than a classic tomato puree in healthy subjects.

Design: 8 healthy men were given two similar meals containing either skin-enriched tomato puree (meal 1) or classic tomato puree (meal 2) at a one-month interval. Meal 1 provided 48 mg total lycopene (all-*trans* + *cis* forms) and about 1.5 mg total β -carotene. Meal 2 provided 30 mg total lycopene and about 1 mg total β -carotene. Blood samples were collected before meal intake and 1, 2, 3, 4, 6 and 8 h after meal ingestion to follow the change in chylomicron carotenoid concentrations. Chylomicrons were isolated by ultracentrifugation and analysed to assess their carotenoid concentration by hplc. Chylomicron carotenoid responses (area under the curve) were calculated for each meal and compared with the non-parametric wilcoxon test. P value below 0.05 were considered significant.

Results and discussion: chylomicron total lycopene and β -carotene concentrations exhibited bell shaped curves after both meals, with a maximum reached at about 3 h. Both chylomicron total lycopene and β -carotene responses were higher after the meal 1 than after the meal 2 ($p = 0.069$ and $p = 0.036$, respectively). The fact that chylomicron lycopene and β -carotene auc ratio (auc after meal 1/auc after meal 2) was similar to that of lycopene and β -carotene amounts in meal 1 / amounts in meal 2 demonstrated that the bioavailability of these carotenoids in tomato skin appeared equivalent to that of these carotenoids in tomato pulp.

Conclusion: skin-enrichment of tomato purees would represent a good way to valorise tomato co-products and to enhance the consumption of lycopene and β -carotene.

To ensure high standards of food safety through an integrated haccp system

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Introduction: Singapore General Hospital, Dietetics & Nutrition Services Department caters to 3,600 – 4,000 meals daily. Our customers are patients who would be defined as people at a higher risk for food-borne illness. Apart from the unwell, we are also serving patients who are pregnant, the elderly and the patients who are even more vulnerable, with compromised immune system. Foodborne illness is therefore a major concern, minimising and controlling biological, chemical and physical hazards in food is critical for food safety.

Method: All 370 normal and therapeutic dishes for the different ethnic cuisine were included. Meals include breakfast, lunch, dinner and afternoon tea snacks. Dishes are divided by process into groups of meat, vegetable, rice, bread, fruit, baked items, cold desserts, and yoghurts. With the HACCP system, the various stages of identification and minimisation of the food hazards would pre-empt preventive steps to be taken before rather than an after response to the food borne problem after it has occurred. Good Manufacturing Practices, fundamental food hygiene principles, controls and monitoring systems were then identified from receiving of raw food materials through storage, preparation, cooking, individual portioning and holding to the transporting of finished dishes to the 1,600 in-patients. Training of supervisory, cooks and other staff who handle food on HACCP Awareness were scheduled according to their designation or duties; using various methods to overcome language barriers (Malay, Tamil, Mandarin, local dialects, etc.), mindsets and 'resistance to change' of some older staff.

Results: Benefits of certification include internal process improvement, a reduction from 3-4 complaints per 100,000 food orders to 1-2 complaints per 100,000 food orders. Compared to the temperature feedback of year 2002, there was an improvement of 19% in excellent ratings and reduction of 50% in poor temperature ratings. HACCP being internationally recognized and targeted for Preventive Food Poisoning also provides further assurance to enhance confidence in the food served to patients in SGH.

Conclusion: In 23 September 2003, the hospital kitchen joined the elite 15% of the food industry who achieved HACCP certification in Singapore, and the first in-house kitchen to be awarded the certification. This certification has not only improved the standards of food safety but also other aspects of food served to patients.

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Food processing and human health

To determine the contributing factors for tube-feeding patients not meeting energy requirements

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Introduction: Nutritional status can influence the medical outcome of a patient. For patients who are unable to obtain nutrients via the oral route, alternative nutrition feeding modalities have to be considered. One of the alternatives is supplying nutrients in the form of nutritional formulas via the feeding tube. However, various factors such as intolerance of feeds and medical procedures may affect the feeding regime, thus hindering patients from meeting their nutritional requirements. This study aims to determine the type of factors, which contribute to tube-feeding patients not meeting energy requirements.

Method: In this retrospective study, all new inpatients on nasogastric tube feeding seen by Dietitians over a one-year period at a general hospital were included. Nutritional assessment, calculation of patient's nutritional requirements (based on equations) were conducted before a nutrition care plan was recommended by the Dietitian. Patients received the recommended nutrition formulas via tube accordingly. Patients were reviewed for tolerance of feeds and adjustments were made as appropriate. Patients who were not on tube feeding by day 5, for example patients who were upgraded to oral feeding, discharged patients and deceased patients, were excluded from this study. Patients were reviewed to confirm if their energy requirements were met by day 5 post-commencement of feeds. The main factor or reason was identified if patient was not meeting his/her energy requirements by day 5.

Results & Discussion: Data from more than 800 tube feeding cases were reviewed. Data analysis showed that more than 70% patients met their energy requirements by day 5 whilst 30% did not. The main contributing factors for patients not meeting their energy requirements include: aspiration, diarrhea, patient on Nil By Mouth, medical procedures which require patients to 'fast' or hinder the feeding schedule. Some of these factors are not within the Dietitian's control. However, factors such as diarrhea and aspirate may be related to the type of nutritional formulas, feeding schedule and also the administration of feeds. The study also investigated the relationship between the type of diagnosis and patients not meeting energy requirements by day 5.

Conclusion: Major factors contributing to tube feeding patients not meeting their energy requirements include both non-nutrition related factors such as medical procedures, and nutrition-related factors such as aspirate and diarrhea.

The vitamin D content of fortified milk produced locally

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Objective: The objective of this research is to determine the vitamin D content of milk and milk products produced in Saudi Arabia.

Methods: Milk samples were saponified, extracted with diethylether, purified using straight phase high pressure liquid chromatography (HPLC), separated by reverse phase HPLC and detected at 254nm.

Results: A total of 160 milk containers with normal fat, low fat, and skimmed milk, fortified with vitamin D were analyzed for vitamin D content. Only 5 percent contained 80%-120% of the amount stated on the label (400 IU/L). Sixteen percent contained 32%-362% more than the amount stated on the label, whereas 59% of the fortified milk samples contained vitamin D in the level of non-fortified milk. The vitamin D content of the 34 non-fortified samples was ranging from undetectable to 50 IU/L.

Conclusion: The amount of vitamin D in fortified milk are far below the amount stated on the label.

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Food, the environment and health, econutrition

Initial assessment on food-borne diseases surveillance system in Daerah Istimewa Yogyakarta, Indonesia

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Similar to other developing countries, data on diarrhea prevalence in Indonesia - as the most common symptom of Food-borne diseases (FBDs) - is only the tip of the iceberg, which may be due to underreporting from the community or inappropriate existing system to capture FBDs cases. WHO has recommended that FBDs surveillance system play a significant role in the early detection FBD outbreaks and their control. Therefore, we undertook the study to identify and review the existing FBD surveillance system and its role in detecting the FBDs. The study was conducted in Daerah Istimewa Yogyakarta province, a tourism destination, representing the lowest prevalence of diarrhea, involving institutions related to surveillance or FBDs-related program from province level to village level in January-March 2002. Design of this study was a descriptive qualitative, which covered in-depth interviews to key persons in target institution, focus group discussion and secondary data. The target institutions at the provincial level, were Provincial Health Office (PHO), Provincial Governmental Office (PGO), Hospitals, Provincial Health Laboratory (PHL) and Regional Drug and Food Control (RDFC). At the district level, the target institutions were Regency Health Office (RHO), Hospitals, Regional Governmental Office (RGO). At the sub-district level, the target institutions were Community Health Centers (CHC)/midwives/volunteers, Sub-District Governmental Office, Hospitals and Private practitioners. The existing FBDs surveillance was a routine-passive surveillance consisting of diarrhea, cholera, hepatitis and typhoid diseases, which were attached with the available Integrated Surveillance System. The CHC is the center of surveillance activities, which mostly focuses on data collection, data compilation and simple data analysis (recapitulation) for recommended action. The compilation of data was sent to RHO. The confirmation of laboratory assessment is being performed by PHL, which then reported the results to RHO. The confirmed diagnosis had never been established by the CHC. Therefore, the data on FBD were reported as diarrhea or food poisoning. Data analysis, feedback and action to prevent diarrhea outbreak was also lacking in RHO. In the era of decentralization, data from RHO were hardly supplied to PHO. RDFC was conducting samples of foods and drink examination and production/distribution of foods and drink facilities inspection. The study concluded that the FBD surveillance in Daerah Istimewa Yogyakarta was non-existent as a specific surveillance, but was attached with the existing disease surveillance system. The CHC was not able to establish the confirmed diagnosis on FBD. RHO had stronger role on surveillance system. It is recommended that the system should be improved to optimal level with concurrent introduction of FBDs surveillance. Capacity building in the field of FBDs surveillance will be mandatory for the RHO. Acknowledgement: This study was funded by WHO-Indonesia, Jakarta

Estimation of young men's nutrition preferences in the period before recruitment.

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The aim of the work was estimation of the nutritional preferences among 147 young men beginning military service in one of the Polish Army military units. The average age of examined was 21.1 ± 1.3 . Most of them came from the country (49.7%). Young men coming from the small towns and big cities made 40.8% and 9.5% respectively. The majority of these examined was secondary (53.1%) and technically educated (43.5%). Only 1.4% was post-secondary educated and 2.0% elementary. The examination was carried out by inquiry method. The following food products were taken into consideration: cereal products, milk and dairy products, meat and meat products, poultry and poultry products, fish and fish products, fruit and vegetables, confectionery as well as "fast food". To estimate nutritional preferences, the five-degree graduation was used. Among all examined products and meals the most favoured (average preference value 4.5) were: white bread, flavoured yoghurt, flavoured homogenized cottage cheese, meat meals, fruit and fruit juices, pizza and dish cooked "au gratin" and Coca Cola. These foods/meals were willingly eaten by 87.7-96.6% of subjects. The following products and meals were included into the group of low preference value (average preference value 3.0-3.5): cereal products (groats, noodles, and rice), melted cheese, cottage cheese, poultry products, fishes products and cooked vegetables. These products/meals were willingly eaten by 44.9-61.2% of those examined. Dark bread and bread with additions (soy or sunflower seeds) were included into the group of the lowest preferences (average preference value 3.0). This kind of bread was willingly eaten by 21.8-28.6% of subjects; 41.5-42.2% of subjects unwillingly consumed this bread. Our results may be a foundation for rational alimentation planning during the military service and show necessity to undertake an action having in view propagation of rational alimentation rules among examined young men in the population.

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Food insecurity in the UK: determinants and consequences.

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Food insecurity exists where there is uncertainty that food will be available, or there is an inability to access the available food, because of financial or physical limitations. Food insecurity is multidimensional and results in poorer health with around 815 million people worldwide food insecure (FAO, 1996). In the USA, about 12% of the general population is food insecure (Bickel et al 2000), but less is known about the problem in the UK. The hypothesis that the risk of food insecurity is higher in those people who are most deprived and have a negative attitude to healthy eating is tested. The population was deprived households in Leeds, UK ($n = 459$). A detailed questionnaire was completed; including an assessment of food insecurity using a 6-item scale (Bickel *et al.*, 2000) deprivation was defined according to Townsend (1987). To analyse data SPSS was used with binary logistic regression to determine associations and the level of risk. 30% of households were defined as being food insecure. This is similar to a recent UK study in a deprived area (Tingay *et al.*, 2003). The level of food insecurity was 40% in those who were most deprived, compared with 25% in those who were less deprived (OR=2.004, CI= 1.306-3.077 with $p = 0.001$). The level of food insecurity was 33% in those who had a negative attitude, compared with 24% in those who held positive attitude (OR=1.551, CI= 1.008-2.388 with $p = 0.046$). The risk of being food insecure was nearly three times higher in those who were deprived and had a negative attitude compared to those who were not deprived and had positive attitudes (OR 2.813, CI= 1.576-5.022; $p < 0.001$). This study shows that in a deprived area in the UK, food insecurity affects many people. The cause appears more complex than simply resources alone. Any programme aimed at alleviating food insecurity will need to understand and address these complex interactions.

Seasonal variation of food consumption patterns in Korea

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This analysis was performed to investigate the seasonal difference of food consumptions according to cooking methods affecting nutrient availability and fat consumptions using 1998 Korean National Health and Nutrition Examination Survey. A cross-sectional survey was conducted in winter, 1998. A total of 10400 subjects were selected by stratified multistage probability sampling design and completed dietary questionnaire including food intakes for one day by the 24 hour recall method. Among these subjects, dietary survey was repeated for sub-sample in spring ($n=2303$), summer ($n=2401$), and fall ($n=2083$) of the next year. All food eaten (dishes) were classified by the cooking method. Frequency and amount of food by the cooking method for each season are analyzed. Total amount of food consumption was significantly higher in winter (1266g) and summer (1251g) than spring (1105g) and fall (1087g) ($p < 0.05$). In winter, people consumed more Kuk (Korean style soup), Tchigae (Korean style stew), seasoned steamed foods, deep fat frying foods, fresh vegetable salads, Kimchi, and raw fish and their products than in other seasons. The amount of food intake from cooked rice, Kuk, cooked vegetable salads, fresh vegetable salads, and beverages and teas was higher in spring than in other seasons. In summer, noodles, dairy products, fruits, steamed grains and potatoes, and fresh vegetables were consumed more than in other seasons. In fall, stir fried foods, cooked vegetable salads, and legumes, nuts, and seeds were consumed more. The intake of roasted foods and grilled foods were similar in all seasons. It is concluded that Koreans are using various cooking methods by the season. They use more various cooking methods in winter, more traditional cooking method in spring, more fresh food in summer, and more oily food in fall. With these results, in Korea both food items and cooking methods are should be considered to use dietary data and to do nutrition education in clinical setting and community.

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Food, the environment and health, econutrition

The Impact of environmental lead poisoning on iron and haemoglobin status in Kenya

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Lead is an environmental and public health hazard of global proportions with leaded petrol causing more widespread human exposure to lead than any other single source. This is particularly the case in Kenya, where the major transport mode is by motor vehicles. The lead particles settle on soil, water, vegetation and food. Even with the well-established health implications of lead poisoning, the global dimensions of lead pollution remain poorly understood due to persisting lack of information particularly in developing countries such as Kenya. This study, therefore, undertook to determine the impact of lead poisoning on iron and haemoglobin status in Kenya. The study group was divided into classes depending on area of residence for the past 5 years (exposure to motor vehicle pollution). Both maternal and cord blood samples were analyzed for lead, iron and haeme content. The subjects were also checked for blood pressure (both systolic and diastolic) and birth weight. There was a significant negative correlation ($r=0.99$) between maternal blood lead concentration and haemoglobin concentration. Similarly, there was a significant negative correlation ($r=0.80$) between maternal blood lead concentration and maternal blood iron concentration. However, there was no significant correlation between cord blood lead concentration and cord blood iron concentration, although a significant correlation ($r=0.99$) between cord blood lead concentration and haemo-globin levels existed. In conclusion, there appears to be a significant correlation between lead concentration in human blood and proximity to traffic volume. Concomitantly, cases of anemia were also predominant in areas with high traffic volume. Blood lead concentration in all these areas were higher than the WHO recommendation of $10\mu\text{g}/\text{dl}$ of blood.

Dietary and health characteristics of rural Korean farmer families with patients

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Recent WTO and FTA led agricultural globalization has brought crisis to already impoverished Korean farmers. This study was proposed to assist in comparing health and dietary characteristics of farmer families with chronic disease 'patients' to farmer families non-chronic disease patients. For the study, 1870 families were selected from 9 rural Korean provinces. Trained evaluators interviewed farmer housewives to collect demographic, health behavior, and dietary relative information about family members. Statistical analyses were performed using SAS (ver 8.1). Chi-square tests and General Linear Models were used. In general, 'patient' family members were older than 'non-patient' family members. For 'patient' families, mean age was 70.4 for husbands and 64.3 for wives. For 'non-patient' families, mean age was 64.2 for husbands and 57.3 for wives. Therefore we analyzed data after stratifying subjects by age 65. 'Patient' families snacked less and "dined out" less than 'non-patient' families. However, they consumed cookies more frequently, and milk and fruits less frequently, when compared to 'non-patient' families. There were no significant differences in nutrient supplementation, food taboos, and/or instant food intake frequencies between 'patient' families and 'non-patient' families. 'Patient' families made less homemade traditional fermented food (kimchi) than 'non-patient' families. Sixty-two percent of 'patient' family members complained about health problems such as shoulder stiffness, lumbago, numb limbs, dizziness, nocturia, breathlessness, sleeplessness, and abdominal fullness, whereas 52% of 'non-patient' family members complained about health problems. Husband cigarette smoking was not significantly different among groups. However, smoking amongst wives was significantly higher in 'patient' families. Alcohol consumption was also higher in 'patient' families. In summary, it was determined that rural 'patient' families had poorer dietary behavior and poorer health in general, when compared to 'non-patient' families, and accordingly, diverse community-level health and nutrition support is suggested to solve farmers' health problems and to improve their quality of life.

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Identifying strategic interventions for improving household food and nutrition security in an urban informal settlement, South Africa

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Poverty, household food insecurity and malnutrition continue to be the major causes of many deaths facing children and women in Africa. Inadequate dietary intake and infectious diseases are the most significant immediate causes of malnutrition. A dietary inadequacy is largely caused by insufficient household food supply and /or poor caring practices for women and children. The underlying causes are many including household food insecurity and are usually inter-related. Most of them lead to insufficient fulfilment of specific basic needs of children and women. Currently, HIV/AIDS affects mainly people in the productive age group. This has a great impact on livelihoods, food and nutrition security because it causes shrinkage of the available labour force. In view of the household food and nutrition insecurity problem in informal settlements in South Africa, we conducted a situation analysis. The cross sectional survey used both qualitative and quantitative methods. We found that chronic urban household food insecurity, prevalence of malnutrition and income poverty was the major problems. A problem tree and an objective tree were used to logically analyse the causes and effects of the poor situation in the study area. The role of this approach was vividly appreciated. Therefore, this paper provides useful experience in design and implementation of mixed methods, a set of strategic interventions and some better practices, which are also useful to researchers, programme planners and policy makers. The paper describes on how best community-based household food and nutrition security research programme should be planned in tertiary institutions in South Africa, particularly in the Vaal University of Technology.

ICCN Poster Presentations

Nutrition and cancer

Vitamin E and its effect on aspirin induce gastric lesion in rats

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This study examined the effects of vitamin E on aspirin induced gastric lesions. The study was divided into two phases: phase 1 determined the effects of various doses of palm vitamin E on the factors affecting mucosal integrity. There was a significant decrease in gastric MDA and gastric acid in all the palm vitamin E supplemented groups compared to control. However, these doses of palm vitamin E had no significant effect on gastric mucus. Phase 2 study determined the effect of multiple doses of palm vitamin E and tocopherol on the prevention of aspirin induced gastric lesions. Fifty rats were randomized into seven groups. Group I was fed a normal diet, Groups II to Group VII were fed with palm vitamin E/tocopherol enriched diet in a dose of 60mg/20, 100mg/30mg and 150mg/50mg /kg food respectively. After four weeks of feeding, the rats were challenged with a single intragastric dose of aspirin (400 mg/kg body weight). The rats were killed 6 hours post-aspirin exposure for the determination of gastric lesion index and gastric parameters as mentioned in phase I study. The gastric lesions index was significantly lower in all the vitamin E groups compared to control. The lowest ulcer index was observed in the groups that received 100mg of palm vitamin E and 30mg tocopherol in the diet. However, there was no significant difference in ulcer indices between palm vitamin E and tocopherol treated groups. The lower ulcer index was only accompanied by lower gastric MDA content. We conclude that both palm vitamin E in a dose of 60mg, 100mg and 150 mg/kg food as well as tocopherol in a dose of 20mg, 30mg and 50mg/kg food are equally effective in preventing aspirin-induced gastric lesions. The most probable mechanism is through their ability in limiting lipid peroxidation that is involved in aspirin-induced gastric lesions.

The effect of *Azadirachta indica* on distribution of antioxidant elements and glutathione S-transferase activity in the liver of rats during hepatocarcinogenesis.

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The liver is often the first organ to be infected by metastasizing cancer. Hepatocarcinogenesis is one of the most prevalent and deadly cancers worldwide, which ranks seventh among cancers in order of frequency of occurrence. Numbers of natural and synthetic antioxidants are known to treat initiation and promotion of chemical carcinogenesis in experimental animal models. The effect of 5% w/v of *Azadirachta indica* extract in diethylnitrosamine and acetylaminofluorene induced hepatocellular carcinoma, which is a vital mechanism in cancer treatment, was studied in male *Sprague dawley* rats. The result of microscopic observation of the lesion score during hepatocarcinogenesis revealed that cells of cancer group without treatment were severely necrotic at week 12. However, cells of cancer group with *Azadirachta indica* treatment appeared nearly normal. The tracking of the elements during hepatocarcinogenesis was done using energy filtering transmission electron microscope (EFTEM). According to EFTEM results, some of antioxidant elements such Na, Ca, and P is highly distributed in *Azadirachta indica* treated normal and cancer group. However, the distribution is too low in normal control and cancer control group without *Azadirachta indica* treatment. The obtained results have shown a significant, decrease ($P=0.05$) of liver cytosol Glutathione S-transferase in cancer control group rats. Meanwhile, treatment with *Azadirachta indica* caused overall increase in liver GST activity nearly to control group. Distinct evidence from this study contribute that oral administration of 5% *Azadirachta indica* extract demonstrated anticancer activity by increasing the distribution of antioxidant elements and GST activity may to protect cells in preneoplastic nodules in cancer treated groups. However, there was no evidence of side effects of *Azadirachta indica* towards normal cells indicating *Azadirachta indica* as a potential preventive agent for cancer.

ICCN Poster Presentations

Nutrition and cancer

Inverse relationship between body mass index and premenopausal breast cancer risk in Malaysian women

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Human breast cancer is usually categorized as either premenopausal or postmenopausal. The epidemiological evidence for the role of anthropometric factors, specifically body mass index, in the etiology of breast cancer has become clearer and stronger particularly for populations in developed countries. The aim of our study was to examine the relationship between body mass index (BMI) and waist-hip ratio (WHR) with breast cancer risk in pre and post menopausal Malaysian women using a case-control study design. Eighty-one women newly diagnosed with breast cancer at the Hospital Kuala Lumpur and University Malaya Medical Centre were matched for age (± 5 years), ethnic group and area of residence (rural/urban) with 81 community control subjects. BMI and WHR were determined using established methods. Obesity and abdominal obesity were identified using the WHO (1995) guidelines. Data were also collected on sociodemographic and lifestyle factors, dietary intake and serum lipid profile. Multiple logistic regression analysis was carried out to estimate odds ratios (ORs) and 95% confidence intervals (95% CI). The study groups comprised Malays (44%), Chinese (40%) and Indians 16%. Nearly 81% of the case subjects were premenopausal. The mean age of case and control subjects was 46.6 years and 47.6 years respectively. The mean BMI of cases was lower, but not significantly, (24.52 ± 4.86) lower than controls (25.37 ± 4.55) at the time of diagnosis. A non-significant difference was observed for WHR between study groups. After adjustment for potential confounders, the model showed that BMI had a significant and inverse relationship for breast cancer risk (OR= 0.834, CI, 0.736-0.946) in pre-menopausal women only. No clear association with breast cancer risk was observed for WHR. Our results endorse previous reports of studies in European and other populations that a lower BMI is associated with increased risk for breast cancer among pre-menopausal women.

Folate status of Thai women cervical dysplasia

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The study was carried out in Thai women that were identified from the National Cancer Institute and Vajira Hospital in Bangkok, and Chonburi Cancer Center in Chonburi Province. Fasting blood samples were collected from 44 women with low-grade cervical neoplasia (CIN I), 70 high-grade cervical neoplasia (CIN II, III and carcinoma *in situ*) and 95 women with normal cytology as the control group for serum and red cell folate analysis and serum homocysteine determination. Cervical smears were obtained for histological diagnosis and colposcopy-directed biopsy investigation was used as confirmation. Polymerase chain reaction (PCR) was used to define the presence or absence of genital HPV DNA. The socioeconomic background, gynecologic history, and other possible risk factors were also gathered by personal interview and the daily intakes of folate were investigated by 24-hour recall, as well as the food habits of the subjects by food frequency questionnaire. The low folate statuses of these women showed a strong association with cervical dysplasia. The serum folate was markedly lower than the control group in both low-grade ($p < 0.01$) and high-grade cervical neoplasia cases ($p < 0.01$). Moreover, using logistic regression, the Odds ratio for low-grade cervical neoplasia with low serum folate level (< 19.82 nmol/L) was 6.13, while that of the high-grade group with the same folate level was 5.57. The investigation of the relationship between abnormality of the cervical cells and red cell folate and serum homocysteine produced similar results. The outcome of folate intake analysis and the food habits of these women were related to the folate status of the blood. This finding supported the contention that the folate deficiency status of the women in this study increased the risk of cervical change.

ICCN Poster Presentations

Nutrition and cancer

Investigation of the effect of lignans on murine mammary gland differentiation in TG.NK mice

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Breast cancer is the most common form of cancer among women in the Western World. Phytoestrogens as lignans and isoflavonoids are suggested to protect against mammary cancer due to their estrogenic activities. Lignans are produced by intestinal flora from precursors primarily found in flaxseed and to a lesser degree in whole grain cereals, berries and nuts. Lignans like enterolactone and enterodiol have weak estrogenic activities. Murine mammary cancer development starts in the undifferentiated structures of the mammary gland, so-called terminal end buds. Enhanced differentiation of the proliferative terminal end buds into the more mature alveolar buds is considered to make the mammary gland less susceptible to cancer development. The aim of the present study was to investigate if lignans from flaxseed can stimulate mammary gland differentiation in an animal model predisposed to mammary tumorigenesis. The model used was MMTV/c-neu transgenic mouse strain (TG.NK) overexpressing the c-neu oncogene homologue of human erb-2 oncogene. TG.NK mice received diets added flaxseed in doses mimicking 0.3, 1, or 3 times the daily human intake of lignans from the 4th week of age for 6 weeks. In order to investigate the effects of lignans on mammary gland development 10 animals per group were sacrificed at the age of 6 and 10 weeks respectively. Whole mounts were prepared from the 4th mammary gland for differentiation analysis. Analysis of whole mounts revealed, that flaxseed exposure did not affect the differentiation pattern of the mammary gland. In approximately 50% of all mice preneoplastic changes have been observed in the mammary gland after 6 weeks of exposure in all experimental groups. The observed changes were increased proliferation in terminal structures resulting in big boldlike undefinable structures. However, the number of changes per animal was slightly but not significantly increased in mice exposed to diet containing flaxseed compared to the controls. The results indicate that short time exposure to human relevant doses of flaxseed did not affect mammary gland differentiation in transgenic TG.NK mice under current experimental conditions.

ICCN Poster Presentations

Nutrition and aids

Serum leptin levels, BMI and fat percentage of HIV positive women (25 – 44 years) in Mangaung, South Africa

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Background: Fasting levels of the protein leptin are related to body fat content. Conflicting data exist regarding leptin levels in HIV positive and negative individuals. This study was part of a larger epidemiological study investigating women's nutritional health.

Design: Using township maps, a random, population-based sample of 500 women was selected and divided into age groups 25-34 years (n = 273) and 35 – 44 years (n = 215). Accepted WHO methods for determining weight and height were used. BODYPAC was used to determine bio-impedance. Both HIV status and leptin levels were determined using a micro-particle enzyme immunoassay method. Each group was categorized according to BMI as normal to underweight, overweight and obese (<25 kg/m², 25.1-29.9 kg/m², >30 kg/m² respectively) and fat percentage between 20 and 25% was considered normal. Groups were described and compared by non-parametric methods. BMI was described by medians and percentiles and compared by 95% CI's for the median difference as well as the Mann-Whitney test. Fat percentage was described by the mean and standard deviations and compared by 95% CI's as well as the student-t test.

Results: Sixty one percent of the younger women and 38% of the older women were HIV positive. In younger patients, BMI and fat percentage of HIV positive women was significantly lower than BMI of HIV negative women (p <0.01 for both). In the older group, BMI and fat percentage of HIV positive and HIV negative women did not differ significantly (p = 0.89 and p = 0.66 respectively). In both the younger and older groups, no significant difference was seen in median leptin values for HIV positive and negative individuals (p = 0.7622). Furthermore, leptin values differed significantly in the three BMI groups in both older and younger women with leptin values unexpectedly decreasing as BMI increased (p <0.0001).

Conclusions: In our study, younger HIV positive subjects had significantly lower BMI and fat percentage, compared to HIV negative women. However, HIV status was not associated with leptin concentrations. It is improbable that leptin is responsible for the wasting common in HIV positive individuals. The fact that leptin does not increase as BMI increases in this population could indicate an inherently different leptin metabolism possibly due to genetic or environmental factors.

ICCN Poster Presentations

Nutrition and aids

Iron status of HIV-positive women (25-44 years) in Mangaung, South Africa

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This study formed part of a larger epidemiological study investigating the nutritional health of women. A population-based random sample of 500 women was selected using township maps. The sample was divided into women 25 to 34 years (n=273) and 35 to 44 years (n=215). Groups were described and compared by non-parametric methods. HIV groups were also compared by 95% CI's for the difference in the percentage of women with parameters below the normal range. Sixty one percent of the younger group and 38% of the older group were HIV-positive. The percentage with serum ferritin levels below 20µg/L was 10.4% of younger HIV-negative women; 5.3% of younger HIV-positive women; 6.5% of older HIV-negative women; and 0.0% of older HIV-positive women. It is possible that this acute phase protein was reactively elevated, especially in HIV-positive women, and thus not a true reflection of iron stores. Although not a valuable parameter, a large percentage of both HIV-negative and HIV-positive women with serum iron levels below 0.7mg/L (30.1% and 36.2% respectively of younger women; and 40.3% and 24.5% respectively of older women). Very few women had transferrin values below 2.0g/L, ranging from 0.0% of older HIV-negative women to 4.7% of younger HIV-positive women, possibly due to the fact that transferrin tends to increase as an adaptive mechanism to enhance iron absorption. Significantly more HIV-positive women had haematocrit values below 0.35 L/L when compared to HIV-negative women (13.3% and 4.72% respectively in the younger group; 95%CI [-14.0; -2.5], and 12.2% and 2.29% respectively in the older group, 95%CI [-17.2; -4.1]). In the younger group, significantly more HIV-positive women had erythrocyte count values below $3.85 \times 10^{12}/L$ (9.0% and 1.9% respectively; 95% CI [-12.7; -1.3]). In both younger and older women, HIV status is associated with haematocrit and in younger women with erythrocyte counts. In order to differentiate between these variables in women with HIV and those with AIDS, the stage of infection would be useful.

ICCN Poster Presentations

Molecular nutrition for the clinician

Is food intolerance due to an inborn error of metabolism?

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Since Feingold hypothesised that chemicals in food caused hyperactivity in 1973 this issue has been controversial. Well planned research in the 1980's did show some children reacted but the mechanism is complex. As well as Attention Deficit Hyperactivity Disorder [ADHD] symptoms improving, mood and physical allergic symptoms improved on a low suspect chemical diet. On this basis some have proposed an immunological component in the mechanism. However the whole foods commonly causing allergic reactions are additional exclusions in some individuals rather than the core exclusions of suspect additives and natural chemicals. To add to the confusion some of the symptoms which respond to diet include headaches, migraine, irritable bowel syndrome [IBS], mouth ulcers, and carsickness which are not allergic symptoms. The fact that symptoms responding were in many of the body's systems meant that several possible mechanisms have been proposed but none clarified. Yet another mechanism was proposed with the use of a gluten and casein free diet in autistic children. Peptides from these proteins are absorbed and thought to act as opiates affecting brain function. However those using this diet also exclude additives, chocolate, MSG and other small molecular weight compounds. An intriguing aspect of dietary response in the ADHD research was the finding of a reduction in halitosis [bad breath]. This author has also had patients report a reduction in breath and also in body and urine odour. Since most of the suspect chemicals are aromatic in structure the possibility of their poor metabolism arose. This was supported by the finding that similar enzymes are involved in the metabolism of both the suspect phenolic compounds [additive colours and flavours, salicylates and the benzoate preservative] and the amines. These are the sulpho transferases. Amines were reported to be degraded in the gut and phenolic compounds in the kidney. Work with diet-responding autistics in the UK has reported relevant findings that implicate sulphur metabolism. These autistic children have shown reduced levels of plasma sulphate, and increased levels of excretion of sulphate, sulphite and thiosulphate in their urine compared to controls. Sulphur oxidation appears to be abnormal in this group. The numbers of slow metabolisers or null metabolisers of cysteine dioxygenase in autistics is much higher than the normal population. A study of non-autistic food intolerant patients showed similar biochemical abnormalities. In clinical research it has been found that foods are better tolerated if flavour is mild, and more adverse reactions occur to foods which are highly flavoured, so a defect in management of aromatic compounds is indicated. The research implicating a defect in the metabolism of phenolic and amine metabolism provides evidence of a possible mechanism.

ICCN Poster Presentations

Molecular nutrition for the clinician

Niacin metabolism and Parkinson's disease

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Previous epidemiological results show the importance of niacin in relation to the cause of Parkinson's disease, that is the nutritional condition which causes pellagra, niacin deficiency, might protect people from Parkinson's disease. Because maize (*Zea mays*) contains niacytin which the human being cannot use as niacin, and because maize contains low tryptophan, and abundant leucine which inhibits quinolinate phosphoribosyl transferase, the key enzyme of converting from tryptophan to NAD, niacin deficiency is observed in the people who obtain most of their energy from maize. Correlation coefficients among the prevalence rate of Parkinson's disease, maize yield, niacin intake and selenium intake by each province in China were analyzed. Positive correlation was seen between selenium intake and niacin intake. Niacin deficiency also could be seen in the Keshan disease prevalent area. Negative association was seen between maize production and niacin intake and between maize production and prevalence rate of Parkinson's disease. Retrospective study of preventive effect of maize on mortality from Parkinson's disease in Japan was also demonstrated. Absorbed niacin is used for synthesizing of NAD in the body, and in the metabolic process, NAD releases nicotinamide by poly (ADP-ribose)ylation which activation has been reported to mediate MPTP-induced Parkinson's disease. Nicotinamide N-methyltransferase (EC2.1.1.1) activity was assayed with cytosolic fraction of rat brain, and nicotinamide could be methylated to 1-methylnicotinamide (MNA) via this enzyme in the brain. The deficiency of mitochondrial NADH: ubiquinone oxidoreductase (complex I) activity is believed to be a critical factor in the development of Parkinson's disease. MNA destroyed several subunits of cerebral complex I, and it was suggested that MNA was concerned in the pathogenesis of Parkinson's disease. From these results, niacin is expected to be the causal substance of Parkinson's disease through following process, NAD produced from niacin releases nicotinamide via poly (ADP-ribose)ylation which is activated by hydroxyl radical. Released excess nicotinamide is methylated to MNA in cytoplasm, and superoxides formed by MNA via complex I destroys complex I subunits directly or indirectly via mitochondrial DNA damage, and stimulates poly (ADP-ribose)ylation. Any hereditary or environmental factors may cause acceleration of this rotation and consequently cause neuronal death.

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