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Developing an "Essentials of Nutrition" manual for medical students

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Background: Nutrition has not been a major focus of the undergraduate medical curriculum at the University of NSW. The position of nutrition co-ordinator, appointed in 1987, was not renewed after 1991. A review of the curriculum in 1988, updated in 1994, revealed an appreciable nutrition content in the course, which was not labelled as 'nutrition' and not linked together to form a comprehensive nutrition module.

A nutrition manual was prepared for medical students in 1990. It contained nutrition material considered important for medical graduates, but not included in the undergraduate course at that time. The subsequent lack of a nutrition co-ordinator meant that students were seldom, if ever, referred to the manual. A tool which would help students to integrate and use important nutrition concepts was required.

Aim: The aim was to prepare a practical guide on nutritional assessment and the management of common nutritional problems encountered in practice by the newly graduated doctor. The purpose was not to cover all nutrition principles comprehensively; rather to alert the graduate to existing resource material, which could be easily accessed in

everyday practice.

Methods: The structure of the manual was based on a general nutrition assessment model, including basic elements of physical assessment and anthropometry, clinical, dietary, and laboratory assessment. The same basic model was used for several common nutrition-related conditions, with different elements receiving more or less emphasis, depending on their importance to that condition. A management outline was also included for each condition. Where possible, experts in these areas within the Faculty were involved in the preparation. Key information on reference values, useful tools such as dietary questionnaires, case studies, and relevant, succinct articles on the rationale behind decisions were included in the resource section. A list of relevant further reading was also included.

Results: So far, nutritional assessment and management outlines have been prepared for obesity, hyperlipidaemia, diabetes, food allergy/intolerance, for the elderly and children. Their value as reference tools are currently being evaluated.

Clinical nutrition in postgraduate medical education

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There are opportunities for health improvement in each of the major disciplines of medicine through engagement in clinical nutrition, general medical practice, paediatrics, internal medicine, surgery, psychiatry, obstetrics and gynaecology and investigative services. This may apply at the primary, secondary and tertiary levels of health care. At present, some major gains are being made in general practice, internal medicine and surgery. The RACGP and the RACP now formally recognise nutrition in their training programmes; it is possible to undertake advanced training in nutrition for the FRACP. More work is required in training posts, rotations between them, and ultimate career development. But, as a first step, each teaching hospital in Australia could be reasonably expected to have an identifiable appointee on the senior medical staff in clinical nutrition. This would then provide a resource for further training inside and beyond the hospitals. What would a physician in clinical nutrition do? At Monash Medical Centre, the Clinical

Nutrition and Metabolism Unit (CNMU) directs the following clinical programmes, both inpatient and ambulatory:

- (1) Eating and body composition disorders
- (2) Complex metabolic problems and inherited metabolic disorders (eg. lipid disorders, osteogenesis imperfecta, PXE)
- (3) Bone health
- (4) Nutrition support for wasting disorders (oral, enteral, TPN)

The Clinical Nutrition & Metabolism Unit personnel are also actively involved in health promotion through the hospital's Health Promoting Hospitals project and in other ways.

At the postgraduate level, clinical nutrition cannot prosper unless the scholarship of the discipline prospers through research and publication, and through the promotion of the relevant special society.

Antigen absorption: food, fire or fuel?

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The epithelium of the gastrointestinal tract is constantly exposed to a variety of antigens. In healthy individuals, only small amounts of ingested dietary antigens are absorbed. The normal immune response to absorbed food antigens is one of tolerance, which enables food antigens to play their nutritive role without causing disease (antigens as food). Breakdown in tolerance results in a spectrum of abnormalities, including food sensitive enteropathy and food intolerance (antigens as fire). When food sensitive enteropathy is subclinical, continued ingestion of the offending food antigen results in tolerance and resolution of the enteropathy. We have observed this phenomenon in infants with soy protein (SP) enteropathy. In a significant proportion of these SP tolerant

infants, the development of tolerance to SP can be prevented by interrupting the SP feeds by cow's milk protein (CMP) feeds. Is the breakdown in tolerance to SP induced by CMP in these infants an example of CMP acting as fuel for the fire of SP? While genetic constitution seems to be the major player in the heightened IgE responsiveness in atopic disorders, environmental factors such as breast feeding, immune responsiveness and epithelial integrity of the gut at the time of introduction of new food antigens to the diet and additive effects of different dietary antigens in potentiating gut mucosal injury seem to be more important in the pathophysiology of food sensitive enteropathies in infants.

Food allergy and food intolerance in young children

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Adverse reactions to food are common in young children. A clear understanding of the differences between food allergy (immunological) and intolerance (non-immunological) is necessary in order to plan investigation and dietary management.

A food allergy is an IgE-mediated reaction to one or more food proteins. Food allergies occur in highly atopic infants and young children who have eczema and cause an immediate reaction around the mouth which may be followed by vomiting, hives, swelling, breathing difficulty and shock. Because specific antibodies are present in the blood, skin prick testing is a reliable way to confirm a food allergy but must be interpreted carefully in the clinical context.

Egg, cow's milk and peanuts are the three most common food allergens. Sensitisation occurs in the first 3-4 months of life, through breast milk or via direct feeding. Avoidance and advice to deal with accidental contact are the only forms of treatment. Food allergies tend to remit with time, but may persist in very atopic children. In 68 children with eczema, the incidence of food allergies was 79% before 10 months and 23% at 7 years. Allergy to more than two foods is very uncommon. In a separate study of people with eczema, food chemical intolerance

reactions were shown to irritate the rash in 47%.

Food intolerance is a reaction to chemical substances found in many foods. Symptoms are dose-related and may be cumulative from eating a range of foods containing the same substance. Symptoms include irritable behaviour, headaches, gastrointestinal symptoms, rhinitis, leg cramps, recurrent hives or aggravation of asthma and eczema. Symptoms can be isolated or occur in any combination and vary with time. The reaction can be within thirty minutes or up to 48 hours after eating a problem food. Although preservatives and the salicylates are most likely to cause reactions, the range of substances that affect a sensitive person is highly individual. Fruit, fruit flavoured food and drinks and savoury snacks are likely to be implicated from the history. Food chemical intolerance can only be assessed by means of an appropriate elimination diet and challenge protocol. Blood and skin tests are not helpful or appropriate to identify problem foods.

Atopic infants and young children can have a complicated food reaction history due to the coexistence of food allergies and food chemical intolerance.

Assessment of isoflavones on serum lipids and lipoproteins

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Epidemiological studies suggest that phenolic compounds, flavonoids and isoflavonoids prevent coronary heart disease. There are over 3000 of these compounds occurring naturally. They are reported to have oestrogenic, antioxidant and antiatherosclerotic activity. To assess the mechanism of the putative cardio-protective effect of these phenolic compounds, we assessed the effect of supplementation on serum lipids and lipoproteins in humans. The major isoflavones, daidzein and genistein, were given 100 mg per day in tablet form, a dose less than in some Asian and Mediterranean diets. Twenty-three healthy subjects (13 male, 10 female) aged 28 to 67 years not on cholesterol-lowering nor hormonal drugs were enrolled in a blind crossover study. Subjects were

allocated either a placebo or an active concentrate for one month, then switched to the alternative tablets. The results found no significant difference in total cholesterol between treatment or placebo phases and baseline (baseline- 6.28 mmol/L, Isoflavone- 6.12 mmol/L, placebo 6.21 mmol/L). Similarly the other lipid parameters measured (triglycerides, HDL, Lp(a), Apo A1 and Apo B) also showed no significant change from baseline. Isoflavone supplementation did not favourably effect serum lipids nor lipoproteins in this group of healthy volunteers. Modification of lipid profile is unlikely to be the mechanism of the putative cardio-protective effect of isoflavones.

Varying content of polyphenols in olive and other edible oils-- a neglected aspect of nutrition and cardio-protective diets

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The traditional Mediterranean diet may be high in monounsaturated fat and is associated with a lower incidence of coronary heart disease (CHD). The monounsaturated fat is largely derived from olive oil. The polar fraction of the oil contains over one hundred minor constituents. There are 10 polyphenols that occur frequently in olive oil. Phenols have antioxidant, vasodilator, anti-arrhythmic activities and may elevate high density lipoprotein (HDL).

The total polyphenolic content of three grades of olive oil and 10

commercially available vegetable and seed oils were estimated by spectrophotometric analysis. Extra virgin olive oil had the greatest amount of polyphenols. Other olive oils and macadamia oil had levels of polyphenols approximately 20% of the extra virgin level. The other oils had either half this level or no detectable polyphenols.

Polyphenolic content in edible oils varies considerably. The content may be of biological significance, and relevant in designing an optimal cardio-protective diet.

Potential benefits and concerns for Otago vegetarians

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Vegetarians have a lower incidence of a number of chronic diseases, such as coronary heart disease, diabetes, obesity, gallstones and arthritis¹. However, there is concern that some people eating a vegetarian diet may not obtain an adequate intake of some nutrients, particularly iron and vitamin B12. In New Zealand the recommended daily intake (RDI) for iron follows the Australian Recommendations and is 12-15 mg for adolescents and menstruating women, and 7 mg for men and post-menopausal women². Recent studies indicate that median intake of New Zealand women is below this³. Individuals on a diet with poor iron bioavailability, or women with high menstrual losses might be particularly at risk of developing iron deficiency.

The nutritional intake of 50 adult vegetarians (5 vegans) and 50 age-sex matched omnivorous controls was assessed using twelve day diet records. Protein, fat, saturated fat and vitamin D intake were significantly lower in the vegetarians, particularly in the vegans. Dietary fibre was higher in the vegetarians, and intake of calcium and zinc was similar, although vegans had a lower calcium intake. Mean (SD) iron intake in the vegetarians and vegans of 16.8 (4.8) mg/day was significantly greater than that of the omnivores - 14.6 (4.3) mg/day ($P < 0.02$). All the iron consumed by the vegetarians was non-haem; for the omnivores 10% was haem iron.

Serum ferritin concentrations were significantly lower in male vegetarians than omnivores; mean (SD) - 36.6 (36.0) and 105.4 (78.7)

ng/ml respectively, $P < 0.01$ and significantly more had values below 12 ng/ml ($P < 0.001$), despite having iron intakes well above the Recommended Nutrient Intake (RNI). Female vegetarians also had lower ferritin concentrations; mean (SD) 13.6 (7.5) compared to 33.6 (54.3) ng/ml, $P < 0.01$, and medians of 12.3 and 15.5 ng/ml respectively, but similar numbers of women had values below 12 ng/ml (42% and 39%) regardless of whether they were vegetarian or not.

Vitamin B12 intake appeared significantly lower in the vegetarians, and all the vegans had intakes below the RNI. Thirty-five percent of the long-term vegetarians and vegans had serum vitamin B12 concentrations below the reference range.

Thus, although the vegetarians had diets nearer to the recommended diet with a lower fat and salt content and more fibre, a significant number need advice to improve their haematological status, as do some omnivores. Recommended intakes of iron may also need to be higher for vegetarians, particularly men.

References:

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2. Trusswell A. (1990). *Recommended nutrient intake; Australian Papers.* (Australian Professional Publications: Sydney)
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Nuts a balanced food: an important component of an anti-atherosclerotic diet.

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Nuts have been part of the human diet from prehistoric times through to the present day. In contemporary hunter gatherer communities, wild beans and nuts are the major sources of vegetable protein. Indeed in some groups, nuts are the major dietary staple. In the Mediterranean countries from the dawn of civilisation through to the present day nut consumption has been a regular part of the diet.

Regular nut consumption is associated with low risk of coronary heart disease (CHD) and this has been found in two independent epidemiological studies. Nut consumption five or more times per week was associated with 53% risk reduction of CHD in a six year follow up of 31,000 participants in the Adventist Health Study. The five year follow up of 35,000 white women in the Iowa Women's Study showed a 40% risk reduction in regular nut consumers.

There have now been five studies that have shown a decrease in total cholesterol and LDL with preservation of HDL when saturated fat and carbohydrates are replaced with nuts. A diet reasonably high in fat but enriched with nuts is generally as effective as an American Heart Association Phase II or III cholesterol lowering diet.

Nuts generally are rich sources of monounsaturated fat,

predominantly oleic acid. The Macadamia nut is the richest diet source of palmitoleic acid. A diet enriched with oleic acid is associated with decreased susceptibility of oxidation of LDL, improvement of fluidity of the HDL which is associated with a greater ability to stimulate cholesterol efflux from cells, and an increase in the fluidity of LDL which decreases the atherogenicity. Nuts are also rich sources of arginine and have a favourable lysine:arginine ratio which is associated with less diet induced atherosclerosis beyond the serum cholesterol level reduction. Nuts are also rich sources of fibre, magnesium, potassium and possibly boron.

Nuts have been consumed by humans since the dawn of time and recent studies show that regular consumption is associated with a low incidence of CHD. Metabolic studies show that regular nut consumption is associated with lowering of serum cholesterol and there may be other metabolic benefits in addition to cholesterol lowering. Nuts are a food source rich in many components. They may help prevent atherosclerosis, enhance the flavour of food and should now be considered as an important component of a cholesterol antiatherosclerotic diet.

Studies on lipoprotein(a) in a Melbourne Anglo-Celtic population

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Background: A high level of serum lipoprotein(a) [Lp(a)] is now widely recognised as an independent risk marker for atherosclerosis and 300 mg/L is the generally accepted risk threshold value. Recently, there has been an increased interest in the distribution of Lp(a) levels in various ethnic populations.

Aims: This study investigates the distribution of Lp(a) in a Melbourne Anglo-Celtic population and assesses the relationship between Lp(a) and other lipids.

Methods: Serum Lp(a) was examined in 348 Anglo-Celtic Australians (male 157 and female 191), aged 24-86 years and resident in Melbourne. Serum Lp(a) was quantified using an in-house immunoturbidimetric assay on a Cobas Fara analyser (Roche). Apo(a) isoforms were identified by SDS polyacrylamide gel electrophoresis.

Results: The distribution of Lp(a) concentrations was highly skewed towards lower levels in this Anglo-Celtic population with 36% of the values being less than 100 mg/L and 68% below the generally accepted risk threshold of 300 mg/L. Apo(a) phenotypes S3, S4 and S5 (homo- and heterozygous) forms were identified in 48% of this population, with the lower molecular weight isoforms (F, B, S1 and S2) comprising 52% of the total. Correlations between Lp(a) and other lipid indices are shown in the table.

Spearman partial correlation coefficients (adjusted for age) between Lp(a) concentrations and lipid indices

Lp(a) levels	Total	Male	Female
Cholesterol	0.09	0.13	0.07
Triglyceride	-0.11*	-0.17*	-0.06
HDL	0.03	0.03	0.04
LDL	0.14*	0.2*	0.09
LDL/HDL Ratio	0.07	0.09	0.06

*p<0.05

Comments: The highly skewed distribution of Lp(a) and the inverse relationship between Apo(a) isoforms and Lp(a) concentrations in this population compares with other studies of Caucasian populations. A negative correlation between Lp(a) and triglycerides was confirmed. A positive relationship was found between Lp(a) and LDL but in both these instances, applied to the male cohort only. No correlation was found to exist between Lp(a) and any of the other lipid parameters.

A forecast on the incidence of cardiovascular disease in a Sikh population

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Despite a high rate of vegetarianism, the male Sikh population in Sydney has a higher atherogenic lipoprotein profile than the general Australian population. We have previously found that the risk of cardiovascular disease (CD) in male Sikhs is significantly higher than that of their female partners. The aim of this study was to assess the total risk of CD in the Sikh community.

The subjects of this study were 102 (51 pairs) non-smoking married Sikh couples of age 25 to 70 years. Data on behavioural variables were collected by administering a questionnaire. Differences in the diets of male and female subjects were mainly in the drinking habits and vegetarianism. Blood pressure (BP) measurements were recorded before taking fasting blood samples for lipoprotein measurements. Age, sex, BP

(systolic), smoking status, diabetic status, total cholesterol (TC) and high-density cholesterol (HDL) were used to calculate the expected percent incidence of CD in the Sikh population over next ten years as well as the standard expected percent risk of CD according to data from Framingham Heart Study data.

These preliminary results show that the risk of CD in the Sikh population in Sydney is expected to be significantly higher (almost double) than the estimated value for the population without risk factors (p<0.005) especially in females and younger males. The risk of CD in Sikh males are also expected to be significantly higher than Sikh females (p<0.0005). More data are being collected to increase the sample size of this study.

The mean values of the CD expressed as the percentage risk over next 10 years

	Age Years	BP Systolic	BP Diastolic	TC	HDL	Diet % Veg	Alcohol % Drinking	% Risk Standard*	% Risk Sikh**	p-value *vs **
Female	39.4	120.3	75.5	4.99	1.19	21.6	5.9	1.05	2.6	<0.005
51	±13.6	±19.8	±13.8	±0.97	±0.31			±1.04	±4.0	
Male	42.7	125.1	80.7	5.40	1.00	11.8	58.8	3.80	6.9	<0.005
51	±13.8	±16.9	±10.4	±0.98	±0.20			±3.80	±6.3	

The effect of medium chain triglycerides on postprandial glucose and lipid metabolism in NIDDM and hypertriglyceridaemia

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An exaggerated postprandial lipaemia may contribute to the increased risk of coronary artery disease associated with non insulin dependent diabetes (NIDDM) and hypertriglyceridaemia. Dietary substitution of medium chain triglycerides (MCT) may reduce postprandial lipaemia, as these are not re-esterified after absorption and are not incorporated into chylomicrons. However, preferential hepatic oxidation of medium chain fatty acids may adversely affect postprandial glucose metabolism via the glucose-fatty acid cycle. To investigate this possibility, indirect calorimetry was used to measure postprandial rates of glucose and fat oxidation over 9 hours in 13 hypertriglyceridaemic patients (5 NIDDM and 8 normal glucose tolerance; mean fasting plasma triglyceride $3.8 \pm 0.4 \text{ mmol.l}^{-1}$ who were given isocaloric oral glucose (40 g.m^{-2} body surface area) and fat (40 g.m^{-2}) loads containing glucose and long chain

triglycerides alone (G + LCT) or glucose and a mixture of LCT and MCT (each 20 g.m^{-2} ; G + LCT + MCT) in a single-blind randomised crossover study. The oral glucose and fat loads were well tolerated by all subjects. When compared to G + LCT, the early (<6h) postprandial increase in glucose oxidation was reduced following G + LCT + MCT ($p < 0.05$) while fat oxidation showed a reciprocal increase ($p < 0.05$). Postprandial triglyceride responses (9 hour incremental area under curve) were reduced by $52.4 \pm 6.8\%$ (mean \pm SEM; $p < 0.002$) following G + LCT + MCT, however glucose responses were unchanged in all subjects. We conclude that partial isocaloric substitution of MCT for LCT may lead to a marked reduction in postprandial lipaemia in hypertriglyceridaemic NIDDM and non-diabetic subjects without short-term adverse effects on glucose metabolism.

Postprandial lipoprotein metabolism in a subject with non insulin dependent diabetes mellitus and fish eye disease

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There is an increased risk of coronary artery disease (CAD) in subjects with non-insulin dependent diabetes mellitus (NIDDM). Risk factors such as exaggerated postprandial lipaemia, elevated plasma triglycerides and reduced high density lipoprotein-cholesterol (HDL-C) are commonly seen in NIDDM. We have investigated the postprandial response following an oral fat load (40 g fat , 40 g CHO/m^2 body surface area) in a female hyperlipidaemic subject with NIDDM and an extremely low HDL-C level (0.1 mmol/L ; $< 10\%$ normal). The latter is caused by the HDL-deficiency disorder fish eye disease (FED), a condition where subjects are not at increased risk of CAD. Triglyceride-rich lipoproteins (TRL) of $d < 1.006 \text{ g/ml}$ and a $d > 1.006 \text{ g/ml}$ fraction (lipoproteins of intermediate, low and high density) were isolated by ultracentrifugation. HDL-C was measured after precipitation of apolipoprotein B-containing lipoproteins. Results were compared to control hypertriglyceridaemic (HTG) subjects with NIDDM ($n = 2$). In all subjects, plasma total

cholesterol (TC) and triglycerides (TG) increased postprandially and remained elevated over the 9 hr study, while HDL-C fell at 3 to 5 hr, and returned to fasting levels by 9 hr. Fasting HTG in controls was due to elevated TRL-TG (2.5 mmol/L), while fasting HTG in FED was due to an increased $d > 1.006$ -TG but fasting TRL-TG (0.6 mmol/L) was within normal limits. In all subjects, the postprandial increase in plasma TG was due to TRL-TG levels which remained elevated at 9 hr. TRL-TG increased 1.7 mmol/L from baseline in both FED and controls. The postprandial $d > 1.006$ -TG and apoB levels remained stable at 3.4 mmol/L and 2.36 g/L , respectively, in FED and 0.6 mmol/L and 1.35 g/L , respectively, in controls. We conclude that the overall pattern of postprandial changes in NIDDM are similar in the subject with FED compared to control subjects, despite the 10-fold difference in HDL-C and differences in TG distribution between TRL and the $d > 1.006 \text{ g/ml}$ fraction.

Selected mineral interactions in women with child bearing potential

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A significant amount of evidence suggests that micronutrient supplements are associated with a reduced risk of pregnancy complications, including birth defects in humans and animals. Although positive arguments can be made for the implementation of supplementation in some women, a significant concern is that widespread supplementation may inadvertently lead to the consumption of excessive levels of some nutrients that would produce toxicity, deficiency or adverse mineral-mineral interactions.

We carried out 2 studies in women with child bearing potential to determine the effect of Ca supplements on Zn absorption and also the effect of Zn supplements on Cu metabolism.

To determine the effect of Ca on Zn absorption, the Zn tolerance test, which is the plasma Zn response to an oral Zn challenge, was used. Nine healthy subjects underwent 3 tests in random order, each time consuming either 4.5 mg elemental Zn, Zn with 600 mg elemental Ca as carbonate or as citrate. Venous blood samples were obtained at 30 min intervals for 4 hours. The area under the plasma Zn curve following the co-ingestion of Zn with Ca carbonate and Ca citrate was significantly lower ($P < 0.017$) than when Zn was ingested alone. The substantial decrease in Zn absorption (80%) following the co-ingestion of Zn with

the 2 Ca salts suggests that elemental Ca is the inhibiting factor.

In the second study, 6 healthy volunteers were asked to supplement their habitual diet with 50 mg of elemental Zn per day for 12 days. Zn concentrations were measured in the erythrocytes (E) and in the plasma by atomic absorption spectrometry. Cu status was assessed by the marker enzyme, E-superoxide dismutase (SOD). Zn concentrations in plasma and erythrocytes tended to increase (18.3 ± 1.4 vs $20.1 \pm 1.0 \text{ } \mu\text{mol/L}$ and 35.6 ± 3.4 vs $36.5 \pm 2.4 \text{ } \mu\text{g/gHb}$, respectively) however, E-SOD activity showed a significant decrease following supplementation 2371 ± 168 vs $1843 \pm 76 \text{ U/gHb}$, $P < 0.02$). Thus, a detrimental effect of increasing Zn intake on Cu bioavailability is reflected by a reduction in the activity of E-SOD within 12 days of supplementation with Zn (4xRDI). Given the recent interest in Zn as an antioxidant, the aim of increasing the intake of Zn in the hope of promoting the cellular antioxidant potential must be balanced against the subsequent and rapid decrease in the activity of SOD.

If mineral supplementation is to be implemented, more information about mineral interactions is required and caution should be exercised to ensure that the total intake from supplements and the diet is not excessive.

Boron excretion in men: intra and inter individual differences

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Numerous studies suggest that boron (B) interacts with other nutrients and plays a regulatory role in the metabolism of minerals, such as Ca, and subsequently bone metabolism. Although the mechanism of action has not been defined, it may be mediated by increasing the concentration of steroid hormones such as β -oestradiol (For review, see Naghii & Samman, *Prog Fd Nutr Sci* 14, 331-349).

The B content of foods is determined by different geological conditions and agricultural methods and therefore intake varies greatly. In the absence of universally applicable food composition data, a reliable way of estimating B intake is by its urinary excretion (of iodine, fluoride). The aim of this study was to determine the magnitude and variation in B excretion in a group of healthy men (average age: 26y; BMI, 24; n=18). The subjects were not taking any form of medication or supplements and they were asked to maintain their habitual diet during the trial. Twenty four hour urine collections were obtained on 2 occasions separated by 3 weeks. B was analysed spectrophotometrically.

The mean concentration of urinary B was in the range 0.4-3.5 mg/day and the concentration was similar within individuals when expressed in absolute terms, relative to creatinine excretion or relative to

body weight as shown in table.

Urinary boron and creatinine excretion (mean \pm SE, n = 18)

	Occasion 1	Occasion 2
Urinary B (mg/d)	1.87 \pm 0.15	1.90 \pm 0.23
Creatinine (mmol/d)	14.6 \pm 0.7	15.4 \pm 1.2
B/creatinine (mg/d)	0.13 \pm 0.01	0.13 \pm 0.01
B/body weight (mg/kg)	0.03 \pm 0.01	0.03 \pm 0.01

Excretion of anionic trace elements, such as B, is mainly through the urine and the magnitude of the daily intake is reflected by the 24-hour excretion. Any variation in B excretion (and therefore intake) is thought to be influenced by the concentration of B in the water supply, individual food preference, and ingestion of B as an ingredient of many personal-care products and food preservative. Based on our results, B intake in this group of subjects was approximately 2 mg/day and showed little variation in the short term.

Is erythrocyte alkaline phosphatase activity a marker of zinc status?

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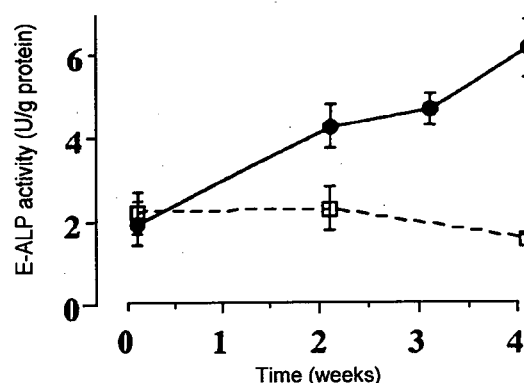
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Alkaline phosphatase (ALP, EC 3.1.3.1) is a dimeric protein with each subunit containing two Zn atoms: a tightly bound atom which is essential for its structural integrity and a second, less tightly bound atom which is involved in the catalytic process. The activity of ALP in erythrocytes (E) decreases as a result of a low Zn diet which suggests that this enzyme may be a marker of Zn status. To investigate this further, we determined the response of E-ALP in healthy subjects following supplementation with 50 mg Zn (4.2 x RDI) daily for 4 weeks. If E-ALP is to be accepted as a marker of status, its activity should decrease with Zn depletion and subsequently increase during supplementation.

Ten male volunteers, took part in a trial lasting 4 weeks. Six subjects were asked to consume 50 mg Zn (as 220 mg Zn sulphate) and 4 subjects were not supplemented. E-ALP and indices of Zn status were determined.

Apparent compliance, as assessed by capsule count was 97.5 \pm 2.4% (Mean \pm SE). All subjects were within the acceptable range of BMI and based on the 7 day weighed record data, their Zn intake was adequate. A small but significant increase in plasma Zn was observed with supplementation (P<0.05), whereas, there was no significant change in E-Zn over the same period. Plasma and E-Cu showed no change. As shown in the figure, the activity of E-ALP increased in all supplemented subjects (P<0.0001).

Consistent with previous results, our data further support the hypothesis that E-ALP is a marker of Zn status as it has been shown to decrease in deficiency and increase during supplementation. The small



change observed in plasma Zn is not biologically significant in view of the many documented factors which influence its concentration. No significant change in E-Zn was observed supporting the suggestion that E-Zn do not reflect changes in Zn status possibly because of the strict intracellular regulation of Zn concentrations. We suggest that measuring changes in metalloenzymes activities of erythrocytes may be a more useful approach for determining Zn status.

Body composition in chronic anorexia nervosa

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Up to 25% of patients with anorexia nervosa (AN) can be considered chronic (1) and mortality among these is estimated to be as high as 20% (2). Little is understood about this patient group and there is need for a prognostic indicator for chronicity. The aim of this study was to examine clinical history and measure body composition in chronic anorexic women. This group could then be compared to both normal and other studied AN populations and relationships between clinical indicators and body composition examined.

Seven females were studied, from a total of 19, who fulfilled DSM-III-R criteria for the diagnosis of AN, with the exception of menstrual status. The average age was 34 (SE \pm 4) yrs and duration of illness 17 (SE \pm 3) yrs. A normal population was selected based upon having the same age as the subjects. In a subject interview, demography, medical history, diet history and weight related behaviours were recorded. Total body nitrogen was determined using in-vivo neutron-activation analysis (3) together with anthropometric measurements (4).

The chronic AN group showed significant depletion of both protein and fat compartments compared to the normals and was not dissimilar to that seen in studies of acute AN patients requiring refeeding (see table). Dietary energy intake was 50% of that recommended and although vitamin intakes were largely adequate, zinc intake was less than 40% of recommended for five subjects and iron less than 66% for three. No relationships between clinical indices and body composition were detected. A participation rate of 37% highlights the difficulties in studying this particular group, and more subjects will be required to further examine the existence of a predictive relationship between body

composition and clinical history.

Variables	Normals n=7 mean \pm SE	Chronic AN n=7 mean \pm SE	Acute AN (5) n=32 mean \pm SD
Body mass index (kg/m ²)	21 \pm 0.5	16 \pm 0.7	15.4 \pm 1.3
Nitrogen index	0.981 \pm 0.04	0.775 \pm 0.04	0.735 \pm 0.11
Nitrogen/ lean body mass (g/kg)	36.3 \pm 0.9	32.1 \pm 1.1	—
Percent body fat	26 \pm 1.3	16 \pm 2.2	15.2 \pm 5.0

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Previous Scientific Meetings of the ACNS were held:

Inaugural	Sydney	11 May 1988
1st	Melbourne	2 May 1990
2nd	Singapore	21 September 1991
3rd	Dunedin	26 August 1993