

Dietary Supplements: Sorting Fact from Fiction

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Early scientific research into food and nutrition was directed towards identifying the essential nutrients¹. Indeed, several of the Nobel prizes in Physiology and Medicine at the beginning of the last decade were awarded for work on discoveries related to vitamins and the recognition of their ability to cure deficiency diseases. The public and medical enthusiasm which resulted is reflected even today in the 'magic bullet' image of nutrition. It is also reflected in the consumption of 'vitamin products' in the belief that these provide essential or desirable supplementation even to a healthy diet.

A vast number of dietary supplements have been marketed either to supplement the diet or to meet special therapeutic needs. The sales of such dietary supplements are in a number of countries substantial and even on the increase^{2,3}. Dietary supplements were traditionally

considered to be composed only of essential nutrients, such as vitamins and minerals, and proteins. Through the U.S. Dietary Supplement Health and Education Act⁴ the meaning of the term 'dietary supplements' was expanded to include other substances. Thus, dietary supplements fall into several categories

including vitamins and minerals, 'unofficial' vitamins and minerals (e.g. inositol, choline and silicon), natural oils (e.g. fish oils, evening primrose oil), natural substances (e.g. ginseng, garlic), and enzymes (e.g. superoxide dismutase).

Although a vast amount of information exists about dietary supplements, not all of it is reliable. This can lead to confusion among health professionals as well as the general public. As dietary supplements are not considered to be drugs, pharmacists are often unfamiliar with them and because they are not foods (in the sense of being part of a normal diet) nutritionists are wary of recommending them⁵. Health professionals should recognise that evidence for claims made for dietary supplements is often conflicting and inconclusive and based on uncontrolled clinical trials or anecdotal reports.

What are the Recommended Intakes for Vitamins and Minerals?

The scientific community and governmental authorities have assessed evidence as to requirements for vitamins and minerals in the population and have issued recommendations on the daily intake levels of these substances⁶⁻⁹. 'Recommended Dietary Allowances' (RDAs) were established by the U.S. Food and Nutrition Board¹⁰. The RDA is the standard used on the labels of dietary supplements and is often interpreted as the minimum desirable intake for optimal health. In fact, the RDA covers the needs of most of the population, even those with high requirements, and is in excess of what most individuals require. The UK developed 'Dietary Reference Values' (DRVs) in an attempt to overcome the misuse of RDAs¹¹. The term 'recommended' has been replaced by 'reference' to emphasise that the figures are estimates or reference values and not absolute recommendations for intakes by individuals. Also, a single figure, the RDA, has been replaced by several which are based on the assumption that the requirements for nutrients in a population follow a normal distribution curve. The 'Estimated Average

Table 1: Possible indications for dietary supplementation⁵

Groups at risk of deficiency include:

- People in a particular demographic category e.g. infants and children, adolescents, women during pregnancy and lactation and throughout the reproductive period, and the elderly.
- People whose nutritional status may be compromised by lifestyle (enforced or voluntary), e.g. smokers, alcoholics, drug addicts, slimmers, strict vegetarians (i.e. vegans), food faddists, individuals on low incomes and athletes.
- People whose nutritional status may be compromised by surgery and/or disease, e.g. malabsorption syndromes, hepato-biliary disorders, severe burns and wounds and inborn errors of metabolism.
- People whose nutritional status may be compromised by long-term drug administration (e.g. anticonvulsants may increase the requirement for vitamin D).

Requirement' (EAR) is the mean requirement; the 'Reference Nutrient Intake' (RNI) is, like the RDA, set at two standard deviations above the mean, and the 'Lower Reference Nutrient Intake' (LRNI) at two standard deviations below the mean.

Indications for Dietary Supplementation

International scientific bodies agree that there is no justification for the widespread use of most vitamin and mineral products, whether sold as foods or pharmaceuticals¹²⁻¹⁵. It is considered that in a community where a reasonably varied diet is readily available, that diet will provide not only the macronutrients but also all the micronutrients which the body needs¹⁶. Table 1 gives some possible indications for dietary supplementation.

Antioxidant nutrients and future perspectives

Currently, there is considerable interest in antioxidant nutrients and their potential health-promoting properties¹⁷⁻¹⁹. Epidemiological evidence is emerging that low plasma levels and low dietary intakes of antioxidant nutrients are related to an increased risk of diseases such as coronary heart disease and cancer²⁰. There is also increasing evidence that these diseases can be prevented or delayed to some extent by dietary changes, in particular by increased consumption of fruits and vegetables. This, together with

scientific hypotheses about molecular and tissue damage from biological oxidation mechanisms, have increased interest in antioxidant nutrients and the possible benefits of supplemental beta carotene, vitamin C and vitamin E and other minerals and trace

elements²¹.

Antioxidants are believed to protect against certain diseases by preventing the deleterious effects of free-radical-mediated processes in cell membranes and by reducing the susceptibility of tissues to oxidative stress. Further research is required to assess whether supplementation of adequately nourished subjects with antioxidant nutrients will reduce the incidence of disease. The few intervention trials of antioxidants reported so far have shown little evidence for the value of supplements²¹. Although several epidemiological studies have found lower serum levels of antioxidant nutrients in patients with cardiovascular disease, cancer and cataracts, there is, as yet, little evidence that supplements of antioxidant nutrients prevent disease.

Role of the Health Professional

When asked about supplements, health professionals should emphasise

Table 2: Toxic doses of nutrients⁵

	RNI ¹	Toxic dose/day	Maximum levels ²
Vitamins			
Vitamin A (as retinol)	700µg (2,310 units)	6mg (19,800 units)	600µg (1,980 units)
Niacin	17mg		50mg
Nicotinic acid		3-9g	
Nicotinamide (s/r ³)		500mg	
Vitamin B ₆	1.4mg	50mg	10mg
Vitamin C	40mg	6g	600mg
Vitamin D	-	500µg (20 000 units)	5µg (200 units)
Minerals			
Chromium	-	1-2g	100mg
Cobalt	-	300mg	30mg
Copper	1.2mg	50µg/kg	3mg
Fluorine	-	10mg	1mg
Germanium	-	20mg	
Iron	8.7mg	40mg	4mg
Iodine	140µg	1000µg	1000µg
Molybdenum	-	10-15mg	1mg
Nickel	-	250mg	
Selenium	75µg	1mg	1000µg
Zinc	9.5mg	20mg	2mg

1. RNI for men aged 19-50years
 2. Maximum daily doses of vitamins and minerals in dietary supplements recommended by MAFF¹³
 3. Sustained release

the importance of consuming a diet based on healthy eating guidelines. This is a diet rich in starchy carbohydrates, including fruit and vegetables, and low in fat, sugar and salt. As a health professional, one should be aware of dietary standards and good food sources of nutrients. One should be able to assess an individual's risk of nutrient deficiency and the need for further referral, by asking questions to detect physical, environmental and social conditions which may predispose to inadequate intakes. There is also a need to be aware of the potential for adverse effects with supplements. Thus, when a client or patient presents with any symptoms, questions should be asked about the use of dietary supplements. Individuals will not always volunteer this information without prompting because they believe that supplements are 'natural' and therefore safe. Health professionals should make their clients aware of the existence of badly worded claims and advertisements, and of the dangers of supplement misuse.

Pharmacists have a particular responsibility when dispensing any supplement with perceived health benefits. Pharmacists must be careful to avoid giving their professional authority to a product which may lack any health or therapeutic benefit or has risk associated with its use. Pharmacists must not give the impression that any supplement is efficacious when there is no evidence for such efficacy. However, providing that a product is not harmful for a particular individual, the freedom to

use it should be respected. What is important is that consumers are able to make informed and intelligent choices about the products that they buy.

The pharmacist should advise healthy individuals to obtain adequate nutrient intakes from foods eaten in variety and moderation rather than supplements. All nutrients are potentially toxic when ingested in sufficiently large amounts over prolonged periods of time. Table 2 provides a list of nutrients and their toxic dose.

Conclusion

In the field of dietary supplements, incorrect and unsubstantiated claims have been advanced and there has been much public misunderstanding, often reflecting premature publicity accorded to preliminary and unconfirmed findings. Consumers should be discouraged from using excessive doses of supplements which could be harmful, and from using such products in the place of more orthodox disease treatment, particularly without the knowledge of their doctor.

A varied and balanced diet supplies all the necessary nutrients. Supplements are required only for the treatment of established nutrient deficiency and for the prevention of deficiency in certain 'at risk' groups of the population. Nutrition experts agree that until further conclusive evidence emerges, healthy food choices can best provide the variety and balance of vitamins, minerals and other nutrients needed for good health. ★

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List of Abbreviations

RDA	Recommended Dietary Allowances
IUNS	International Union of Nutritional Sciences
DRV	Dietary Reference Values
EAR	Estimated Average Requirement
RNI	Reference Nutrient Intake
LRNI	Lower Reference Nutrient Intake
DoH	Department of Health
MAFF	Ministry of Agriculture, Food and Fisheries
NIH	National Institutes of Health
NRC	National Research Council
WHO	World Health Organisation

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