

# Nutrition Problems and Trends in Nutrition Research and Training in the 90's

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## Abstract

Food and nutrition science is a most stimulating and satisfying intellectual exercise. Understanding how food affects our biology and health itself contributes to our intellectual health. But the principal issues in Nutrition and Health now and for the future are these :

1. The increasing contribution of molecular biology, as opposed to nutrient biochemistry. In parallel there is more integrative nutrient and food component methodology which is allowing us to consider food and food patterns more objectively, along with the socio-cultural context of food consumption.

2. The emphasis on nutritional problems in the young is shifting to those in later life.

3. The need to integrate developments in preventive and therapeutic nutrition.

4. The difficulties which have arisen with public nutrition education where it has been overly assertive and dogmatic and a move towards respect for and improvement of individual decision making or "informed choice".

5. Increased health care and other (teaching, agriculture, food industry, economics, sociology) professional training and research in nutrition.

6. The development of national and international nutritional policies. The WHO "Health for all" objective helps focus these policies.

## Introduction

We are intimately linked to our food and have for most of human history, been linked to its production and preparation<sup>(1)</sup>.

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Our increasing separation from production and preparation and alienation from the soil and land, will be one of the great research and training challenges for nutrition by the next century.

Yet, if for no other reason, scientific enquiry into food and nutrition science would be of value in its own right, as a stimulating and satisfying intellectual exercise. It is the nature of our species

that we like to have understanding. Comprehension of how food affects our biology and health itself contributes to our intellectual health and sense of well-being.

We do, nevertheless, need to consider how a number of value systems affect the way in which we think about nutrition and health. Our values go beyond the spirit of enquiry, to the ethical, the spiritual (which for some is the religious), the cultural, the societal, the family relationships and, pervasively, the monetary and the material.

### **Perspectives of nutrition and health**

There are various ways of looking at the relationships between nutrition and health. Often these are the product of methods available to us or the training that we have. They therefore have particular relevance to discussion about the kind of research that we do or the formal training that we require.

#### *The molecular perspective*

This is the newest way we have of examining the influence of nutritional status on health. It arises directly out of the revolution in molecular biology. For a while it looked as though this revolution would distract investigators from a more global and integrative approach to health and the bearing that food intake might have on it. However, after a relatively brief few years of rapid development in molecular biology, researchers have begun to identify ways in which food can modulate gene expression. This is best evidenced by changes in production of distinct messenger RNAs in response to dietary change<sup>(2)</sup>. We will increasingly understand the various bases of how, for a particular genetic make-up, food influences our biology. It means, as well, that we will

be able to monitor, at the cellular level, the precise changes wrought and ahead of sequelae further down the chain of biological response. A whole new range of options by which we might influence human health will emerge. Some of the new and important question will be how much genetic variation can be tolerated with a particular way of eating, to what extent are other ways of eating desirable or possible, and to what extent can we afford to manipulate genetic response to food intake. As a matter of fact, all of these will make it only more compelling to examine food-health relationships at the macro-physiological and socio-cultural level. The reasons are principally that the many complexities of food chemistry and of the determinants of food intake may allow checks and balances not in evidence in a particular messenger RNA response to a particular stimulus.

#### *The nutrient perspective*

Traditional nutrition science has been, in the main, nutrient science. It has been characterized by the description of macro- and micro-nutrients, their biochemistry and physiology, and the clinical consequences of excesses or deficiencies of intake. Clinical syndromes, like pellagra, and public health problems, like iodine deficiency syndromes, have been so described. On the one hand, with advances in molecular biology, more fundamental ways of describing these problems will be available. And, on the other hand, with greater understanding of food, food chemistry, food patterns and food culture, nutrient science will be found to have increasingly limited horizons. For example, apparently similar intakes of selenium, in one part of the world are associated with selenium-deficiency manifest in cardiomyopathy, while in other parts of the world they are not; in one

part of the world a particular quantity and quality of fat intake is associated with a high incidence of coronary heart disease, and in another it is not. We have been slow to appreciate the multivariate basis of health problems and have naively expected that a change in intake of one nutrient will be highly predictive of clinical deficiency or excess once certain thresholds have been crossed. We now understand better that genetic and a host of environmental factors can interact to modulate nutrient effects.

#### *The food perspective*

Yet another consideration is the biological importance of non-nutrient components of food. Some we have known about for a long while such as caffeine and salicylates. But even now the potential importance of naturally occurring salicylates in food for health outcomes like coronary heart disease have received scant attention. Compounds that we have known to be of importance in animal husbandry and production, like phytoestrogens have only recently come under scrutiny for their potential importance in human health. We have recently demonstrated that supplementation of post-menopausal women with different food stuffs (soya flour and red clover sprouts), significantly improves the status of vaginal cytology in post-menopausal women (G. Wilcox, M.L. Wahlqvist, H. Burger and G. Medley, submitted for publication). There are new nutritional implications here for post-menopausal osteoporosis and for cardiovascular disease. The effects of some foods on health indices cannot always be entirely accounted for by their known nutrient composition<sup>(3)</sup>. We have oversimplified nutrition and osteoporosis to calcium and bone. An example which has recently interested us is that men who consume fish have preferred

arterial wall characteristics to those who do not, in a way that is unlikely to be attributable entirely to omega-3 fatty acid content of the fish<sup>(4)</sup>.

In those with hyperlipidaemia, more reduction in serum cholesterol can be achieved than simply by an alteration in dietary fat intake, through the combined manipulation with plant food intake<sup>(5)</sup>.

Further, components of food not naturally occurring, namely residues, are of growing importance in human health. In 1983, in Asia and the Pacific the United Nations estimated that 2 million people were overtly poisoned by pesticides each year and 40,000 affected in toto. The concern about residues from pesticides<sup>(6)</sup> and from fertilizers<sup>(7)</sup> is now better appreciated.

In the quest for consistency of product and flawless appearance, a great deal of change in food chemistry is taking place in basic food commodities. A recent review "How the tomato lost its taste"<sup>(8)</sup> draws attention to the substantial loss of taste in tomatoes with these developments and the new need to satisfy consumers by restoration of those food components which have been lost. At this stage, we have little information about the biological consequences of the chemicals responsible for taste and smell. It would be surprising if some of them, which occupy receptors in the olfactory apparatus in the nose and in the taste buds of the tongue, are restricted in their biological activity to these sites.

Thus, future training in nutrition must emphasize the broader aspects of food chemistry. We can expect a surge of interest in the biological effects of the non-nutrient components of food in the next decade. This will change the way in which we think about food and health and there might come a time when the term

"nutrient" loses its present significance. If, for example, there are inhibitors of cholesterol synthesis at the level of the enzyme HMG CoA reductase to be found naturally in food, will we regard these as nutrients or not?

#### *The socio-cultural perspective*

Food and social activity are closely intertwined<sup>(9,10)</sup>.

Increasing social activity has a powerful prediction for life expectancy, as judged from the prospective study of two cohorts of Swedish men<sup>(11)</sup>. A number of these social activities are associated with food. One of the ways in which food may confer health might be through promotion of social activity and, in turn, well-being? Alternatively, social activity may contribute to health by way of encouragement of food intake. In relation to the latter possibility, Horwath has shown that elderly people who are more socially active have a greater variety in their food intake. Moreover, those who have a greater food variety have better personal scores of health status<sup>(9)</sup>.

At present it is unclear whether some cultures are more favourable to health because of the eating patterns intrinsic to them. In some cultures, like the Chinese, food is very tightly linked to social discourse and events; in others, like the contemporary western fast-food system, the food culture is recent, rapidly changing, and arguably fragile. Much cross-cultural food and health research is required to understand these matters.

#### *The economic perspective*

A food supply and its health implications are increasingly determined by the way in which profit can be had from the food chain. To some extent, this has always been so. The advent of subsistence agriculture provided new commodi-

ties for barter. The turning of grain into flour provided opportunities for millers and profit could be made in the process. Contemporary food industry seeks "the value-added product" where price mark-up is possible by changing primary commodities into more ready-to-eat products.

Much of the economic imbalance between nations is a reflection of food and food product trade. The formerly economically intact village or community is now a cash-cropping community, buffeted by the winds of international monetary fortune.

Moreover, a range of values has been increasingly discounted in favour of a solely economic value system. This has profound effects on the food supply and on health. Whether in Australia or in Indonesia, the socio-economically disadvantaged are at greater risk of nutritionally-related health problems, in various combinations of over or undernutrition. More nutritionists need training in economics and more economists need to work with nutritionists and health workers to address these problems. In the meantime, it is increasingly clear that education may transcend the socio-economic differential and improve the health of those economically disadvantaged. In Australia, for example, the coronary risk factor, serum cholesterol, is lowest among those with tertiary education and highest among those with only primary school education<sup>(12)</sup>.

#### *The political perspective*

The difficulty for many health workers, including those who deal with the nutritional aspects of health, is how the political process allows or disallows changes in the food supply conducive to health. I have seen this at close hand as chairman, until recently, of the Food and Nutrition Policy Project in the Australian

State of Victoria, the only state to have such a policy active, and more recently, as a member of the Victorian Inter-Departmental Committee which endeavours to link several government departments together in the interest of improvement in the food supply. The theme of Victoria's "Food and Nutrition Policy" is "to make healthy choices (about food) easier choices". The challenge is to find ways in which politicians can meet the expectation of their several constituencies and yet move the policy ahead. Gradually, new opportunities are being found for consumers to obtain and enjoy more whole grain cereals, fruits and vegetables, fish, leaner meat, products lower in salt, and a range of beverages lower in alcohol<sup>(13)</sup>. Again, there is a need for exposure, in training, of nutritionists to the political process and for active research into the nature of that process.

#### *The ecological perspective*

Curiously, our health may be more jeopardized by the adverse affects on our environment of the ways in which we are producing food, transporting it, storing it, packaging it and disposing of it, than in the eating of it<sup>(1,6,7,14,15)</sup>.

With the destruction of forests and other ecologies comes a reduction of the biological and genetic variation available on our planet, and deterioration of the atmosphere. In Australia, within 200 years of European settlement the damage has been prodigious compared with more than 40,000 years of Aboriginal land usage. Land made *arable* by certain fertilizers is then polluted with nitrate or cadmium or some other compound. *Intensive animal production*, as in the Netherlands<sup>(14)</sup>, is leading to what may be irreparable damage to environment and people, due to ammonia production, greater nitrate content of ground water

and phosphate content of surface water.

Freezing has been one of the great boons to the safe preservation of food, but now we are facing the consequences of chlorofluoro-carbon (CFC) refrigerants and destruction of the ozone layer; this will contribute to more skin cancer and cataract formation. The packaging of food in plastic and aluminium is contributing to a nightmarish accumulation of garbage in many cities<sup>(15)</sup>. There is an urgent need for research into more environmentally friendly packaging and storage systems.

#### **Changing age emphasis to later life**

Quite correctly, most concern about nutrition and health has been directed towards children in developing countries, up to half of whom may be dead before the age of 5 because of malnutrition. At the same time, it is important to be sure that the health of adults and elderly folk is not compromised by the nature of their food supply. We know little about the impact of food intake beyond childhood, on life expectancy, morbidity and well-being. Leading the way in this area has been the interest in nutrition and cardiovascular disease, principally that affecting the coronary vasculature and the cerebrovasculature. However, a wider range of nutrition problems than this in later life is now recognized :

1. Macrovascular disease and its risk factors (especially hypertension and hyperlipidaemia)<sup>(16)</sup>
2. Neoplastic disease (especially colo-rectal cancer, lung cancer and the gynaecological cancers of breast, uterus and cervix)<sup>(17)</sup>
3. Osteoporosis (with associated fractures of vertebral bodies, neck of femur and wrist)<sup>(18)</sup>
4. Non-insulin dependent diabetes

mellitus<sup>(19)</sup>.

5. Obesity<sup>(20)</sup>

6. Alcohol-related disease

7. Nutrient abuse<sup>(21,22,23)</sup>

At the same time there are many who live to a healthy old age. Indeed, the following current and projected populations of those over 65 years in developing and developed countries indicates the numerical importance of the elderly<sup>(24)</sup> :

Year	Over 65 years	
	Population (million)	Percentage
Developing countries		
1980	129	3.9
2000	229	4.7
Developed countries		
1980	129	11.4
2000	167	13.2

A particular problem amongst the aged can be a decline in immune function, with associated proneness to infection and probably neoplastic disease. Immune deficiency in the aged is potentially reversible, at least in part, by nutrition support<sup>(25)</sup>. The current definition of clinical nutrition problems in the Asian-Pacific region is likely to undergo considerable change as the age structure of these populations matures<sup>(26,27,28,29,30,31,32)</sup>.

Because of this awareness of the enormous potential for nutritional improvement of the health of the aged, the International Union of Nutrition Sciences Committee on Nutrition and Ageing, which I chair, in conjunction with the WHO Global Program for the Elderly (GPE), has embarked on a cross-cultural study of food habits and health in later life<sup>(33)</sup>. The key hypotheses are :

(1) Survival to old age is compatible with widely differing food habits.

(2) Non-nutritional variables, such as social activity, interact with food habits

to predict health status in the aged.

The significance of this work, now being conducted in several countries, is that it will allow us to document food habits amongst the aged in different cultures, before this information is irrevocably lost. And the program should contribute to nutritional and health policies, not only for the aged, but for their younger peers as they advance towards later life.

From the work completed amongst elderly Aboriginal Australians in the Kimberley region of north western Australia, amongst elderly Greeks in Spata near Athens and in elderly Chinese near Tianjin in China, new insights are already emerging. The present view that there might be a particular way of eating which is to be preferred above all others, reflected in current dietary guidelines in industrialized countries, is, therefore, being tested as one of the key hypotheses in this study<sup>(2)</sup>.

But one of the great values of survival to great age within a culture will be the maintenance of its food heritage - and its contribution to the diversity and resilience of the human species.

### Changing patterns of nutritional disorders

A crucial reason for intensive training and research in nutrition is the rapid change in patterns of nutritional disorders. This has implications for the numbers of people required to deal with the new set of problems and for the level of research activity necessary to grapple with the unknowns.

It might be thought that the nexus between malnutrition and infection was peculiar to developing countries. For at least 15 or 20 years there has been a fresh realization that almost any reason for hospitalization may be associated with malnutrition and lead to an individual

being immunologically compromised. But the new dilemma is the relationship between the acquired immunodeficiency syndrome (AIDS) and malnutrition<sup>(34)</sup>. Nowadays, when one sees a patient with malnutrition in the west, it is necessary to think of the possibility of AIDS. The question of the extent to which malnutrition increases the expression of AIDS and the question of the extent to which nutritional support may be of assistance in the management of AIDS are yet to be resolved.

What is often regarded as overnutrition as a basis for chronic disease, especially macrovascular disease in industrialized countries, may not be simply this. For example, it is becoming apparent that a relative lack of protective foods, such as fruits and vegetables, may be as important as the overconsumption of saturated animal fat from meat and dairy products in the pathogenesis of macrovascular disease<sup>(11,35)</sup>.

#### **Integration of preventive and therapeutic nutrition : the unnecessary public health and clinical dichotomy**

There has been a tradition of the separation of preventive and therapeutic medicine and, with it, of these areas of nutrition. This is unfortunate. It is partly organizational and financial. In countries like Australia, medical training has principally concentrated on the curative (rarely possible) and the therapeutic, although this is changing. The system of remuneration for medical services and the career structure have facilitated this approach.

There has been some development of the role of a "community physician" in Australia where medical graduates work not so much on a one-to-one basis, but at a community level; the concept of community responsibility for a medical

graduate is more familiar to those in countries like Indonesia. The community setting actually provides not only opportunities for preventive medicine, but also large scale therapeutic interventions. Likewise, the one-to-one consultation also provides opportunities for preventive counselling as it does for therapy. Moreover, those who in therapy, see new opportunities are seen for broadly-based prevention programs. The reality is that we operate in pluralistic health care delivery systems. Getting the mix right for a particular situation, and in relation to resource availability, is what is required. Needless to say, prevention is always better than cure.

Thus, it should be unnecessary for there to be a public health and clinical dichotomy, whether in training or in research<sup>(36)</sup>.

#### **Public nutrition education**

Efforts to decrease the burden of nutrition-related disease in the community take different forms in different times. In medicine, we have been rather prone to be prescriptive about advice, but this is not acceptable in the latter part of the 20th century and is likely to be even less so in the next century. People now expect to be informed in such a way that they can make better choices themselves. Public nutrition education is therefore required to be less dogmatic than heretofore. The tenor of public nutrition advice is now "guideline". This may progress even further, since one of the problems with current "dietary guidelines" is that they are coming to be "set in stone". Whereas in the late 1970s they were seen as the best way of presenting the new nutrition knowledge, they are now at a point of arresting further thinking about where we should be headed.

As already discussed, there is food cultural disparity of the aged in different parts of the world for apparently similar levels of health, which begs the question as to what is the range of human dietaries actually possible? Do we not need to take account of other lifestyle and environmental matters in order to give the best nutritional advice? The guidance for the sedentary may not be that for the regularly physically active<sup>(37)</sup>. It is increasingly evident that those who have higher levels of energy expenditure by way of physical activity and who eat more live longer<sup>(23)</sup>. This is not the impression given by dietary guidelines which would have people progressively reduce their energy intake to deal with overfatness. In so doing, the levels of food intake often become precariously low from the point of view of adequacy of essential nutrient intake.

The advent of ingredient and of nutritional labelling of packaged foods is allowing more flexibility in food standards and greater opportunity for healthy food choice. It will be a challenge to provide similar information about unpackaged foods like the primary commodities (grain, fruits, vegetables, fish, meat). Another challenge will be to cope with altogether new kinds of foods produced by contemporary food technology, which will not have their counterparts in traditional foods. Nutrition epidemiology will have a major task to keep pace with the potential health impact of these technological changes; and the consumer will have to make choices in a food arena of increasing complexity. Again, the requirement will be for more nutrition graduates to combine training in nutrition with the techniques of community education. But this will need to take place in an environment which is more respectful of human decision-making.

## Professional training in nutrition

Each professional in the nutrition field will need a good grounding in *research methodology*. Future basic and applied nutrition research questions will be demanding, even formidable and exciting. At the very least nutritionists will need the *facility for evaluative work*. No country, rich or poor, populous or not, will be able to afford not to have research skills among its nutrition graduates.

Another need will be for *combined training* in nutrition and other fields. Some examples will be nutrition training combined with physical education, with agricultural science, with food technology, with economics, with administration, with public health, and, clearly, with clinical medicine.

On the matter of nutrition training in medicine at the undergraduate level, the most important need is for the process of nutrition education to take place around patient care. For this there must be role models, who practice nutrition, amongst clinicians<sup>(38)</sup>.

As a nutritionist, I have welcomed the opportunity that a Chair of Medicine provides to develop stature for the discipline of nutrition within clinical medicine.

## National and international nutrition policy

Nutrition policy develops where governments are convinced that nutrition is of major importance in attending to public health and in the management of the ill. Then, skills are required to link the several critical interest groups together in the process of forging and implementing policy. The interest groups include health, agriculture, food industry and educational



agencies. They must be supported by the financial arms of government.

In the development of national policy, international perspective is also required. This is an evidence in the set of policy objectives which have been canvassed in my part of Australia<sup>(39)</sup> :

1. to produce food locally or within Australia as far as possible; the less the food imports the less vulnerable the food supply system; the total energy costs of locally grown food would also be less.

2. to produce food with as little ecological disturbance as possible and with the least demand on non-renewable resources.

3. to ensure an adequate energy and nutrient intake for all Australians, an adequate diet.

4. to promote a food intake pattern that carries the least risk for those disorders that most affect Australians, a prudent diet.

5. to assist food-deficit countries to achieve a satisfactory local food production and, where necessary, to produce additional food within Australia to make good food shortages in those countries.

For our own country, we are beginning to see the need to produce food with attention to the environment. Yet this is internationally important. So also is the approach to food deficit countries, where recognition is given to the need for local food production, irrespective of Australia's trade position. Ways to reconcile national and international policy approaches will be increasingly important for the health and well-being of people everywhere.

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# **HUMAN NUTRITION**

## **Better Nutrition in Nation Building**

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1990

Siriyod Printing Company Ltd.  
Bangkok, Thailand.  
Tel. 2334387, 2358874

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Faculty of Tropical Medicine  
Mahidol University  
ISBN 974-586-900-7

Published by:  
Siriya Printing Company Ltd.  
Bangkok, Thailand. Tel. 2334387, 2358874