PROCEEDINGS OF THE NUTRITION SOCIETY

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Nonsense and non-science in nutrition

By I. MACDONALD, *Department of Physiology, Guy's Hospital Medical School, London SE1 9RT*

A few years ago *Reader's Digest* gave an account of the hazards of food. It was a tongue in cheek approach and suggested, for example, that milk on the cereal at breakfast would lead to coronary artery disease, that the bacon contained nitrosamines which would produce cancer, that the coffee was atherogenic and that the sugar added to it and to the cereal was responsible for all manner of ills. The article continued in a similar vein for lunch and dinner. This account highlighted the nonsense and non-science in nutrition and put nutrition and the nutritionist in a rather unflattering light. Though this article was published a while ago the same sort of nonsense is still being put out today by what I would call 'pop' nutritionists. I would define a 'pop' nutritionist as one who capitalizes on peoples' fears and hopes, and these individuals and quasi-professional organizations must bear a heavy responsibility for the wide range of nutritional nonsense and non-science that is currently directed at the man (or woman) on the Clapham omnibus.

Before discussing the issue any further I think it is germane to the title of this talk to consider whether, in fact, nutrition is a science.

The *Oxford English Dictionary* defines science as 'the state or fact of knowing' and it is this definition that I shall be using. Nutrition is certainly not a pure science in its own right if considered under the general heading of, for example, physical science, chemical science or biological science. Rather it is a subsection of biological science and perhaps what makes nutritional science, as compared with physiological science, for example, more open to the brick-bats of others is that it is a science with popular appeal and it is not self-contained, but uses and applies the more rigidly defined disciplines of biochemistry, physiology, etc. Nutrition is a science, not a discipline, as it applies knowledge and techniques from other areas. It tends to consider the whole organism rather than individual cells or their components and is therefore of special interest and relevance to those whose main concern is man or the whole animal.

I hope, later on, to go into some of the possible causes of why nutrition seems to be alone among pure and applied sciences in attracting the attention and opinions of those whose contact with and knowledge of science is minimal. I shall use the term nonsense to mean words or ideas that cannot be substantiated.

I should like to divide this talk under three main headings. First, I shall present some examples of misleading information, concepts and advice concerning nutrition which seem to be common and current at the present time. Second, I should like to consider some of the possible causes for the seemingly widespread dissemination of ill-founded nutritional knowledge and advice and third, to discuss ways of reducing this problem and to consider whether, in fact, it is as serious as it appears.

For the first example I shall take what is currently perhaps the most popular item in the diet to attract the public's attention, namely dietary fibre. This is strange in that it is not a nutrient at all as it is not available for digestion and absorption by the enzymes secreted by the stomach or intestines. The awareness of wheat fibre, or bran as it is called, began commercially in 1930 and the reason for its more recent popularity probably stems from a book by Cleave & Campbell (1966) in which they state that many of the diseases in the western world are due to the refined nature of the carbohydrates in our diet. This point was subsequently taken up with vigour by Burkitt & Trowell (1975) who had both spent a life-time in medical practice in tropical Africa. The difference in the disease pattern and especially the rarity, in the tropics, of some disorders which are very common in the western world, led these authors to support Cleave and Campbell's hypothesis, namely that the food in Europe and North America was too refined. It was this fact, they stated, that was responsible for the disease patterns seen in the western world. This hypothesis has some evidence that is compatible with it, but where the enthusiasm of the proponents overcame their scientific caution was in the type of factual support they offered in favour of their hypothesis. Their evidence was almost entirely based on association, and it is widely recognized that this type of support is not only of little value, but can be dangerous in that it may be misleading. As an example of this type of support for their hypothesis that a low-fibre intake is the basic cause of diseases common in the western world, they state that the incidence of carcinoma of the colon is high in low-fibre-consuming communities such as ours, and low in high-fibre-consuming peoples such as those in the tropics and, therefore, that a reduced intake of fibre causes colon cancer. This is neither sense nor science for the following reasons. First, there are many other variables between the high- and low-fibre-consuming communities, other than the difference in fibre intake, and the difference in colon cancer incidence could perhaps be due to another, as yet unknown, variable. Second, the communities whose fibre consumption is considered to be high, tend to have a short life span, and therefore do not survive to an age when colon cancer most frequently appears. Third, the daily intake of fibre in the underdeveloped countries may, in fact, be less than in the western world because in the tropical areas less food is eaten, and if fibre in fruit and vegetables is taken into consideration it can

be shown that in the UK, for example, there has been only a slight fall in total fibre intake in the past 100 or more years (Robertson, 1972). In other words, though we are eating less whole wheat flour, we are eating more fruit and vegetable 'fibre' today compared with a century ago.

The average span of life in high-fibre-consuming countries is much lower than in the so-called low-fibre-consuming western world. One deduction that is not made by the proponents of dietary fibre, and that can be made from this fact using exactly the same kind of deduction by association that the pro-fibre people use, is that the greater the amount of wheat fibre ingested, the shorter the life span (Fig. 1).

The composition of dietary fibre is very variable, and this makes a cause and effect relationship between dietary fibre and prevention of a particular disease even more unlikely to be revealed by comparing epidemiological or association data. In passing, it is perhaps of interest to note that the first clinical use of dietary fibre, in the form of wheat bran, was in relieving the symptoms of diverticulosis. There seems little doubt that bran is clinically effective in this respect, but one paper has

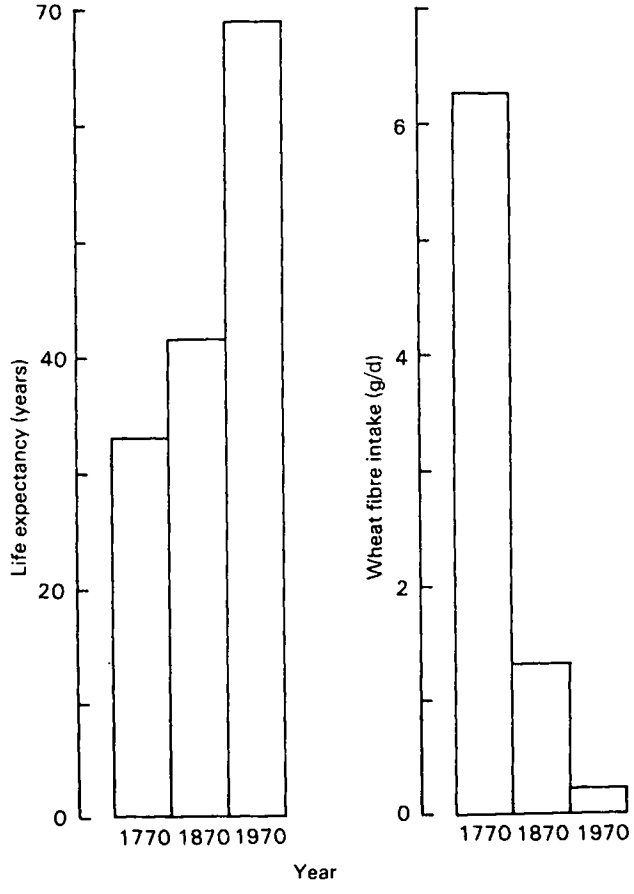

Fig. 1. Life expectancy and wheat fibre intake in the UK.

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queried this and found that patients are very liable to show a 'placebo' effect (Ornstein *et al.* 1981). As an example of the enthusiasm of the fibre proponents, one of the earliest papers on the value of fibre in diverticulosis had no controls because it was considered by the author to be unethical to deny this therapy to a control group. Even if dietary fibre were to be found of therapeutic value it does not mean that it is useful in preventing diverticulosis. An aspirin is taken to relieve the symptoms of headache, but headache is not due to aspirin deficiency.

Part of the popular appeal of dietary fibre is probably based on the notion that food in the western world is too refined and there has therefore been a swing to the other extreme, namely the belief that food that has not been processed and that has been grown without the addition by man of any substance made by man is more health-giving than the regular western food, hence the meaningless terms 'natural', 'organic' and 'health' foods which imply an endorsement of this nonsense. This concept of consuming only so-called 'natural' foods can be put into practice by only a few individuals in the western world, because adding fertilizers and pesticides and refining not only make food cheaper, but make it more plentiful, so that in the absence of these advantages, only the wealthy could afford the increased cost of this food and therefore presumably not suffer from those very deficiency states which are said to be brought about by not eating 'natural' foods. There may in fact be dangers from consuming 'natural', etc. foods, largely because they may be exempt from industrial standards of hygiene.

The complete lack of any scientific rationale behind the urge to consume more 'natural' foods shows how emotional ('natural is better') is the judgement many of us make regarding food. What is perhaps more surprising is that, despite emotional judgements and with little in the way of nutritional education, primary nutritional deficiency states are rarely seen in the western world. Education in nutrition in the western world should perhaps be more concerned with how to prevent excesses, rather than with how to avoid deficiencies.

There is a tendency for more and more people, especially in early adulthood, to spend the least possible time preparing a meal. This has led to eating a rapid meal away from the home, or to bringing food home that has been prepared elsewhere. The pattern of eating is moving away from the traditional meal of meat or fish and two vegetables eaten at home, and this change in eating pattern needs to be considered from the nutritional aspect. All food, to meet basic metabolic needs, must fulfil two fundamental requirements, namely, adequacy in terms of energy intake and variety to meet the protein, vitamin, mineral, etc. requirements. As long as these are met by food, however taken, the diet will be satisfactory. 'Fast' food and snacks are quite capable of fulfilling these requirements and as long as the basic tenets of nutritional requirements are followed, the move away from the traditional meal will not be accompanied by malnutrition. The term 'junk' food is commonly bandied about at present and, when the person who uses that phrase is asked to define it, it is usually found to be applied to 'fast' food, until he or she is reminded that milk is a 'fast' food. Apart from the inability to define 'junk' food, the expression is a semantic nonsense because it is a contradiction in terms. If it is

food then, by definition, the body can derive some benefit from it and therefore it cannot be 'junk', which implies a useless or waste product.

As my research interest has been in the metabolic effects of various dietary carbohydrates, I have watched this field with interest and one of the most emotive examples of nonsense and non-science in nutrition is seen in the enthusiasm engendered against sugar (sucrose). This theme of the potential danger of sucrose to health is taken up with gusto by the press and by many medical people.

The campaign against the consumption of sugar illustrates two points which operate elsewhere in the field of nonsense and non-science in nutrition. First, the avidity with which the media, and apparently the public, accept with little to back it, the story that sugar is bad for health. Apart from dental caries, there is little scientific evidence to support this view. In fact, when life expectancy is plotted against sugar consumption there is a very good positive correlation, implying that the more sugar that is consumed the longer one lives (Figs. 2 and 3). This crazy logic is no different from that used by those who promote the value of other constituents of the diet, such as fibre. What I find extremely disturbing is that very

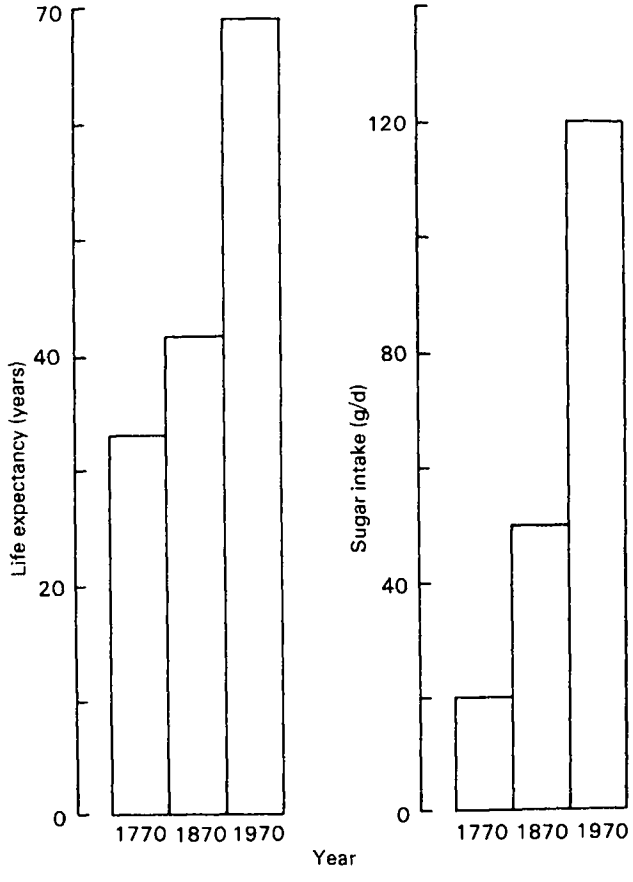

Fig. 2. Life expectancy and sugar intake in the UK.

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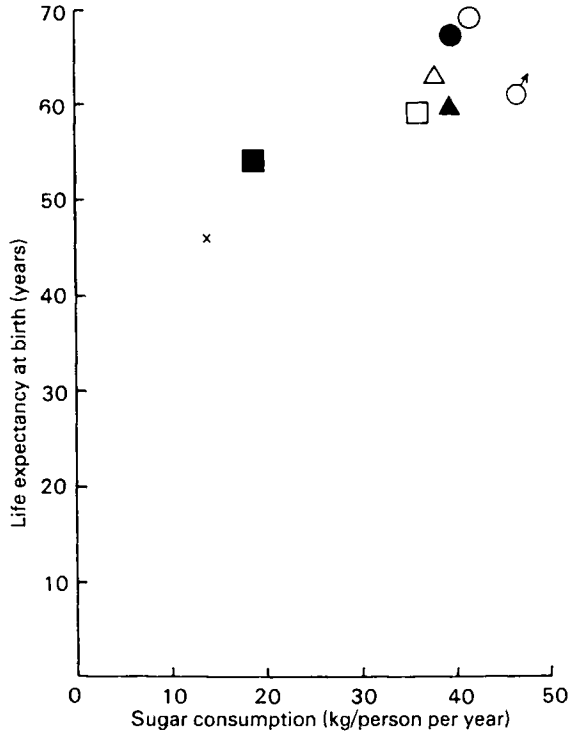

Fig. 3. Life expectancy plotted against sugar consumption world-wide. (○) North America, (●) Europe, (△) Oceania, (▲) Central America, (□) South America, (■) Asia, (×) Africa.

many people who are in the top-drawer in science and medicine accept without question the media views on food and nutrition, especially in relation to sugar and fibre, views that are put forward without any scientific basis. When these able and, in their own areas, critical people write, they include these views as dogma which therefore need no reference or scientific back up.

Another lesson from the anti-sugar saga is the danger that arises when an acknowledged expert in a particular field expresses his opinions in that field. For example, little attention would be paid to a well-known expert in nutrition expressing his views on the hazards of, say, nuclear power, but when that expert expresses his opinions in the area of nutrition, most people would, justifiably, accept these views as gospel. It is therefore important that in those areas in which we can claim some expertise we are particularly careful in expressing our opinions, as opposed to facts, to the public.

The sugar story illustrates another point in the changing public attitude to food, a public who by necessity have to base their views on those expressed in the media. Fifty years or so ago, the public was insisting, and rightly so, on pure uncontaminated food. Now the pendulum has swung the other way and, as mentioned earlier, the chicken that has spent its life in the farmyard is apparently preferred to the battery-reared animal. Similarly with sugar, it is now criticized for

being too pure and contamination is requested with the strong suggestion that the contaminants may provide some necessary trace elements. For example, it has been suggested that the chromium found in raw sugar may be useful in glucose metabolism.

An example of a concept being widely publicized before there is any science to back it up is seen in the recommendation to take megadoses of vitamin C to prevent the common cold, and subsequent claims that it prevents other common diseases. Only after the notion and practice of taking large quantities of ascorbic acid was widespread, was there a scientific attempt to assess whether the claims had any basis in fact. To me, it seems very odd that clinical advice is given to people before there is any knowledge about the results being favourable or, indeed, before there has been any serious consideration of possible deleterious side-effects. This is precisely what Pauling (1976) did, however, and others after him have tried to promote other vitamins and like compounds as preventives or cures for all manner of ills.

Having up to now pointed out the errors of others and illustrated how statements are made that have no basis in fact or science, I must confess to promulgating just such a misconception. Several years ago in lectures to medical students I warned them that malnutrition was likely to be found in the elderly in the UK and for this reason they should be on the look out for it. So confident was I on this point that I set out several reasons why this should be. These reasons I found very cogent and hoped that my student audience would agree. However, there is absolutely no evidence at all to support that view and surveys setting out to determine the incidence of various types of deficiency diseases in the elderly have discovered that they do not exist specifically in this group of people.

Having considered some examples of ill-informed advice that seem to be prevalent in nutrition in the western world—what are the causes? Why is it that the 'pop' nutritionist enjoys such success? It is only too easy to be hoist by my own petard by trying to elucidate causes because no measurements have been made, but it is not unscientific to hypothesize.

To some extent, experts in nutrition have only themselves to blame for the widespread misuse of nutritional information insofar that people whom the public consider to be experts, often make statements that are contradictory. For example, in order to prevent coronary artery disease the public has at various times been advised to take more polyunsaturated fat, less sugar, less coffee, more tea, more fibre, etc., and no one can possibly believe each bit of advice to be true, so nutrition becomes discredited. The man in the street then reasons, with some force, that, if the experts disagree, he will eat what he feels is good for him. Another problem associated with nutrition experts who are prepared to appear on television or write for the newspapers, is that quite often they may not be top-drawer experts. The reason for this is that interviewers on radio or television do not want statements with qualifications because they are not interesting and do not make news; they tend, therefore, to edit out the qualifications. Very many of the scientists in nutrition are not prepared to have their statements mutilated in this way or to face

loaded questions and because of this refuse to collaborate, leaving the field open to the dramatic person who likes publicity but whose depth of knowledge and thought in nutrition are, perhaps, rather superficial.

It is a compliment to nutrition that the general public feels that nutrition is so important in preventing and curing disease and, because of the importance many people attach to what they eat, there is plenty of scope for emotional judgements and for capitalizing on these emotional judgements. For example, I understand that racing cyclists are convinced that rice pudding is the finest source of energy for a long-distance cycle run. It is difficult to see the scientific rationale for this particular form of energy intake but nevertheless the psychological aspect of food, as seen in this instance, is important. I alluded earlier to 'pop' nutritionists and it is because of the lack of precise knowledge and the emotional basis behind what a person eats that we are seeing in the western world so many self-styled nutritional experts, some of whom, for a limited time, seem to make a commercial success for their recommended potions. The consumer, as a non-expert, cannot judge the validity or otherwise of the advice, although I suppose a patient is no more able to judge the worth of his general practitioner or surgeon.

I should like to hypothesize that the advertizing industry may contribute, in small measure possibly, to the nonsense and the non-science in nutrition. I accept that strict codes of practice are laid down but, nevertheless, there may be implications in some advertisements that all may not be well with the state of health of the reader, viewer or listener, and that this may be remedied by using the advertised product. Plenty of examples of nonsense based on science are to be found in the slimming-products area. The high-protein slimming diet, scientifically based on the high specific dynamic action of protein, is not by itself going to help the overweight; and those who recommend a high-fat and low-carbohydrate diet, based on energy lost as ketone bodies in breath and urine, have not done their sums or have not wished to do their sums, because the energy lost in this way is trivial. Furthermore, ketosis is a dangerous state for someone handling machinery such as a motor car.

Perhaps the most important cause for the seemingly large amounts of nonsense and non-science in nutrition is the inability of the nutritional scientist to disprove a nutritional claim. I heard it stated on the radio a few months ago, that the western diet contains too much copper and to counteract this more zinc needs to be consumed. This is pure speculation, but no one can stand up and categorically state that it is not true. Hence this dictum will be heeded and, who knows, may even lead to zinc overload in some enthusiastic consumer. The broadcaster, who was plugging her new book on nutrition, also stated that fresh food was preferable to frozen food because protein and vitamins were badly affected by freezing. Here was a statement that was blatantly false, but who was going to point this out to the listener, and what radio station is going to put out such a non-newsworthy statement, which would imply that some of its programmes contain false information?

Having considered some of the possible causes of the large amount of nonsense

and non-science that the public receives about nutrition, and before turning to the consideration of preventive measures to nullify such information being disseminated in a free society, the consequences of false nutritional facts and bad advice must be considered.

The greatest harm is obviously to the consumer who acts on the misinformation given. The harm done is to his or her health in that, instead of helping to improve his well-being, the wrong advice will not fulfil this hope and may even have an adverse effect. This adverse effect may be directly due to the false security of mind of the consumer and lead him or her to omit certain articles of the diet that may result in deficiencies. For example, high-fibre diets in children have been shown to result in iron and zinc deficiencies (Reinhold *et al.* 1973) as well as an increased incidence of intussuception (Burkitt *et al.* 1963). The consumer may be lulled into a false sense of security but by following poor advice in the preventive sphere he will take risks which are not justified and may therefore speed up his demise.

Following the advice of the purveyors of non-science in nutrition almost invariably leads the consumer to spend more money on his food than is necessary. It is difficult to think of an example where poor or wrong nutritional advice would reduce the cost of the food bill. Even slimming, where money could be saved by simply consuming less, is made more expensive than eating normally. Because of the high price of slimming foods—which in the majority of cases are psychological crutches only—people pay more to eat less, so wrong nutritional advice can be disadvantageous to both the health and the pocket of the consumer.

Another, and perhaps less important consequence of non-science in nutrition, is that nutrition gets a bad image in the public eye. As mentioned earlier many so-called experts make pronouncements which frequently contradict each other. The public is not in a position to know whether a so-called expert is the result of self-judgement or of judgement by his peers. This conflict of views leads the public to consider that nutritionists do not really know what they are talking about. So when genuine dietetic advice is given, which will benefit the patient, he or she tends to ignore it—to his detriment.

Having, I hope, made a case for not ignoring the misleading advice given to the public, what can be done to counteract this advice?

The first idea which comes to mind is better education. If people know the nutritional facts, they will be able to spot when they are given the wrong information. This concept is theoretically the ideal approach; however, most of the nutritional claims relate to areas where facts are limited so only an in-depth knowledge of nutrition would permit a person to make a reasoned judgement on the pronouncements of those who speculate. In the real world people have to work, and in their leisure time do not want to study nutrition in depth unless it specifically interests them. What about teaching children more nutrition at school? Again this seems a sound idea but has the same disadvantage that in-depth teaching in nutrition is not feasible and would not be warranted. Educating the public at all ages in the applied science of nutrition is ideal in theory but would not work in practice.

What about educating the educators, particularly those in the health professions such as doctors and dentists? This already takes place to some extent, but not, many would argue, to a sufficient extent. A knowledge of nutrition by the health professionals is the least that can be expected and is feasible in practice. However, only a small minority of people seek such advice from doctors, etc. unless disease is present and, as disease is more prevalent in the old, it may well be that by that time of life the nutritional advice is too late. Perhaps the dentist should be the person to give nutritional advice and offer a balanced view on the latest nutritional claim because first, his patients are captive; second, many of his patients are young adults; and third, they cannot dissent. Another approach, which is not so much concerned with general education in nutrition for the public but more with countering specific 'crazes', would be to issue statements by reputable authorities supporting or refuting the latest nutritional 'craze'. As I said earlier, it is not possible to refute speculation, so the statements would have to emphasize the lack of scientific back-up for a particular claim, and to point out and warn of the potential hazards of a particular regimen. Though this sounds easy in theory, it is not quite so simple, because reputable authorities tend to move slowly, and a year or more may pass before a statement is issued.

Government statements on nutrition are probably taken seriously by the public and the food industry, but their tardiness reduces their impact considerably. Therefore, by what other means can the public get sound nutritional advice on current crazes? One such means is obviously the law, and already most countries in the western world have a multitude of laws which control the safety of foods and the claims of advertisers, and if the nonsense or non-science were known to be harmful, then it would obviously be impossible to promulgate it. However, the benefits of nutrition today have a much longer latent period than in the era of 'take this tablet and your gums will stop bleeding', so claims are difficult to substantiate. Harmful effects may only become apparent months or years later; hence the impossibility of invoking the law to claim for effects which only years later could be shown to be harmful.

There are Nutrition Foundations in many western countries which are organizations financed by industry to promote research and education in nutrition. These foundations can obtain the services of the leading scientists in nutrition. Statements issued by these foundations are reported by the media and hence reach the public. The British Nutrition Foundation has published brief statements on snack foods, on dietary salt, on vitamin C, on bread and potatoes, on natural *v.* processed foods and on healthy eating. These papers are assessed by academic and industrial nutritionists and therefore represent a balanced view.

In a similar kind of approach, but available to a more limited audience, are the statements published in the *American Journal of Dietetics* on various currently popular areas of nutrition; for example, a few years ago, on vitamin E. These well-considered and balanced statements are obviously intended for dietitians, so that they at least get a balanced view and can pass it on to their patients.

One of the effects of untrained, uninhibited enthusiasts shouting their latest nutritional claim from the roof-tops is that of placing the food industry in a difficult position. Should they, for example, reduce the sugar in their products and increase the ascorbic acid, and can they make claims for the fibre, vitamin E, etc. in their products?

Having outlined some, but not all, of the possible ways of combating the spread of nutritional mumbo-jumbo, I should finally like to raise the question of sufficiency of proof in order to gain say the statements and recommendations of the 'pop' nutritionists.

If nutrition scientists are to counter the campaigns of the do-gooders they will need scientific evidence to back up their counter-claims and the problem is just how much scientific evidence is needed? To wait until the case against the quack is 100% scientifically sound, could in theory lead to much misery and ill health before the advice of the quack is proved to be harmful. This then is the dilemma, how much in the way of sound evidence is required before a nutritional claim can be stated as likely to be false? This is like asking how long is a piece of string, but perhaps one way to overcome this problem is for the nutritional scientist to state that there is, at the moment, no sound evidence to substantiate the claim, and also to state that in fact there is evidence to suggest that the claim may be false or lead to disease. It is equally important for the scientist to say that he will alter his view just as soon as any new-found evidence is produced which would justify such a change in mind.

I hope I have highlighted what I consider to be an expanding area where the public is being misled in the so-called nutritional advice given to it. There are many reasons for this, but one final suggestion for reducing the number of these false claims is to learn more about the effects of what we eat, which in the end means more scientific research in this area, and this is precisely what the Nutrition Society is about.

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