NUTRITION AND LIFESTYLES

Edited by

MICHAEL TURNER

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Preface

Nutrition is a multidisciplinary subject about food *and* the people who eat it. Much is known about food production and manufacture, and about food composition and its metabolism in the body. Relatively little is known about people and the factors in their lives that determine food preferences and food choice—information that is essential equally for the medical profession, educators, policy makers and the producers and manufacturers of food.

At the first of a series of Annual Conferences organised by The British Nutrition Foundation, of which this book is the Proceedings, attention was focussed on the determinants of food choice—why people eat what they eat—and on difficulties in promoting good health through good nutrition in selected population groups—the young, the elderly, immigrants, and the many people who rely on Local Authority Catering Services. Determinants of food choice were examined from physiological, psychological, cultural, sociological, economic and medical viewpoints. There were also contributions from market research, advertising and education experts.

The Conference was unique in bringing together experts from very diverse disciplines to focus on the subject of 'Nutrition and Lifestyles'. It is hoped that many went away with a new perspective on their own subject and a desire to foster a dialogue at the interface of conventional disciplines where the major conceptual advances in the next decade can be expected.

MICHAEL TURNER

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Introductory remarks

SIR KENNETH BLAXTER, FRS

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I am sure that all readers will agree that the topic of 'Lifestyles and Nutrition', the subject under discussion at the First Annual Conference of the British Nutrition Foundation, is one of interest since it has considerable bearing on public health, on the need for education in the nutritional field and on the ways in which the food and agricultural industries cater for the food requirements of the population. At the same time, I think that the topic is an extremely difficult one to dissect and analyse in a constructive way. I would like, in these opening remarks, to emphasise some of these difficulties and to indicate where I think and hope our discussions might lead.

The Household Food and Expenditure Survey, together with the Estimates of National Supplies of Food moving into Consumption,[1] provide good estimates of the amounts of food which are bought and consumed within the home or which reach the markets of the country. Despite certain well-known discrepancies between them, these estimates enable an assessment of the adequacy of the national diet to be made, and in the instance of the Food Survey, its variation with geographical region, with the season of the year, with the composition of the household and with the family income can be ascertained. The survey is designed to provide the best estimate of the mean food intake, and while it can be criticised because of certain sampling problems, it nevertheless shows that on average people in the country are adequately nourished. This no doubt evokes an equally average sense of reassurance.

The problem is that everyone knows that food consumption varies considerably from family to family and within a family. It also varies from time-to-time within a family, and the duration of the times within this time-to-time variation varies too. Questions then arise about the long-term and short-term adequacy of the diet of the individual. This has long been recognised and special surveys to ascertain nutritional status have been made of groups of individuals who constitute readily defined sectors of the population, which are thought to include individuals at nutritional hazard. Examples of such surveys are those of the DHSS on pre-school children, pregnant women, one-parent families and the elderly.[2] Studies of such groups may well show but minor deviations of their mean nutritional status

from that of the population as a whole; considerable variation within the group is still very apparent for food habits and food preferences, that is, nutritional lifestyles vary widely, probably as widely within the groups as in the population as a whole. People who are average in every nutritional respect even within these sub-groups must surely be rare.

The extent of the variation in nutritional lifestyles in the patterns of food consumption can obviously be predicated even if it cannot be precisely stated. In this collection of papers, many examples of such variation are given, some anecdotal, some of a wider nature. What is not known, and is far more important and demands attention, is the nature of the determinants of these habits, and whether deeper knowledge of them can be used to predict the incidence of over- or under-nutrition which could have effects on health or to assess the nutritional consequences of change in the social, cultural and economic circumstances that surround our lives. In the one instance we are seeking better ways of assessing those individuals who are at nutritional hazard than is provided by simple demographic classification of the population. In the other instance we wish to know whether we can anticipate problems of a nutritional nature from assessment of the effects of changes, not in the food supply, but in the basic determinants of demand for the many separate items that make up that overall food supply.

This book is thus concerned with the analysis of variation and with an attempt to identify causal factors. In such a complex field, physiological knowledge about the determinants of appetite, about the latency of nutritional responses, and about the relationships between measurable physiological attributes of people and their requirements for particular nutrients is obviously a starting point. While some nutritionists might ingest nutrients, most ordinary people eat food and in doing so exert choice. The factors which determine these choices—for they are many—involve the behavioural sciences in complex interactive ways. Economic considerations are involved; so too are those relating to social psychology and social anthropology. The British Nutrition Foundation First Annual Conference was thus unique in exploring ways in which the accumulated wisdom of very diverse disciplines can throw light on a very obvious and practically important series of problems related to the well-being of modern man. I hope that we were able to achieve the integration necessary to provide frameworks in which solutions can be found.

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Is food intake under physiological control in man?

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There has been an increasing tendency in recent years to minimise the importance of the physiological control of food intake in the maintenance of energy balance in man.[1] Originally it was inferred that appetite must be under precise control since an adult may ingest several tons of food over a period of five years and remain within 1–2 kg of his original weight.[2] In fact, closer examination of the statistics on weight stability reveals that most people do not remain at constant weight over a 10- to 20-year period when assessed on a yearly basis; many individuals show a maximum swing in weight of 5 to 10 kg.[3] Nevertheless, it is unusual for the rate of weight change to reflect a discrepancy between energy input and output of more than 2% of the food ingested[4] so the problem of explaining the control of food intake to such fine limits seems to remain. Miller,[5] however, has continuously emphasised the importance of adjustments in energy expenditure in explaining the maintenance of a constant store of body energy and has cast doubt on the significance of appetite regulation in man. The adjustment of energy expenditure to changes in food intake has been known for several decades.[6,7] By making use of the known rates of change in energy output it has been possible to simulate with a computer model the slow weight changes observed in man even if the energy intake is assumed to vary randomly from day to day within quite large limits.[8] On this basis and after a characteristically elegant examination of studies aimed at testing the sensitivity of appetite control in man, Garrow[1] concluded that 'In man control of food intake is complex, and the primitive hypothalamic reflexes are so buried under so many layers of conditioning, cognitive and social factors that they are barely discernible.'

Thus the emphasis has swung to a consideration of the effects of food intake on energy output and the control of food intake has been given a subservient role. The purpose of this presentation is to redress the balance and to show that food intake in man is controlled by physiological mechanisms even if this control does not account for the remarkable stability of body weight in the face of a large daily inflow of energy. Appetite does seem to respond to physiological cues even if the finer

adjustments in energy balance are determined by modulating energy output. This 'programming' of food intake is far from precise but normally does relate to the energy needs of the body. It can, as we are well aware, be overridden by environmental pressures and particularly by social and psychological factors. These factors themselves impede a critical assessment of the control of food intake.

One way of assessing the physiological control of food intake in man while limiting the effects of social pressures involves the monitoring of food intake in the newborn and the young child. Clearly social factors, including the attitude of the mother, may influence the outcome and it can also be argued that the breast- or bottle-fed child also lacks the variety of food which is an important determinant of food intake in our society. Nevertheless, the clear demonstration of a physiological regulation of food intake in these young children indicates that man is not unique among mammalian species and has not lost the regulatory system. Some of the best work on this aspect of regulation comes from the detailed studies on the food intake of 37 newborn children whose milk was delivered in pre-weighed bottles to the homes and subsequently collected for further weighing.[9,10] Mothers were unaware of the energy density of the milk and were encouraged to allow the child to decide on his own needs rather than coaxing him to finish the feed. The babies fed the more dilute milk rapidly adjusted to their intake and ate more. This compensation was remarkably good although one of the nine babies had a persistently high intake on the more concentrated feed. Many of the children consuming the feed with half the energy density of the other milk had an 80% increase in volume intake rather than the 100% increase needed for precise compensation, this discrepancy being most marked in the first month of life—thereafter there seemed no consistent difference in the energy intakes of children fed the two dilutions of milk.

Further evidence for the physiological regulation of food intake comes from studies on malnourished children in Jamaica.[11] The malnourished children, once they had recovered from the preliminary problems of infection and electrolyte imbalance, developed a voracious appetite and consumed two to three times the energy needed by a normal child of the same age. The child needs a high intake of energy to meet the demands for synthesising new tissue and on these high intakes grows at 15 times the normal rate. When, however, the child approaches or attains a weight appropriate for his height, there is usually a marked decline in food intake which may be so abrupt that the adjustment is complete within 48 hours, the child then resuming a more normal rate of growth. This remarkable demonstration in children of the changes in appetite in response to nutritional needs is also well recognised in adults who have been deprived of food for appreciable periods of time, or who are recovering from illness or surgery. The evidence for these changes in food intake in adults is much

more difficult to collect. Nevertheless, there is evidence that food intake will adjust in many adults within two to five days if they have to rely on synthetic diets with an energy density which is unobtrusively altered.[12,13] These studies are somewhat artificial and do not necessarily indicate that food intake is normally regulated to match physiological needs.

Much of the thesis that food intake does not adjust in man is based on the observation that even after a week the food intake of army recruits involved in initial intensive training does not match their energy expenditure.[14] Conversely, when five medical students were trained to give themselves either a 4·2 MJ (1000 kcal) supplement, an 8·4 MJ (2000 kcal) or an energy-free supplement by gastric tube each evening before going to bed, only one adjusted his measured food intake over the subsequent 3- to 5-week period in response to the extra energy ingested. Changes in body weight were small and suggest that energy expenditure responded to the additional input of energy. Certainly the individual who ingested nearly an additional 300 MJ with a change in weight of only 3·4 kg would have had some difficulty in accommodating the extra energy without showing a greater weight gain. It is more likely that he increased his expenditure of energy and thereby reduced his deposition of fat. This widely quoted paper did not discuss the results of a similar study on 12 college students who received orally at night for three weeks an energy-free supplement followed by a 4·2 MJ (1000 kcal) supplement for eight weeks.[15] During the first week of supplementation there was a reduction in the intake of food amounting to on average 2·13 MJ (509 kcal) less than the original intake. During the seventh week of supplementation the reduction amounted to 1·95 MJ (467 kcal) per day. Thus the students on average compensated for 50% of the additional energy ingested. As expected those students who responded to the supplementation by reducing their intake most had the smallest weight gain during this overfeeding phase.

The main difference between these two studies was in the method of supplementation. In the London studies the five medical students were trained to pass intragastric tubes and feed themselves with the supplement, whereas the larger number of Cornell students drank their additional food. Although this difference would appear to be small, there does seem to be some learning process, perhaps related to physiological events following the ingestion of food, which is enhanced if food is drunk rather than being delivered directly into the stomach.[13]

These studies all relate to somewhat artificial manipulations of food intake where attempts have been made to disguise changes in the energy intake. Yet there are certain general principles which are often neglected when considering the problem of whether the amount of food consumed by man has a physiologically determined component. It is well recognised that subjects differ markedly in the amount of food eaten. To take an extreme example, we know that a short man usually eats substantially less than a