Carbohydrates: How Important? How Much? How Little?

Professor Mark L. Wahlqvist, Section of Human Nutrition, Deakin University, Victoria. 3217

Man's diet can vary greatly in the relative contribution of carbohydrate to energy requirements. Traditional societies commonly have a seventy-ninety percent contribution to energy from carbohydrate (13). With affluence, the relative energy contribution of carbohydrate falls and that of fat rises according to FAO data. Attempts to eliminate carbohydrate have been made in fad diets such as that of Dr. Atkins and are associated with ketogenesis and ketonuria. Although the average Australian energy contribution from carbohydrate is about 40%, the range is probably from 20-60%. Sucrose probably contributes 30-50% of the carbohydrate energy. There has been a relative increase in the sugar derived from manufactured foods. There has been a relative decline in the contribution of cereal products, especially bread, to energy from starch (10).

Man is omnivorous with a fuel economy which allows for variations in energy derived from carbohydrate of various kinds (7), fat, protein and ethanol. But it is quite clear that a high carbohydrate intake is compatible with good health. As evidence accumulates, it appears that where health problems relate to carbohydrate intake, they relate principally to what does not accompany carbohydrate rather than to the carbohydrate itself (5). Nevertheless, simple sugars, usually sucrose, are essential substrates for microorganisms responsible for dental caries. As far as glucose intolerance and diabetes are concerned, higher carbohydrate intakes are associated with improved glucose tolerance (12). Unrefined carbohydrates with a high dietary fibre content reduce the postprandial rise in blood glucose possibly by a variety of mechanisms (12). Where physical activity and energy requirements are low, as with advancing years, nutrient density is important, so that unrefined carbohydrate, is to be preferred to refined. However, it is to be remembered that even low extraction flour is nutritionally superior to sucrose (10). The 'anti-carbohydrate' attitudes of the community, evidenced by an aversion to bread and potatoes, will slowly change with the recognition that an increased intake of cereals, fruits and vegetables at the expense of other items in the diet is likely to favourably influence the nutritionally-related problems of obesity, coronary heart disease, colo-rectal cancer, diabetes mellitus and dental caries (4).

.2/

Man does have a preference for foods that are sweet, although this can be modulated by environmental factors (1). From earliest times, homo sapiens has sought fruits, berries, honey and manna (1,2). The energy density of sweet foods may have had survival value. Partly because sucrose is energy dense, with implications for the development of obesity, partly because of its cariogenic potential and, partly, because of rising world prices alternative sweeteners have been sought (1,3,9,11). These may be nutritive (fructose, glucose, mannitol, sorbitol, maltose, lactose), minimally nutritive (aspartame) or non-nutritive (neohesperidin dihydrochalcone, saccharine, cyclamate). The potential hazards of the non-nutritive sweeteners have probably been overstated (6). The dipeptide sweetener aspartame may become available in the future, but in as much as it contains phenylalanine, it will need to be avoided by phenylketonurics (3). There appears to be an increasing use of sweetener enhancers such as maltol which can allow about a 15% reduction in the sucrose content of a food for the same effective sweetness (9). The real value of minimally or non-nutritive sweeteners or flavour enhancers in the management of obesity remains uncertain. Economic factors are now altering the relative positions of sucrose and other nutritive sweeteners in the market place (8,11) and nutritionists must examine these trends.

For economic as well as nutritional reasons, it seems likely that the 1980's will see an increasing proportion of man's energy requirements derived from carbohydrate of cereal, fruit and vegetable origin.

REFERENCES:

1. Birch, G.G., Green, L.F. and Coulson, C.B.
   Sweetness and sweeteners
   Applied Science, London (1971).

2. Cribb, A.B. and Cribb, J.W.
   Wild food in Australia.
   Collins, Sydney (1974).

3. Crosby, G.A.
   New Sweeteners.
   Critical Reviews in Food Science and Nutrition. June 297-323 (1976).

4. Editorial.
   Eating to Live.
   Med. J. Aust. 2: 467 (1979)

5. Hood, L.F., Wardrip, E.K., and Bollenback, G.N.
   Carbohydrates and Health.
   AVI Publishing Co. Inc. Westport, Connecticut (1977).

6. Hoover, R.
Saccharin - bitter aftertaste?
New Eng. J. Med. 302: 573-575 (1980)

7. Hurst, W.J., Martin, R.A. Jr. and Zoumas, B.L.
Application of HPLC to characterisation of individual carbohydrates in food.
J. Food Science 44: 892-896 (1979).

8. Junk, W.R. and Pancoast, H.M.
Handbook of Sugars for Processors, Chemists and Technologists.
AVI Publishing Co. Inc., Westport, Connecticut (1973).

9. Pintauro, N.D.
Sweeteners and Enhancers.
Noyes Data Corporation, New Jersey, USA (1977).

10. Saxelby, C. and Venn-Brown, U.
The role of Australian Flour and Bread in Health and Nutrition.
Bread Research Institute of Australia, North Ryde, Australia (1980).

11. Tweedie, L.S., MacBean, R.D. & Nicherson, T.A.
Present and Potential Uses for Lactose and some Lactose Derivatives.
Food Technology in Aust. February 57 (1978).

12. Wahlqvist, M.L., McDonald, J. and Flint, D.M.
Diet and Diabetes Mellitus.
Food & Nut. Notes and Rev. 36 (4): 180-186 (1979)

13. Wood-Bradley, R., Flint, D.M. and Wahlqvist M.L.
Food and Nutrition in an Independent Papua New Guinea.
Search 11: 73-77 (1980).

AUSTRALIAN NUTRITION FOUNDATION

ONE DAY
COLLOQUIUM

ON

"FOOD AND NUTRITION FOR THE EIGHTIES"

THE SCIENCE CENTRE
35 CLARENCE STREET
SYDNEY

21 AUGUST, 1980