
New Facets of Diabetic Diets

BRIONY J. THOMAS, PhD, SRD

Formerly Research Nutritionist, Unit for Metabolic Medicine, Guy's Hospital, London

There is nothing new about the idea that diet has a useful part to play in diabetic management. Even the ancient Greeks were familiar with diabetes mellitus and recommended a diet of 'honey, autumn fruits and sweet wines' to alleviate the severe wasting caused by the disease[1]. Successive centuries have seen a wide variety of dietary practices. In the eighteenth century, John Rollo[2] believed that rotten meat and rancid fat had anti-diabetic properties and gave his patients a 'no carbohydrate' diet based on animal products in an advanced state of degeneration. The nineteenth century saw both high carbohydrate 'cures' based on skimmed milk or oatmeal[3] and low carbohydrate diets containing 'vegetables thrice boiled to dissolve out their sugar'[4]. In the early years of this century, the Allen starvation diet was the mainstay of treatment[1]. Since the discovery of insulin in 1921, carbohydrate restriction has been the dominant theme, diabetics being allowed no more than 40 per cent of dietary energy in the form of carbohydrate[5].

With this background, there is an understandable temptation to regard the latest set of dietary recommendations for the diabetic[6] as just another changing whim of fashion as transient as the rest. The new proposals do, however, have one distinguishing feature. Unlike their predecessors, they are supported by a great deal of scientific evidence. Until now the diabetic diet has evolved very much on a trial and error basis. Insulin revolutionised diabetic management but no attempt was made to re-evaluate the role of diet. Instead, guesswork and assumption continued to guide dietary practices, many of which have now become unquestioned tradition.

For the first time in the UK, a detailed review of what is known about diet and diabetes was recently made and the document 'Dietary Recommendations for Diabetics in the 1980s'[6] is an attempt to assess the most suitable diet for the diabetic on the basis of current knowledge.

Dietary Objectives

Three key issues are central to the philosophy behind the new recommendations. The first concerns the fundamental question of what the diabetic diet is trying to achieve. Few would question that a diet of some sort is needed. For the diabetic on insulin or oral hypoglycaemic agents, dietary measures are essential to prevent rapid swings in blood sugar and to help achieve good control. For other diabetics, dietary measures alone will suffice as a means of treatment. However, there is a considerable amount of misconception about the dietary constituent that is beneficial. For the last 60 years or so it has been assumed in

the UK that carbohydrate restriction is the dietary factor essential to good diabetic control. Yet this is clearly not the case. In Asian and African countries, where cereals are the staple food, a low carbohydrate diet is an economic impossibility and diabetics typically consume 65-80 per cent of their dietary energy as carbohydrate without apparent harm[7,8]. Experimental studies have confirmed that not only is it possible for all types of diabetics to be well-controlled on a high-carbohydrate diet but also that such a diet does not increase the requirement for injected insulin or the endogenous insulin secretion in those with some residual beta-cell function[9-12]. Instead, the body appears to adapt to a high intake of carbohydrate through enhanced peripheral sensitivity to insulin[13] and increased activity of the glycolytic pathways[14,15]. These adaptive mechanisms cannot operate in the absence of insulin, hence the well-documented effect of carbohydrate in the untreated state, which gave rise to the belief that carbohydrate was 'bad' for diabetics.

It appears to be total energy intake, rather than carbohydrate, that is most relevant to diabetic control. It is easy to forget that carbohydrate is not the only nutrient affecting blood glucose levels. Carbohydrate has the most influence on post-prandial levels, but in the fasting and semi-fasting state, blood glucose levels are predominantly determined by the liver. The liver manufactures glucose not only from its carbohydrate reserves in the form of glycogen, but also from surplus moieties of protein and, indirectly, from the glycerol component of fat. Thus all nutrients can affect blood glucose levels and, in conditions of energy surplus, worsen diabetic control.

The relevance of energy intake to control can most easily be demonstrated in the obese non-insulin-dependent diabetic in whom a reduction in energy intake is followed within days by a dramatic fall in blood glucose level, long before reduction of weight, with its concomitant decrease in insulin resistance, occurs[16]. This effect, often attributed to carbohydrate restriction[17], can be achieved by restriction of any or all of the calorific nutrients[18]. The non-overweight insulin-dependent diabetic does not need caloric restriction but it may be no less important that this type of patient consumes an energy intake that matches and does not exceed energy requirement. In the past, relatively little attention was paid to the energy content of the diabetic diet. At best, prescribed energy content was based on average energy needs for a person of a given sex, age and weight. This is not precise enough. Energy requirements of individuals may vary widely from this average[19]; recommended food intake must be based on individual energy needs.

Diabetic diets currently prescribed thus owe their success or failure as much to the degree of energy balance achieved as to the regulation of carbohydrate intake *per se*. A sudden over-indulgence in carbohydrate will certainly cause deterioration in control, but this is more a consequence of the dietary energy excess than a specific effect of the carbohydrate. Provided that energy intake and expenditure are in balance, it probably makes little difference to diabetic control whether a diabetic diet contains a low or a high proportion of its energy as carbohydrate.

Composition of the Diabetic Diet

The second main issue in the new recommendations concerns dietary composition. Given that there is a choice between a low or a high carbohydrate diet, is there any evidence that one is better than the other? In the short term both can be equally effective. It is the long-term effects that may differ.

In this and most other Western countries we have become accustomed to the greatly increased risk of the diabetic suffering premature disability or death from arterial disease[20]. Yet this is not the case in other parts of the world. In Japan, for example, the prevalence of large artery disease among diabetics may be as little as one-tenth of that in Western nations[21], a difference not attributable to genetic factors since Japanese diabetics who emigrate to the West rapidly acquire the raised susceptibility of their new environment[22]. There are, of course, many environmental changes that occur during integration into a Western society, but by far the greatest one concerns diet. The native high-carbohydrate, low-fat diet is rapidly abandoned in favour of the low-carbohydrate high-fat style of eating, with the consequent rapid elevation in serum cholesterol level. Total serum cholesterol concentration is now well-established (together with cigarette smoking and hypertension) as one of three main risk factors for arterial disease, independently of the powerful inverse association between serum high density lipoprotein (HDL) cholesterol level and cardiovascular risk[23-25].

It has not been proved beyond doubt that a reduction in dietary fat intake will reduce cardiovascular disease. No experimental study to date has followed large enough numbers of sufficiently young subjects for adequate periods for such an effect to be demonstrated; nor has a study of arterial disease prevention by dietary means ever been made in diabetics or other high-risk groups. It is, however, plausible that the high-carbohydrate low-fat diet habitually consumed by the Asian or African diabetic may help explain their marked protection to the development of arterial disease. Conversely, the dietary policy previously adopted for diabetics in this country has little to commend it. Minimising the exposure of the diabetic to known cardiovascular risk factors is obviously prudent. Serum cholesterol level is of particular concern because the diabetic disorder itself tends to elevate serum cholesterol concentration as a result of the direct correlation between blood glucose and serum cholesterol levels[26]. Yet, until now, diabetics have been encouraged to con-

sume a diet which, because of its high fat content, will certainly not reduce serum cholesterol and could conceivably elevate it still further and enhance atherogenesis.

Now that carbohydrate restriction can no longer be regarded as essential to good diabetic control, such a policy can no longer be justified. The new recommendations therefore propose that less energy should be consumed in the form of fat and more as carbohydrate.

Type of Carbohydrate

The type of carbohydrate consumed is also an important consideration and comprises the third main issue of the new proposals. Minimisation of post-prandial glycaemia remains an important aspect of dietary treatment. In the past this was achieved by elimination of sucrose and other simple sugars from the diet on the grounds that they are absorbed more rapidly than complex carbohydrates such as starch, and thus produce undesirable peaks of glycaemia. This view does not appear to be entirely correct. There is remarkably little difference between the rate of absorption and glycaemic effect of starch and glucose when given in aqueous solution[27], and sucrose (owing to its fructose moiety) has a less acutely hyperglycaemic effect than either glucose or starch[28]. A difference is seen only when comparisons are made in the form of foods, e.g. the effects of sugar in a sweetened drink with a starchy food such as bread or potatoes[29,30]. The difference is caused not so much by the effect of the sugar or starch *per se* but by the presence or absence of dietary fibre. Dietary fibre flattens the post-prandial glycaemic curve, so a mixture of carbohydrate and fibre generates a smaller rise in glycaemia than the same type and amount of carbohydrate consumed alone[31,32]. Fibre appears to exert this effect by slowing down the rate of carbohydrate absorption from the small intestine[33].

The question of suitability of carbohydrate therefore depends more on the type and amount of fibre it contains rather than its content of sucrose. To some extent the traditional distinction between sugary and starchy foods still applies, since starch is frequently accompanied by some fibre whereas sucrose and glucose are often found in a fibre-free form. Yet there are many anomalies in our present dietary advice. Patients are told not to add sugar to drinks but are encouraged to consume fruit juice, which is a fibre-free mixture of sugars and water; desserts containing added sucrose are forbidden, but those based on cornflour and milk are considered suitable, even though they consist entirely of rapidly absorbed carbohydrate.

It is also becoming clear that different fibres have different effects; some are more efficient than others at flattening post-prandial glycaemia. This means that one fibre-containing carbohydrate food may have a glycaemic effect that differs from an equivalent amount of carbohydrate in another fibre-containing food[34,35]. Beans in particular appear to have a much smaller glycaemic effect than would be expected on the basis of their carbohydrate content[36].

Much remains to be learnt about fibre and the effects of foods and combinations of foods on post-prandial glycae-

mia. Nevertheless, a general increase in the fibre content of the diabetic diet and, in particular, ensuring that every meal or snack contains some fibre appear to be useful therapeutic measures[37].

The Recommendations

The above three issues and several others relating to them have led to the new set of dietary recommendations. These can be summarised as follows:

1. Excessive energy content (i.e. protein, fat and carbohydrate) of the diet worsens diabetic control. Each patient therefore requires a diet which does not contain a surplus amount of food energy and which should be based on individual rather than average need.

The best assessment of individual energy requirement is made by dietary enquiry. In a person of stable weight, habitual energy intake will equal energy output and give a good guide to energy requirement. Therefore, before a diet is prescribed, a diabetic should spend some time with a dietitian who can assess an appropriate level of energy for the physician to prescribe. At the same time the dietitian will gather information about eating habits, which is needed for later dietary modification to suit the diabetic treatment.

2. In an attempt to lessen the risk of arterial disease, the proportion of fat in the diet should be reduced, ideally to no more than 35 per cent of energy consumed. In practical terms this can be achieved by using skimmed milk instead of whole milk; using a low-fat spread instead of butter or margarine; grilling rather than frying food; eating less beef, lamb, pork and manufactured meat products but more chicken, turkey, fish, liver and kidneys, and eating fewer high fat dairy products such as cheese and cream and replacing these with low fat dairy products such as yoghurt and cottage or curd cheese.

3. If fat intake is reduced, carbohydrate intake can be increased to meet the energy needs. At least half of the dietary energy content should be consumed in the form of carbohydrate.

4. The type of carbohydrate consumed is important. Most of the carbohydrate should be eaten in the form of polysaccharides (i.e. starch) and the use of foods rich in fibre should be strongly encouraged. Isolated sources of rapidly absorbed mono- and disaccharides (sweets, chocolate, sweetened drinks) should be excluded from the diet except in cases of illness or hypoglycaemic emergency. Refined (i.e. fibre-free) starch-based foods should be used sparingly.

These objectives can be achieved by eating a high-fibre breakfast cereal such as Weetabix, Shredded Wheat or All-Bran instead of low-fibre products such as Cornflakes or Rice Krispies; eating wholemeal bread instead of white bread; using wholemeal flour for baking instead of white flour; using brown rice or pasta instead of their refined equivalents, and eating more fruit, vegetables, pulses and beans.

5. In diabetics treated with insulin or oral hypoglycaemic agents, the timing of carbohydrate intake remains an important consideration if hypoglycaemia is to be prevented. In diabetics treated by diet alone, timing is less

crucial, although the advantages of regular small meals over infrequent large ones should still be stressed.

6. It is no longer considered imperative that the diabetic who needs to lose weight must follow a diet low in carbohydrate. Any nutritionally sound reducing diet or dietary strategy—such as going to a slimming club—which achieves weight loss is acceptable and beneficial. However, the high-carbohydrate diet now recommended is particularly suitable for those who are overweight because it is a bulky diet and hence least likely to cause hunger.

7. In view of the possible links between sodium intake and raised blood pressure, it is suggested that diabetics should not consume a diet which contains more salt than that of the non-diabetic. The traditional low-carbohydrate diet tended to result in a higher than average salt intake because it encouraged consumption of salt-rich foods such as bacon, ham, cheese and other dairy products. The new dietary regime is comprised of foods which should ensure a lower than average salt intake.

8. Unless contrary to medical advice, diabetics may consume alcohol in moderate amounts provided that its energy contribution is taken into account. Beers and lagers specially brewed for diabetics are not essential and their relatively high alcohol and energy content necessitates cautious use.

9. The use of sorbitol, fructose and diabetic speciality foods is not encouraged. These products are expensive and offer little health benefit because their energy content is similar to their conventional counterparts and the reduction in terms of refined carbohydrate intake is often minimal. However, 'dietary' foods which are substantially lower in energy content than their equivalents (e.g. low calorie drinks and some tinned fruits) may assist weight loss. Saccharine (and any other permitted non-nutritive sweetener) remains an acceptable sugar substitute for diabetics.

10. Following any sort of diet is never easy. Diabetics should be given far more practical and realistic help than many of them at present receive. Dietary advice must be tailored to individual needs, circumstances and preferences. So far as is practicable, the diabetic diet should be a modified version of a person's previous eating habits. The type of diet sheet which contains a standard menu for all patients is of little use and compliance with this type of dietary advice is particularly poor. Professional dietetic assistance is vital and should be available at a level sufficient to provide individual counselling, education and follow-up.

Benefits of the New Diet

It has to be said that there is no cast-iron proof that these measures will benefit the diabetic, but there is a mass of circumstantial evidence suggesting that the new dietary strategy offers many advantages over the traditional low-carbohydrate approach. At the very least, the new diet is unlikely to do harm; the vast majority of the world's diabetics have already consumed a far more extreme version of this diet for decades without ill-effect. The proof of the pudding will indeed be in the eating.

It is also worth remembering that these new recommendations are very much in line with the principles of healthy eating being advocated for the whole population. If any sector of the population merits the protection from arterial disease which diet can offer, it is surely the atherogenically-at-risk diabetic.

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References

1. Allen, F. M., Stillman, E. and Fitz, R. (1919) *Rockefeller Institute for Medical Research*. Monograph no. 11.
2. Rollo, J. (1798) *Cases of the Diabetes Mellitus*, 2nd edn. London: Dilly.
3. Card, W. I. (1937) *Clinical Science*, **3**, 105.
4. Stowers, J. M. (1963) *Nutrition Abstracts and Reviews*, **33**, 1.
5. Truswell, A. S., Thomas, B. J. and Brown, A. M. (1975) *British Medical Journal*, **2**, 7.
6. British Diabetic Association (1982) 'Dietary Recommendations for Diabetics for the 1980s'. British Diabetic Association, London. Reprinted in *Journal of Human Nutrition: Applied Nutrition* (1982) **36A**, 378.
7. Patel, J. C., Metha, A. B., Dhirawani, M. K. *et al.* (1969) *Diabetologia*, **5**, 243.
8. Hirata, Y., Nakamura, Y. and Kaku, M. (1971) In *Diabetes Mellitus in Asia*. Amsterdam: Excerpta Medica.
9. Stone, D. B. and Connor, W. E. (1963) *Diabetes*, **12**, 127.
10. Brunzell, J. D., Lerner, R. L., Hazzard, W. R. *et al.* (1971) *New England Journal of Medicine*, **284**, 521.
11. Simpson, R. W., Mann, J. I., Eaton, J. *et al.* (1979) *British Medical Journal*, **2**, 523.
12. Simpson, R. W., Mann, J. I., Eaton, J. *et al.* (1979) *ibid.*, **1**, 1753.
13. Lerner, R. L., Brunzell, J. D., Hazzard, W. R. *et al.* (1971) *Diabetes*, **20**, 342.
14. Bierman, E. L. and Nelson, R. (1975) *World Review of Nutrition and Dietetics*, **22**, 280.
15. Wigand, J. P., Anderson, J. W., Jennings, S. S. and Blackard, W. G. (1977) *American Journal of Clinical Nutrition*, **32**, 6.
16. Weinsier, R. L., Seeman, A., Herrera, M. G. *et al.* (1974) *Annals of Internal Medicine*, **80**, 332.
17. Wall, J. R., Pyke, D. A. and Oakley, W. G. (1973) *British Medical Journal*, **1**, 577.
18. Ernest, I., Hallgren, B. and Svanborg, A. (1962) *Metabolism*, **11**, 912.
19. Widdowson, E. M. (1962) *Proceedings of the Nutrition Society*, **21**, 121.
20. Garcia, M., McNamara, P., Gordon, T. and Kannel, W. B. (1974) *Diabetes*, **23**, 105.
21. Goto, Y. and Fukuhara, N. (1968) *Journal of the Japanese Diabetic Society*, **11**, 197.
22. Kawate, R., Mijanishi, M., Yamakido, M. and Nishimoto, Y. (1978) *Advances in Metabolic Disorders*, **9**, 201.
23. Kannel, W. B., Castelli, W. P. and Gordon, T. (1979) *Annals of Internal Medicine*, **90**, 85.
24. Carlson, L. A. and Bottiger, L. E. (1972) *Lancet*, **1**, 865.
25. Gordon, T., Castelli, W. P., Hjortland, M. C. *et al.* (1977) *American Journal of Medicine*, **62**, 707.
26. Lewis, B. L. (1976) In *The Hyperlipidaemias*. London: Blackwell.
27. Wahlqvist, M. L., Wilmschurst, E. G., Murton, C. R. and Richardson, E. N. (1978) *American Journal of Clinical Nutrition*, **31**, 1998.
28. Thompson, R. G., Hayford, J. T. and Danney, M. M. (1978) *Diabetes*, **27**, 1020.
29. Wishnofsky, M. and Kane, A. P. (1935) *American Journal of Medical Science*, **189**, 545.
30. Swan, D. C., Davidson, P. and Albrink, M. J. (1966) *Lancet*, **1**, 60.
31. Jenkins, D. J. A., Goff, D. V., Leeds, A. R. *et al.* (1976) *Lancet*, **2**, 172.

32. Haber, G. B., Heaton, K. W., Murphy, K. and Burroughs, L. F. (1977) *Lancet*, **2**, 679.
33. Eastwood, M. A. and Kay, R. M. (1979) *American Journal of Clinical Nutrition*, **32**, 364.
34. Crapo, P. A., Reaven, G. and Olefsky, J. (1977) *Diabetes*, **26**, 1178.
35. Jenkins, D. J. A., Wolever, T. M. S., Taylor, R. H. *et al.* (1980) *British Medical Journal*, **281**, 14.
36. Jenkins, D. J. A., Wolever, T. M. S., Taylor, R. H. *et al.* (1980) *ibid.*, p. 578.
37. Anderson, J. W. and Ward, K. (1978) *Diabetes Care*, **1**, 77.

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