

# PRACTICAL THERAPEUTIC DIETETICS

## III. DIABETES

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### GENERAL PRINCIPLES

Although the need for dietary control in diabetes is generally recognized, the extent of restriction may vary and the diet most frequently prescribed today is moderately liberal. It should be designed to cater for the known metabolic features of the disease and the needs of the individual, e.g. to reduce weight, replenish glycogen deposits, etc.; and it should be tailored to fit the social circumstances of the patient. Since the patient must himself assume

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the major responsibility of his therapy, a prerequisite of the diabetic diet is simplicity. Patients are often hindered in following their diets because of the lack of understandable information given to them. Since it must be followed permanently, the diabetic dietary prescription must be flexible. In all cases the general principles given below should be adapted to the individual.

### *Carbohydrate*

Concentrated sugars are forbidden. It is frequently necessary to draw the attention of patients to the fact that mineral waters and other 'cool drinks', sweetened con-

densed milk, honey, and glucose sweets are all strictly forbidden.

The carbohydrate intake should be restricted to control the glycosuria, but should not be so low that the body is forced to metabolize fat excessively and thus develop ketosis. Starchy foods and almost all fruits should be regarded as interchangeable, the patient being permitted to take a controlled number of portions per day, each of approximately 15 G. of carbohydrate. It is practical to calculate the interchangeable foods in terms of household portions, and although the diet prescribed in this way will be slightly less accurate than one which is weighed out, it will be easier for both the doctor and the patient to interpret.

One medium slice of bread is equal to 15 G. of carbohydrate, and the diet becomes simple to follow when the patient assesses his allowance in terms of replacements for a slice of bread.† For example, 2 tablespoonsful of rice, a teacupful of porridge and a medium portion of most fruits (such as 1 apple, 1 orange, 6 prunes or 2 thin slices of pineapple) are given as exchanges for a slice of bread. Twelve large grapes are equal in carbohydrate content to a slice of bread; this is reflected in the loss of diabetic control that occurs in many patients during the grape season. Fallacies, such as that white bread contains more carbohydrate than brown or toasted bread, should be corrected.

Bananas, too, are often omitted in the diabetic diet. It should be explained to the patient that although this fruit contains twice as much carbohydrate per ounce as the other more fibrous fruits, a medium banana weighs 2-3 ounces, while a medium portion of apple or orange weighs 4-6 ounces. The banana, a versatile and often economical fruit, can therefore be included in the diabetic diet as a 'starch exchange'.

Patients of average weight and activity are usually allowed 10-12 starch exchanges daily. The overweight patient, and also the mild diabetic who will be able to avoid taking insulin, provided he is on a strict diet, should take fewer starch exchanges, and as little as 80 G. of carbohydrate per day may be indicated. The underweight or juvenile diabetic, as well as the underprivileged and active patient, should take more carbohydrate as a source of necessary calories.

#### Protein

The requirements of the diabetic are similar to those of the non-diabetic, provided the diabetes is controlled. Whereas juvenile diabetics are encouraged to take a higher protein diet if this is economically possible, it should be remembered that high-protein foods usually contain large amounts of fat too—even lean meat contains approximately 10% of fat. White fish and skimmed milk should be encouraged in the low-fat diet, although skimmed milk contains carbohydrate to the equivalent of two slices of bread per pint.

#### Fat

In view of the possible correlation between coronary heart disease and a diet high in animal fat, and the statis-

tical evidence that diabetics are prone to atherosclerosis, diabetics are encouraged to replace saturated fats with vegetable and fish oils in the diet. Unless they are underweight, diabetics are discouraged from taking more than a small amount of fat—the objective being to bring the body weight as near as possible to the patient's ideal weight.

#### Unrestricted Foods

Little can be gained by restricting fibrous, green and yellow vegetables, and low-carbohydrate fruit such as paw-paws and lemons. Many patients are under the misapprehension that carrots and pumpkin contain large amounts of carbohydrate. Perhaps this idea exists because these vegetables are frequently prepared with sugar. However, they contain no more carbohydrate than the green and leafy varieties, and there is no reason to restrict these two economical vegetables provided the patient realizes that added sugar is forbidden. Herbs, synthetic flavourings and condiments are also allowed *ad lib.*, as well as foods which contain more calories, but are eaten in relatively small amounts, such as gelatine, leeks, etc. Bulk and variety are provided by the addition of these foods, and patients should be made aware of the ways of avoiding monotony in the diet by the inclusion of these unrestricted foods.

#### Distribution of Meals

The division of the dietary allowance is determined by the type of insulin used and the patient's individual needs. The mild diabetic who is controlled by diet alone or who is taking tolbutamide tablets, is generally advised to have the three normal meals. The occasional diabetic on regular insulin should take meals containing the largest amount of carbohydrate immediately following the insulin injections. For the patient taking a single dose of insulin or chlorpropamide each morning, the diet should be arranged to reduce peak loads at mealtimes and to avoid hypoglycaemic reactions between meals. 'Buffer' meals of carbohydrate should be consumed mid-morning and mid-afternoon and before retiring at night. The balance of the carbohydrate is distributed between the three regular meals, although the breakfast carbohydrate intake should usually be smaller than that at the other two meals, because diabetics frequently have an inherently higher blood-sugar level in the morning than later in the day. For example, a patient taking long-acting insulin and a diet permitting 10 carbohydrate exchanges per day should distribute these as follows: breakfast, 2; 11 a.m., 1; dinner, 2-3; 4 p.m., 1; supper, 2-3; 10 p.m., 1. The patient should be told that if he still has early morning hypoglycaemic reactions in spite of the consumption of the carbohydrate buffer meal at bedtime, he should take protein or fat, which are digested more slowly, and that added carbohydrate will be of little avail in this respect.

#### JUVENILE DIABETES

Diabetes in children presents problems that are distinct from those encountered in adults. The effect of erratic physical exercise and infections on the blood sugar makes the diabetes more difficult to control. The diets must also be adjusted to the needs of growth and development. Although undue carbohydrate restriction appears to be un-

†For a more comprehensive exchange list see Part II of this series; on p. 808 of the *Journal* of 3 August 1963.

warranted, the use of 'free diets' is generally not supported. An adequate but controlled regime comprehended by the child and his parents appears to be the most satisfactory approach. Two diets sometimes used in the treatment of juvenile diabetes are as follows:

(a) The Lawrence 'line' diet, in which concentrated sugars are avoided and other basic foods are regarded as either 'black lines' or 'red lines'. Each black line represents 10 G. of carbohydrate, and each red line represents  $7\frac{1}{2}$  G. of protein and 9 G. of fat. The advantage of this diet is that, since it is weighed, the bounds of control are narrower and the chances of complications are thus lessened. Furthermore, as the food requirement increases to provide for the needs of the growing child, the necessary number of lines are added quite simply. However, it is difficult economically for the underprivileged, and mathematically for the relatively unintelligent mother to follow, and the added expense and time involved in using a scale to weigh out each meal is seldom warranted.

(b) The diet advocated by White in 1940 is simple and more practical. It is estimated by allowing 1,000 calories for a child of one year and 100 calories for each following year, to a maximum of approximately 2,200–2,500 calories for girls and 2,600–3,000 calories for boys. The diet contains carbohydrate, protein and fat in the respective gram ratios of 2.0:0.9:1.0. This diet, too, involves adaptation of grams of nutrients to foods in household portions. It also contains a relatively large amount of fat and the protein allowance is higher than many patients can afford.

I do not recommend either of these diets and find that it is usually sufficient to advise the patient to avoid concentrated sugars and to take an adequate amount of carbohydrate, while preventing obesity. High-protein foods are relatively unrestricted, but animal fats—which are frequently found in large amounts in foods which are good sources of protein—are limited. The patient is told to take meals which are controlled with regard to content and time of day, and to consume snacks between meals and at bedtime to avoid hypoglycaemia. Before strenuous activity 'buffer' meals should be taken to forestall the possibility of an insulin reaction. Education of the child and his parents about the nature of the disease and treatment should be made an essential feature of juvenile diabetes.

#### 'DIABETIC' FOODS

Although so-called diabetic or dietetic foods are not a necessary part of the diabetic diet, they do provide variety for the more privileged class of patient. Each product should, however, be individually evaluated. These foods may be summarized as follows:

1. *Canned fruits*. These are frequently sweetened with an artificial sweetener, although plain water-packed canned fruits are available. Patients should be told that, ad-

though no sugar is added, each whole fruit remains equivalent to one slice of bread or similar exchange.

2. *Chocolate*. The sugar is omitted and extra fat is added; this results in the calorie value being almost identical to that of the product containing sugar. Diabetic chocolate is, however, useful where calories from non-carbohydrate sources are required.

3. *Fruit gums, fruit salts, cough lozenges*. These contain a negligible amount of nutrient and need not be restricted.

4. *Fruit squashes*. Each average glass of made-up fruit squash contains 2–3 G. of carbohydrate. Unless they are consumed in large quantities there seems little reason to restrict these drinks.

5. *Jam*. This product is expensive and is seldom taken in large enough quantities to require restriction. One teaspoonful contains 0.2 G. of carbohydrate and 4 G. of sorbitol.

6. *Oil*. A new product is the so-called diabetic oil. This is a mineral oil, and while its consumption will not contribute to the calorie intake of the patient, since it is not metabolized, it is generally agreed that mineral oils should not be encouraged as a foodstuff.

#### SWEETENING AGENTS

*Saccharin* is frequently discarded by patients owing to its bitter taste. This is often because the cheaper and unstable forms are used for cooking purposes. These should only be added when the product is partly cooled down after cooking. Patients should, moreover, be reminded that saccharin is 450 times as sweet as sugar and should be used very sparingly.

*Sorbitol*. During the last 30 years sorbitol has been increasingly used in the diabetic diet. This has led to the illogical conclusion that, like saccharin, it is free from calories. Recent tests have shown that, while sorbitol is not metabolized as rapidly as carbohydrate and does not cause an immediate rise in blood sugar, its long-term calorific value is similar to glucose. Sorbitol is, moreover, relatively expensive.

#### CONCLUSION

The ideal dietetic regime, which is high in protein and low in saturated fats, is expensive and difficult to follow. Because the diabetic diet is a variable aspect of the specific treatment of each patient, only the general principles have been discussed above—a selection of varied diets for individual requirements will be found in a book soon to be published by Dr. W. P. U. Jackson.

Grateful acknowledgement is made to Dr. W. P. U. Jackson for his advice and helpful suggestions. A dietetic bibliography will appear with the last article in this series.