

# Dietotherapy

\* The Dietotherapy section, usually authored by Corinne H. Robinson, is in this issue given over to a special article on diet in diabetes by Doris Johnson, Ph.D., Director of Dietetics, Grace-New Haven Community Hospital and Assistant Professor of Public Health (Nutrition), Yale School of Medicine

## PLANNING THE MODERN DIABETIC DIET

MODERN nutritional concepts stress that therapeutic diets are modifications of the normal diet.<sup>1</sup> This applies to the diabetic patient as well as to others in whom dietotherapy is an essential part of clinical management. No longer need the diabetic patient feel that his diet is a handicap or that he requires many specially prepared foods which set him apart from the rest of the family. Today the diabetic patient builds his diet upon the same basic foods required for adequate nutrition as does the normal individual.

Since the nutritional management of the diabetic patient is of necessity an individual matter, it is imperative to plan a diet to fit each patient's need. The total caloric requirement of the patient should be the first consideration. Caloric needs are based on the patient's "ideal" weight and activity. Tables of height and body structure as related to age are available<sup>2</sup> and may be used to determine the patient's "ideal" weight. The caloric allowance for the moderately active normal adult is approximately 20 cal. per pound of so-called ideal body weight.<sup>3</sup>

### CALCULATIONS

The caloric allowance for the moderately active diabetic patient is kept somewhat below this amount, usually at about 15 cal. per pound of ideal body weight. This is advisable since weight reduction is often necessary for the diabetic and it also serves as a

means of keeping the metabolic process more nearly within the capabilities of the patient. Thus a moderately active patient whose ideal weight is 120 lb. would require approximately 1800 cal. per day.

After the caloric requirement has been determined, the protein allowance for the patient may then be planned. Again, the ideal weight of the patient is used as the basis for calculation. The protein allowance for the diabetic patient is, in general, the same as that for the normal individual. The protein allowance has been established at  $\frac{1}{2}$  to  $\frac{2}{3}$  Gm. per pound of ideal body weight per day.<sup>3</sup> Therefore the diabetic patient whose ideal weight is 120 lb. should receive approximately 60 to 80 Gm. of protein per day.

The carbohydrate allowance of the diet is determined by taking 40 to 60 per cent of the nonprotein calories as carbohydrate. In the example previously cited, this would make the carbohydrate of the diet 185 Gm.

$$\begin{aligned} 1800 \text{ (total cal.)} - 320 \text{ (protein cal.: } 80 \text{ Gm.} \times \\ 4 \text{ cal./Gm.)} &= 1480 \text{ cal.} \\ 50\% \text{ of } 1480 \text{ cal.} &= 740 \text{ cal.} \\ 740 \text{ cal.} \div 4 \text{ cal./Gm.} &= 185 \text{ Gm. carbohydrate} \end{aligned}$$

This carbohydrate allowance will provide for a palatable and varied diet for the diabetic patient. Diabetic diets should seldom be prescribed to contain less than 150 Gm. of carbohydrate per day. At lower levels of carbohydrate than this it is difficult, if not

almost impossible, to plan a nutritionally adequate diet which will still be interesting and palatable to the patient and which he will be more likely to follow. From 150 to 200 Gm. of carbohydrate per day are required for an adequate intake of essential foods to meet the established nutritional needs of an individual.

The fat allowance of the diet is calculated from the remaining nonprotein calories. In the example given this is 82 Gm. Since the diet prescription is always written to the nearest 5, the fat prescription will be 80 Gm.

$$740 \text{ cal.} \div 9 \text{ cal./Gm.} = 82 \text{ Gm.}$$

The final diet prescription should be given in the order: protein, fat, and carbohydrate, and will, in the example given, now read 80-80-185. This order is preferred since most tables of food composition are given in this sequence.

The physician has a further responsibility in determining the patient's diet prescription. He must also specify the division of the *carbohydrate* among the three meals of the day and any between-meal feedings deemed necessary. This again is an individual matter for each patient and must be determined by the physician accordingly, based on the type of insulin used and the patient's response to treatment. It is essential that the division of the carbohydrate of the diet prescription be written as a part of the diet order. As an example, the above order might be written 80-80-185 (35-65-75-10), indicating that the patient was to have 35 Gm. of carbohydrate for breakfast, 65 Gm. for lunch, 75 Gm. for dinner, and 10 Gm. of carbohydrate as a bed-time feeding.

A diet order such as that used in the example will meet the nutritional allowances for our hypothetical patient. The basic diet for the average person in health supplies approximately 75 Gm. protein, 77 Gm. fat, and 170 Gm. carbohydrate.<sup>1</sup> Thus all the essential foods may be supplied in the diabetic diet. It is important, however, that under ordinary circumstances the diet prescription for a diabetic patient include not less than these amounts of protein, fat, and carbohydrate. If a diet lower in calories than the example cited is necessary, care must be taken to see that

the prescription is such that the diet will be nutritionally adequate. A 1200 calorie diet can, by careful planning, be made nutritionally adequate. The reduction in calories will be achieved by restriction of fat and carbohydrate. Such a diet supplies approximately 70 Gm. protein, 55 Gm. fat, and 110 Gm. carbohydrate. It is essential that the protein of the diet be not less than the minimum allowance for adequate nutrition. A 1200 calorie diet naturally will not have the variety of selection of foods that the higher caloric diet will have.

The practice of using a preplanned diet prescription for every diabetic patient is not to be condoned. Each diabetic patient must have a diet prescription, just as he receives his individualized prescription for drugs, to meet his particular needs. Besides meeting the physiological requirements of the patient the diet prescription must also meet the social and economic needs of the patient. To give the patient a stereotyped diet, with no consideration for each of these factors, is to defeat the purpose of the diet, since it will not be followed.

The translation of the diet prescription into foods is an extremely important part of planning the diabetic diet.

#### THE DIABETIC DIET

A procedure for the planning of diabetic diets was proposed in 1950<sup>4</sup> which has not only the merit of requiring little time to plan a diet but of being simple enough to be readily taught to the majority of patients. It has the further advantage of providing a standardized method for planning the diabetic diet and a classification of foods which may be used throughout the country. This will greatly reduce the confusion which has arisen among patients and doctors alike as to which set of food values to use in planning the diabetic diet. This exchange system was the result of the work of a committee composed of representatives of the American Dietetic Association, the American Diabetes Association, and the Diabetes Branch, United States Public Health Service. The recommendations of this committee were accepted by the represented as-



TABLE I  
Composition of Food Exchanges

List	Food	Measures	Gm.	P	F	C	Cal.
1	Milk Exchanges	1/2 pt.	240	8	10	12	170
2a	Vegetable Exchanges	As desired	...	...	...	...	...
2b	Vegetable Exchanges	1/3 cup	100	2	...	7	36
3	Fruit Exchanges	Varies	...	...	...	10	40
4	Bread Exchanges	Varies	...	2	...	15	68
5	Meat Exchanges	1 oz.	30	7	5	...	73
6	Fat Exchanges	1 tsp.	5	...	5	...	45

sociations, and the material is available both for the physician and for the patient.<sup>5</sup>

In the proposed systems the foods to be used are classified into six groups called "exchanges." These exchange groups include milk, meat, fruits, vegetables, bread, and fat. Thus only six sets of food composition figures need be known (Table I). The foods included in each exchange group are equivalent as far as proximate composition is concerned and may therefore be substituted one for another (Table II).

The protein, fat, and carbohydrate of the diet prescription are divided into the six exchange groups to form a basic daily food plan (Table III). In doing this, the foods necessary to normal nutrition must be included in adequate amounts.<sup>1</sup> Thus three cups of milk, at least two servings of fruit, two servings of vegetables besides potato, an egg, four ounces of meat or its equivalent, and adequate amounts of whole grain or enriched cereal and fortified margarine or butter should be included in the daily diet plan.

With such a daily diet plan and a list of the foods included in the exchange groups, the patient may be taught how to substitute specific foods into the plan to form the meals he may have each day (Table IV). In this manner the diabetic patient may have a diet with considerable variation in it. He must be taught, however, to select these foods wisely so that he will include the foods necessary for normal nutrition. Emphasis should be placed on including at least one good source of ascorbic acid each day.

#### PRACTICAL POINTS

In planning a diet for a diabetic patient the physician should discuss with him his

food habits and racial or religious customs which may influence his acceptance of certain foods. His hours of work, whether or not he carries a lunch or eats in a restaurant, and his economic status will be other factors which may influence the patient's willingness to accept the diet plan given him. The diet plan must be worked out with the patient so that he will be able to apply it to his way of living. It should be obvious that to give a patient a sheet of paper on which is printed a standard diet is not the answer to his dietary problem. The procedure for calculating diabetic diets presented here is not time consuming and the busy physician who does not have available the services of a dietitian should be able to take the time to plan the diet for each patient so that it will be practical. Experience has shown that if this is not done the patient will not follow the diet and gross errors will result. Moreover, dietary inadequacies may occur which can further complicate the picture.

The modern diabetic diet need not be weighed. Measurement by measuring spoons and cups and by average portions, as in the case of the fruit and bread exchanges, is sufficiently accurate for all practical purposes. The variation in the proximate composition of foods is such that to weigh them by grams implies an accuracy which may not be present.

In looking over the list of food exchanges, it will be observed that types of foods included are such that a wide selection of foods is offered. These foods may be used as is or included in recipes to make many other combinations. The diabetic patient need not be made to feel that he must have so-called "dietetic" foods in order to have an interesting and varied diet. These specialty foods are



TABLE II  
Exchange Lists

LIST 1. MILK EXCHANGES			LIST 4. BREAD EXCHANGES		
Carb.—12 Gm., Protein—8 Gm., Fat—10 Gm., Calories 170			Carbohydrate—15 Gm., Protein—2 Gm., Calories—68		
	<i>Meas.</i>	<i>Gm.</i>		<i>Measure</i>	<i>Gm.</i>
* Milk, whole .....	1 cup	240	Bread .....	1 slice	25
Milk, evaporated .....	1/2 cup	120	Biscuit, Roll.....	1 (2 in. diam.)	35
* Milk, powdered .....	1/4 cup	35	Muffin .....	1 (2 in. diam.)	35
* Buttermilk .....	1 cup	240	Cornbread .....	1 (1 1/2 in. cube)	35
* Add 2 fat exchanges if fat free.			Flour .....	2 1/2 tbsp.	20
			Cereal, cooked .....	1/2 cup	100
			Cereal, dry (flake and puffed) .....	3/4 cup	20
			Rice, Grits, cooked.....	1/2 cup	100
			Spaghetti, Noodles, etc., cooked .....	1/2 cup	100
			Crackers, graham (2 1/2 in. sq.) .....	2	20
			Oyster .....	20 (1/2 cup)	20
			Saltines (2 in. sq.).....	5	20
			Soda (2 1/2 in. sq.).....	3	20
			Round, thin (1 1/2 in. diam.) .....	6-8	20
			<b>Vegetables</b>		
			Beans and Peas, dried, cooked .....	1/2 cup	90
			(lima, navy, split pea, cowpeas, etc)		
			Baked Beans, no pork.....	1/4 cup	50
			Corn .....	1/3 cup	80
			Parsnips .....	2/3 cup	125
			Potatoes, white, baked, boiled .....	1 (2 in. diam.)	100
			Potatoes, white, mashed... ..	1/2 cup	100
			Potatoes, sweet, or Yams.. ..	1/4 cup	50
			Sponge Cake, plain.....	1 (1 1/2 in. cube)	25
			Ice Cream (omit 2 fat ex- changes) .....	1/2 cup	70
LIST 2. VEGETABLE EXCHANGES			LIST 5. MEAT EXCHANGES		
A.—These vegetables may be used as desired in ordinary amounts. Carbohydrates and Calories negligible.			Protein—7 Gm., Fat—5 Gm., Calories—73		
Asparagus .....	"Greens"	Lettuce	Meat and Poultry (med. fat) (beef, lamb, pork, liver, chicken, etc.)	1 oz.	30
Broccoli .....	Beet	Mushrooms	Cold Cuts (4 1/2 in. sq., 1/8 in. thick) .....	1 slice	45
Brussels .....	Chard	Okra	Frankfurter .....	1 (8-9/lb.)	50
Sprouts .....	Collard	Pepper	Fish: Cod, Mackerel, etc....	1 oz.	30
Cabbage .....	Dandelion	Radishes	Salmon, Tuna, Crab.....	1/4 cup	30
Cauliflower .....	Kale	Rhubarb	Oysters, Shrimp, Clams... ..	5 small	45
Celery .....	Mustard	Sauerkraut	Sardines .....	3 medium	30
Chicory .....	Spinach	String Beans, young	Cheese, cheddar, American... ..	1 oz.	30
Cucumbers .....	Turnip	Summer Squash	Cottage .....	1/4 cup	45
Escarole .....		Tomatoes	Egg .....	1	50
Eggplant .....			Peanut Butter*.....	2 tbsp.	30
B.—Vegetables: 1 serving equals 1/2 cup equals 100 Gm.			* Limit use or adjust carbohydrate.		
Carb.—7 Gm., Protein—2 Gm., Calories—36			LIST 6. FAT EXCHANGES		
Beets .....	Peas, green	Squash, winter	Fat—5 Gm., Calories—45		
Carrots .....	Pumpkin	Turnip		<i>Measure</i>	<i>Gm.</i>
Onions .....	Rutabaga		Butter or Margarine.....	1 tsp.	5
			Bacon, crisp .....	1 slice	10
			Cream, light, 20% .....	2 tbsp.	30
			Cream, heavy, 40% .....	1 tbsp.	15
			Cream Cheese .....	1 tbsp.	15
			French Dressing .....	1 tbsp.	15
			Mayonnaise .....	1 tsp.	5
			Oil or Cooking Fat.....	1 tsp.	5
			Nuts .....	6 small	10
			Olives .....	5 small	50
			Avocado .....	1/8 (4 in. diam.)	25
LIST 3. FRUIT EXCHANGES					
Carbohydrate—10 Gm., Calories—40					
	<i>Measure</i>	<i>Gm.</i>			
Apple .....	1 sm. (2 in. diam.)	80			
Applesauce .....	1/2 cup	100			
Apricots, fresh.....	2 medium	100			
Apricots, dried.....	4 halves	20			
Banana .....	1/2 small	50			
Berries: Straw., Rasp., Black.....	1 cup	150			
Blueberries .....	2/3 cup	100			
Cantaloupe .....	1/4 (6 in. diam.)	200			
Cherries .....	10 large	75			
Dates .....	2	15			
Figs, fresh.....	2 large	50			
Figs, dried.....	1 small	15			
Grapefruit .....	1/2 small	125			
Grapefruit Juice.....	1/2 cup	100			
Grapes .....	12	75			
Grape Juice.....	1/4 cup	60			
Honeydew Melon.....	1/8 (7 in. diam.)	150			
Mango .....	1/2 small	70			
Orange .....	1 small	100			
Orange Juice.....	1/2 cup	100			
Papaya .....	1/8 medium	100			
Peach .....	1 medium	100			
Pear .....	1 small	100			
Pineapple .....	1/2 cup	80			
Pineapple Juice.....	1/3 cup	80			
Plums .....	2 medium	100			
Prunes, dried.....	2 medium	25			
Raisins .....	2 tbsp.	15			
Tangerine .....	1 large	100			
Watermelon .....	1 cup	175			

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TABLE III  
Sample Diet Calculation  
(Diet Prescription 80-80-185 (35-65-75-10))

Food	Amount	P	F	C	Food	Amount	C
Milk Exchange, List 1	3 cups	24	30	36	<b>BREAKFAST:</b>		
	(standard)				Fruit Exchange	1	10
Vegetable Exchange, List 2A	As desired	...	...	...	Egg (Meat Exchange)	1	..
Vegetable Exchange, List 2B	2	4	...	14	Bread Exchange	1	15
Fruit Exchange, List 3	3	...	...	30	Fat Exchange	2	..
				<b>80</b>	Milk	1 cup	12
Bread Exchange, List 4	7	<u>14</u>	...	105	<b>TOTAL</b>		<b>37</b>
		<b>42</b>			<b>LUNCH:</b>		
Meat Exchange, List 5	5	35	<u>25</u>	...	Meat Exchange	1	..
			<b>55</b>		Vegetable Exchange, List 2A	As desired	..
Fat Exchange, List 6	5	...	<u>25</u>	...	Vegetable Exchange, List 2B	1	7
<b>TOTAL</b>		<b>77</b>	<b>80</b>	<b>185</b>	Fruit Exchange	1	10
<b>CALCULATIONS:</b>					Bread Exchange	3	45
Carbohydrate					Fat Exchange	2	
185 Gm. carbohydrate in prescription					<b>TOTAL</b>		<b>62</b>
80 Gm. carbohydrate in diet from other than bread exchanges					<b>DINNER:</b>		
$\overline{105} \div 15 = 7$ bread exchanges					Meat Exchange	3	..
Protein					Vegetable Exchange, List 2A	As desired	..
80 Gm. protein in prescription					Vegetable Exchange, List 2B	1	7
42 Gm. protein in diet from other than meat exchanges					Fruit Exchange	1	10
$\overline{38} \div 7 = 5$ meat exchanges					Bread Exchange	3	45
Fat					Fat Exchange	2	..
80 Gm. fat in prescription					Milk	1 cup	12
55 Gm. fat from other than fat exchanges					<b>TOTAL</b>		<b>74</b>
$\overline{25} \div 5 = 5$ fat exchanges					<b>BEDTIME:</b>		
					Milk	1 cup	<u>12</u>
					<b>TOTAL</b>		<b>12</b>
					<b>GRAND TOTAL</b>		<b>185</b>



TABLE IV  
Menu Adaptation of Meal Plan

Meal plan		Menu	
<b>BREAKFAST:</b>			
Fruit Exchange	1	Orange juice	1/2 cup
Egg	1	Poached egg	1
Bread Exchange	1	Whole wheat toast	1 slice
Fat Exchange	2	Bacon	1 slice
		Butter	1 tsp.
Milk	1 cup	Milk	1 cup
<b>LUNCHEON:</b>			
Meat Exchange	1	American cheese	1 oz.
Vegetable Exchange			
List 2A	As desired	Lettuce for sandwich	
List 2B	1	Carrot sticks	1/2 cup
Fruit Exchange	1	Apple	1 small
Bread Exchange	3	Bread (for sandwich)	3 slices
Fat Exchange	2	Butter	2 tsp.
<b>DINNER:</b>			
Meat Exchange	3	Roast beef	3 oz.
Vegetable Exchange			
List 2B	1	Peas	1/2 cup
List 2A	As desired	Celery	As desired
Fruit Exchange	1	Peach	1 medium
Bread Exchange	3	Potato, mashed	1/2 cup
Fat Exchange	2	Bread	2 slices
Milk	1 cup	Butter	2 tsp.
		Milk	1 cup
<b>BED TIME:</b>			
Milk	1 cup	Milk	1 cup

usually expensive, often unpalatable, and tend to make the diabetic patient feel that his diet is different from that of others. This should not be the case. His diet is only a modification of the normal diet in carbohydrate content and therefore may include all but a few of the foods eaten by the average person. The only specially prepared foods that the diabetic patient need purchase are fruits canned or frozen without sugar.

#### SUMMARY

Every physician will find it of value to use the exchange system presented here for the calculation of the diets for his diabetic patients. This system provides a standard procedure to be followed by physicians and dieti-

tians throughout the country, takes little time to calculate a diet for each individual patient, is easily taught to the patient, allows for a great variety of foods in the diet, and provides for adequate nutrition.—DORIS JOHNSON

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