Food for Thought

New dietary reference intakes for macronutrients and fibre

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Question

A 42-year-old woman has been diagnosed with type 2 diabetes. Overweight for more than 20 years, she has recently gone on a high-protein, low-carbohydrate diet to lose weight and improve her health. What recommendations should I make concerning her intake of carbohydrates, protein, and fat? Will the regimen she has chosen provide her with adequate dietary fibre?

Answer

Diets that severely restrict carbohydrates for long periods are not as beneficial as diets that are more balanced in macronutrients. Restricting carbohydrates for short periods is not harmful to most people, but a better plan is to restrict intake of refined carbohydrates (sugar, white flour, highly processed foods). Keeping caloric intake low and increasing physical activity is important in any weight-loss plan. Women who could become pregnant should be cautious about losing weight, particularly if they are following restrictive diets. Eating vegetables, fruit, whole grains, beans, peas, and lentils will ensure that dietary fibre intake is adequate.

Carbohydrates, fat, and protein all contribute to the body's energy needs. To meet the need for these macronutrients without increasing risk of chronic disease requires that people eat a balanced diet. Low-fat, high-carbohydrate diets might be harmful to people with a particular type of blood-lipid profile, while diets high in fat could lead to obesity and its complications. Dietary reference intakes suggest that adults consume 45% to 65% of their total calories from carbohydrates, 20% to 35% from fat, and 10% to 35% from protein. These proportions are more flexible than previous proportions and will be useful for those planning diets to meet their unique needs.[1]

Carbohydrates

The recommended dietary allowance of 130 g/d for adults and children is based on the average minimum amount of glucose used by the brain. Actual intake is higher. Adult men consume between 200 and 330 g/d, while adult women consume between 180 and 230 g/d. Red blood cells, white blood cells, the medulla of the kidney, and the brain have an absolute requirement for glucose; the brain, however, can partially meet its energy needs from ketoacids.

Two issues that often arise regarding carbohydrates are the effect of sugar on behaviour and the importance of the glycemic index (GI). Many anecdotal reports link high sugar intake with poor behaviour in children. A meta-analysis of 23 studies conducted during a 12-year period concluded, however, that sugar intake does not affect children's behaviour or cognitive performance.[2]

The GI is a scientific theory about how the body digests and absorbs various carbohydrates (the glycemic load is the product of the dietary GI and total dietary carbohydrates). The GI of a particular food describes how quickly the glucose from that food enters the bloodstream (**Table 1**). Unrefined carbohydrates high in dietary fibre have a low GI,

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while foods such as sugar, white bread, and other highly processed foods have a high GI. Eating foods with a low GI might benefit those with type 2 diabetes because it will help to maintain an adequate balance between blood glucose and insulin levels.[3] Epidemiologic evidence[4-6] mostly supports the theory that foods with a low GI reduce risk of type 2 diabetes, but one study[7] found that GI was not associated with risk of diabetes. The new dietary reference intakes made no specific recommendations about the GI of foods and risk of chronic disease because there were no intervention studies (clinical trials) where dietary GI was manipulated.

Table 1. Glycemic index of some common foods

FOODS	GLYCEMIC INDEX
Grains	
• White bread	100*
• Bran flakes	106
• All-Bran Buds	64
• Cheerios	106
• Oatmeal	69
• Bagel	103
• Spaghetti	63
• Soda crackers	103
Vegetables and fruit	
• Carrots	70
• Corn	80
• Green peas	67
• Raisins	91
• Apples	54
• Banana	80
• Orange	61
• Cantaloupe	93
• Mashed potato	100
• French fries	107
• Sweet potato	74
Beans	
• Baked beans	63
• Lentils	43
• Pinto beans	56
Milk products	
• Whole milk	43
• Fruit yogurt	51
• Plain yogurt	20
• Ice cream	86
Snacks	
• Colas	93
• Popcorn	79
• Pretzels	119
• Potato chips	80
• Jelly beans	114

**Reference value: values for this table were drawn from several sources. All values reported are standardized to white bread = 100.*

Fat

Humans have a dietary requirement for two polyunsaturated fatty acids: alpha-linolenic acid, an omega-3 fatty acid, and linoleic acid, an omega-6 fatty acid. Dietary sources of omega-3 fatty acids include fatty fish such as salmon, canola oil, and flax oil. Omega-6 fatty acids are found in safflower oil, sunflower oil, and corn oil. An adequate intake of alpha-linolenic acid is 1.6 g/d for adult men and 1.1 g/d for adult women. An adequate intake of linoleic acid is 17 g/d for adult men and 12 g/d for adult women. The typical North American diet meets the need for essential fatty acids, but the quality of this diet with respect to certain types of fat is questionable.

Saturated fats, trans fats, and dietary cholesterol are not required at all in the diet. Saturated fats are mostly obtained from animal products and are solid at room temperature. Trans fats are produced during the hydrogenation process in which oils are made solid (vegetable shortening). Trans fats behave like saturated fats in the body, raising the risk of heart disease through increased blood levels of low-density lipoprotein cholesterol. The recommendation is to keep intake of these substances as low as possible while consuming a nutritionally adequate diet. Monounsaturated fats, such as olive and canola oils, have a positive effect on high-density lipoprotein cholesterol and are preferred sources of dietary fat.[1]

Protein

Food eaten should include high-quality dietary proteins that provide adequate levels of essential amino acids. The recommended dietary allowance for both men and women is set at 0.8 g per kg of body weight. Most people consume much higher

levels of dietary protein. The new dietary reference intakes refer, for the first time, to the need for an additional 25 g of dietary protein during pregnancy and lactation, bringing the requirement up to 1.1 g per kg of body weight.[1]

Fibre

The new dietary reference intakes recommend intake of dietary fibre for the first time and include a wider definition of fibre. Dietary fibre means nondigestible carbohydrates and lignin that are intrinsic and intact in plants. Functional fibre means isolated nondigestible carbohydrates that have beneficial physiologic effects on humans. Psyllium is an example of a functional fibre. Total fibre is the sum of dietary and functional fibre.

Adequate intakes of dietary fibre are shown in **Table 2** for specific sex and age groups. A diet that includes a variety of whole grains, vegetables, fruit, peas, beans, and lentils will meet dietary requirements for fibre. Fibre is thought to have a wide-ranging influence on human health, including having gastrointestinal benefits and reducing the risk of chronic disease.[1]

Macronutrients and fibre in a daily diet

The recommended level of carbohydrates (130 g/d) can easily be achieved by consuming a cup of rice or spaghetti with sauce, a cup of milk, a cup of orange juice, an apple, and a carrot. A 75-kg man needs 60 g of protein daily, and a 55-kg woman needs 44 g of protein daily. One serving of meat (steak, hamburger, turkey, chicken) provides between 25 and 30 g of protein. Ample dietary fat is obtained from meats, dairy products, and vegetable oils.

Recommended dietary intake of fibre, which ranges according to age and sex from 21 to 38 g daily, might be difficult for average Canadians to achieve, but small dietary changes can help. Five servings of fruit and vegetables can provide as little as 10 g and as much as 20 g of dietary fibre. Wholegrain breads have 2.0 to 2.5 g of dietary fibre per slice. Higher-fibre breakfast cereals range between 5 and 12 g of dietary fibre per serving.

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Table 2. Recommended macronutrient intakes for various age and sex groups

GROUP	CARBOHYDRATE G/D*	PROTEIN G/KG/D*	FAT (% OF TOTAL ENERGY)	FIBRE G/D†
Girls 4-8 y	130	0.95	20-35	25
Girls 9-13 y	130	0.95	20-35	26
Girls 14-18 y	130	0.85	20-35	26
Boys 4-8 y	130	0.95	20-35	25
Boys 9-13 y	130	0.95	20-35	31
Boys 14-18 y	130	0.85	20-35	38
Men 19-49 y	130	0.80	20-35	38
Men ≥50 y	130	0.80	20-35	30
Women 19-49 y	130	0.80	20-35	25
Women ≥50 y	130	0.80	20-35	21
Pregnant women	170	1.10	20-35	28
Lactating women	210	1.10	20-35	29

**Recommended dietary allowance.*
†Adequate intake.