Dietary Fibers: An Update

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•In the domain of preventive nutrition, the effects of dietary fibers have been the subject of a host of investigations during the past years. Dietary fiber denotes all plant cell wall components, e.g., various amounts of fibrillar polysaccharide (mainly cellulose), matrix polysaccharides (hemicellulose, pectins), lignins, cutin, waxes, some glycoproteins and are often accompanied by starch. It resists digestion by the secretions of the gastrointestinal tract and is degraded by the colonic microflora. Dietary fiber may act as a laxative by several mechanisms. It can bind water and ions in the colonic lumen, thereby softening the feces and increasing their bulk; it also can support the growth of colonic bacteria, thereby increasing fecal mass; some components of the fiber may be digested by colonic bacteria to metabolites that increase the osmotic activity of the luminal fluid; colonic fermentation of pectins and gums can decrease stool water by production of metabolites, such as short-chain fatty acids, directly influencing colonic mechanisms of fluid and electrolyte transport. Thus, fiber fraction is interesting for its effect on the colon physiology. A high-fiber diet is associated with reduced incidence of diver- ticulosis, cancer of the colon, cardiovascular disease and diabetes mellitus. The more insoluble fibers such as cellulose and lignin found in wheat bran are beneficial with regard to colonic function, whereas the more soluble fibers found in legumes and fruit, e.g., gums and pectins, lower blood cholesterol, possibly by binding bile acids and dietary cholesterol. The soluble fibers also slow stomach emptying, and they delay and attenuate the postprandial rise in blood glucose, with consequent reduction in insulin secretion. This effect is beneficial to diabetics and to dieters because reduces the rebound fall in blood glucose that stimulates appetite. Foods differ widely in their type and content of dietary fiber. Foods rich in fiber include whole grain foods, bran flakes, fruits, leafy vegetables, root vegetables and their skins and prunes, which also contain the laxative substance diphenylisatin; bran contains over 40% dietary fiber. Grains and cereals contain mainly insoluble, poorly fermentable fibers; their ingestion will shorten intestinal transit time and increase stool bulk. Vegetables and fruits contain more water-soluble fibers that result in a more moist stool but with less effect on transit time. Today, a variety of dietary supplements are available to add bulk and water-holding capacity to the intestinal contents, such as: (a) malt soup extract (12 g daily in four divided doses); (b) husk and dried ripe seed of the psyllium plant, grown in France, Spain and India, is enriched in a hydrophilic mucil- loid that forms a gelatinous mass when mixed with water; (c) a variety of semisynthetic celluloses, including methylcellulose and carboxymethylcellulose, compounds hydrophilic and indigestible forming a bulky colloid when mixed with water; (d) polycarbophil compounds that are nonabsorbed hydrophilic polyacrylic resins with the capacity to absorb 60 to 100 times their weight in water, thereby adding bulk and softness to the feces (recommended dose 1 g, one to four times daily, each dose taken with 250 ml water). Psyllium, lignin and pectin bind bile acids, reducing their intestinal reabsorption and promoting their excretion. The consequent increase of hepatic synthe-sis of bile acids from cholesterol may reduce plasma cholesterol in low-density lipoproteins. It is not possible to lay down desirable levels of intake of dietary fiber. The daily intake of crude fiber, which makes up only part of the

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dietary fiber in the diet, amounts to 4-8 g in the United Kingdom and 3-4 g in the USA. The mean daily intake of dietary fiber in a British population is estimated to be 19.7 g, in a Danish town population 17 g and in a Finnish rural population 31 g. On the basis of satisfactory laxation reported by patients, 20 to 60 g/day of dietary fiber usually is sufficient. Dietary fibers have few side effects and minimal systemic effects. Allergic reactions may occur, especially with use of plant gums. Ca^{2+} polycarbophil releases Ca^{2+} in the gastrointestinal tract and should not be used by patients who must restrict their Ca^{2+} intake or who are taking tetracyclines concurrently. Carboxymethylcellu- lose sodium and psyllium husk may contain significant quantities of Na^{+} and should not be used when systemic retention of Na^{+} and H_20 is a problem. Some preparations contain dextrose and should be avoided in the treatment of diabetic patients. Cellulose can bind and reduce the intestinal absorption of many drugs, including cardiac glycosides, salicylates and nitrofurantoin; psyllium may bind coumarin derivatives.

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