

The Importance of Total Dietary Fiber in Human Nutrition and Health

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Dietary fiber may best be defined as the sum of all ingested food polymers not digested in the small intestine, and may or may not be degraded or fermented in the large intestine. Included in this definition are such polymers as polydextrose, mail-lard polymers and fructooligosaccharides. An important contribution to our understanding of the significance of dietary fibers to human nutrition and health has been the successful development of methods for its quantification. Credit must be given scientists who have diligently worked to develop and improve methods for dietary fiber analysis. These scientists include : Leon Prosky, Robert Selvendran, David Southgate, Hans Englyst, Bunpei Mori, Olaf Theander and Sungsoo Lee.

Possibly the most important contribution of dietary fiber in the human diet leading to good human nutrition is its reduction of calories by serving as a bulking agent. If an average diet provides 2200 kcal/day and contains 18g of dietary fiber, doubling the dietary fiber intake to 36g/day could result in food selections of reduced energy intake by 200~300 kcal/day. Eating foods rich in dietary fiber help reduce the total amount of food intake, and in addition studies have shown that it takes a longer time to eat foods or meals high in dietary fiber content compared those of lower dietary fiber content.

Dietary fiber can be separated into two fractions, insoluble dietary fiber and soluble dietary fiber. Both fractions have unique functional properties in foods, and the scientific evidence suggests that these two fractions have unique and different ac-

tions in the intestine leading to good nutrition and good health, probably through different mechanisms. Consumption of a combination of both insoluble and soluble dietary fibers is highly desirable. Soluble dietary fibers have been reported to slow the rate of gastric emptying. The insoluble dietary fibers provide bulk in the stomach. Collectively, both fractions in the diet, and eventually the stomach, help people reach satiation earlier, and this satiety is of longer duration.

In the small intestine, many of the soluble dietary fibers are believed to increase the viscosity of the luminal contents. A number of physiological functions considered to be nutritionally advantageous to the host are believed to result from expression of this physical property. The rate of nutrient digestion in the small intestine is believed to be slowed with soluble fibers. A significant effect of slower digestion is the lowering of post prandial blood glucose concentrations, and consumption of soluble dietary fibers appears to be highly advantageous to the diabetic. It is also postulated that as dietary fiber and discarded mucosal cells accumulate in the lower portion of the small intestine (e.g., ileum) bile acid reabsorption is retarded. By reducing the enterohepatic circulation of bile acids, blood cholesterol concentrations decrease, and this is one of the most highly publicized and positive nutritional aspects of consuming foods and diets rich in dietary fiber.

The one negative nutritional factor frequently associated with dietary fiber consumption, has been

that dietary fibers impair mineral (e.g., element) absorption. Extensive and convincing evidence is now available to strongly suggest that no food source of dietary fiber has any adverse effect on mineral absorption and nutrition in animals or humans.

In the large intestine, a number of different and positive effects are associated with dietary fiber consumption. Insoluble dietary fibers help retain water and result in softer and larger volumes of fecal waste. Also associated with increased insoluble dietary fiber intakes is the resultant faster movement of waste products through and out of the gastrointestinal tract. This simple physiological function caused by dietary fiber may be one of the most important events contributing to a normal and healthy intestine.

Insoluble dietary fibers can be partially degraded in the large intestine and help serve as an anchor or a surface for attachment of bacteria. Soluble dietary fibers can also be degraded in the large intestine and usually to a larger extent compared to insoluble dietary fibers. Increased intakes of ferme-

ntable dietary fiber can lead to increased amounts, and a more diverse population, of large intestine bacteria. These changes in intestinal bacteria produced by dietary fiber consumption are considered highly advantageous to intestinal functioning and health. The products of the fermentation of dietary fiber in the large intestine and the resulting changes in other metabolites (i.e. hydrogen ion concentration, ammonia concentration and type and amount of bile acids) are now considered to have a significant effect on intestinal morphology and cytokinetics. The regulation of intestinal mucosal cell proliferation and metabolism by dietary fiber may help explain how dietary fiber maintains a healthy intestine and also why it is effective in the therapy of an unhealthy intestine.

The importance of dietary fiber and recommendations to increase dietary fiber consumption in the human diet are totally justified. Science is moving ahead in explaining how dietary fiber is exerting its beneficial effects on human nutrition and health.