NUTRIENT BIOAVAILABILITY AND INTERACTIONS

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Reliance for an assessment of nutritional status upon nutrient intake data is no longer sufficient because there are many factors which alter the bioavailability of the nutrients ingested. Among such factors are the condition of the foods themselves such as age or maturity, the methods used in processing and the presence of interfering substances: oxalate, phytate, goitrogens or fiber. Additionally, absorption from the gastrointestinal tract is determined by the chemical nature of the nutrient, competitive antagonism for uptake processes, and formation of chelates or complexes. Host variables such as species differences, individual variation or the presence of disease can also alter the fraction of a food absorbed.

The formation of metal complexes with phytate and/or protein has been shown to be one of the major factors which influence bioiavailability. Phytate is found primarily in the bran and germ portions of grains and to a lesser extent in legumes, nuts and seeds. Zinc is particularly susceptible to becoming deficient as a result of reduction of uptake due to phytate complexation. Besides zinc, experiments have shown that calcium, copper, iron, magnesium, manganese and phosphorus from ingested foods, as well as from endogenous secretion (saliva, pancreatic fluid), are bound by phytate and made unavailable for absorption into the body. Thus, the presence of phytate in the diet is creating new dietary concern because of the widespread use of soy-based infant formulas and substitution of textured vegetable proteins for milk and meat.

Nutrient bioavailability of minerals, as well as vitamins, protein and fat, are also affected by dietary fiber. This may be due to decreased gastrointestinal transit time for specific binding to fibrous components. Dietary fiber produces gastrointestinal effects by alteration of bile-acid binding, cation-exchange, gel formation and water holding capacity. Colonic activity depends upon the extent to which fibers are digested before reaching the colon. A recent study compared the fibers of cabbage and wheat bran. Cabbage fiber, which is extensively broken down, provides a readily usable substrate for microbial growth, whereas wheat fiber remains largely undigested and retains water in the gut lumen. Wheat fiber and probably cereals in general, reduce transit times, and increase stool weights because their structure consists of small cells with highly lignified walls which resist digestion. Consumer pressure for increased dietary fiber and the widespread addition of phytate to the diet, although considered generally beneficial, are creating secondary nutritional concerns. This necessitates a comprehensive data bank with the capability of assessing nutrient interactions through integrated monitoring.