ALCOHOL ALERT

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Alcohol and Nutrition

Nutrition is a process that serves two purposes: to provide energy and to maintain body structure and function. Food supplies energy and provides the building blocks needed to replace worn or damaged cells and the nutritional components needed for body function. Alcoholics often eat poorly, limiting their supply of essential nutrients and affecting both energy supply and structure maintenance. Furthermore, alcohol interferes with the nutritional process by affecting digestion, storage, utilization, and excretion of nutrients (1).

Impairment of Nutrient Digestion and Utilization

Once ingested, food must be digested (broken down into small components) so it is available for energy and maintenance of body structure and function. Digestion begins in the mouth and continues in the stomach and intestines, with help from the pancreas. The nutrients from digested food are absorbed from the intestines into the blood and carried to the liver. The liver prepares nutrients either for immediate use or for storage and future use.

Alcohol inhibits the breakdown of nutrients into usable molecules by decreasing secretion of digestive enzymes from the pancreas (2). Alcohol impairs nutrient absorption by damaging the cells lining the stomach and intestines and disabling transport of some nutrients into the blood (3). In addition, nutritional deficiencies themselves may lead to further absorption problems. For example, folate deficiency alters the cells lining the small intestine, which in turn impairs absorption of water and nutrients including glucose, sodium, and additional folate (3).

Even if nutrients are digested and absorbed, alcohol can prevent them from being fully utilized by altering their transport, storage, and excretion (4). Decreased liver stores of vitamins such as vitamin A (5), and increased excretion of nutrients such as fat, indicate impaired utilization of nutrients by alcoholics (3).

Alcohol and Energy Supply

The three basic nutritional components found in food--carbohydrates, proteins, and fats--are used as energy after being converted to simpler products. Some

alcoholics ingest as much as 50 percent of their total daily calories from alcohol, often neglecting important foods (3,6).

Even when food intake is adequate, alcohol can impair the mechanisms by which the body controls blood glucose levels, resulting in either increased or decreased blood glucose (glucose is the body's principal sugar) (7). In nondiabetic alcoholics, increased blood sugar, or hyperglycemia--caused by impaired insulin secretion--is usually temporary and without consequence. Decreased blood sugar, or hypoglycemia, can cause serious injury even if this condition is short lived. Hypoglycemia can occur when a fasting or malnourished person consumes alcohol. When there is no food to supply energy, stored sugar is depleted, and the products of alcohol metabolism inhibit the formation of glucose from other compounds such as amino acids (7). As a result, alcohol causes the brain and other body tissue to be deprived of glucose needed for energy and function.

Although alcohol is an energy source, how the body processes and uses the energy from alcohol is more complex than can be explained by a simple calorie conversion value (8). For example, alcohol provides an average of 20 percent of the calories in the diet of the upper third of drinking Americans, and we might expect many drinkers who consume such amounts to be obese. Instead, national data indicate that, despite higher caloric intake, drinkers are no more obese than nondrinkers (9,10). Also, wh en alcohol is substituted for carbohydrates, calorie for calorie, subjects tend to lose weight, indicating that they derive less energy from alcohol than from food (summarized in 8).

The mechanisms accounting for the apparent inefficiency in converting alcohol to energy are complex and incompletely understood (11), but several mechanisms have been proposed. For example, chronic drinking triggers an inefficient system of alcohol metabolism, the microsomal ethanol-oxidizing system (MEOS) (1). Much of the energy from MEOS-driven alcohol metabolism is lost as heat rather than used to supply the body with energy.

Alcohol and the Maintenance of Cell Structure and Function

Structure

Because cells are made mostly of protein, an adequate protein diet is important for maintaining cell structure, especially if cells are being damaged. Research indicates that alcohol affects protein nutrition by causing impaired digestion of proteins to amino acids, impaired processing of amino acids by the small intestine and liver, impaired synthesis of proteins from amino acids, and impaired protein secretion by the liver (3).

Function

Nutrients are essential for proper body function; proteins, vitamins, and minerals provide the tools that the body needs to perform properly. Alcohol can disrupt body function by causing nutrient deficiencies and by usurping the machinery needed to metabolize nutrients.

Vitamins. Vitamins are essential to maintaining growth and normal metabolism because they regulate many physiological processes. Chronic heavy drinking is associated with deficiencies in many vitamins because of decreased food ingestion and, in some cases, impaired absorption, metabolism, and utilization

(1,12). For example, alcohol inhibits fat absorption and thereby impairs absorption of the vitamins A, E, and D that are normally absorbed along with dietary fats (12,13). Vitamin A deficiency can be associated with night blindness, and vitamin D deficiency is associated with softening of the bones (6).

Vitamins A, C, D, E, K, and the B vitamins, also deficient in some alcoholics, are all involved in wound healing and cell maintenance (14). In particular, because vitamin K is necessary for blood clotting, deficiencies of that vitamin can cause delayed clotting and result in excess bleeding. Deficiencies of other vitamins involved in brain function can cause severe neurological damage.

Minerals. Deficiencies of minerals such as calcium, magnesium, iron, and zinc are common in alcoholics, although alcohol itself does not seem to affect the absorption of these minerals (15). Rather, deficiencies seem to occur secondary to other alcohol-related problems: decreased calcium absorption due to fat malabsorption; magnesium deficiency due to decreased intake, increased urinary excretion, vomiting, and diarrhea (16); iron deficiency related to gastrointestinal bleeding (3,15); and zinc malabsorption or losses related to other nutrient deficiencies (17). Mineral deficiencies can cause a variety of medical consequences from calcium-related bone disease to zinc-related night blindness and skin lesions.

Alcohol, Malnutrition, and Medical Complications

Liver Disease

Although alcoholic liver damage is caused primarily by alcohol itself, poor nutrition may increase the risk of alcohol-related liver damage. For example, nutrients normally found in the liver, such as carotenoids, which are the major sources of vitamin A, and vitamin E compounds, are known to be affected by alcohol consumption (18,19). Decreases in such nutrients may play some role in alcohol-related liver damage.

Pancreatitis

Research suggests that malnutrition may increase the risk of developing alcoholic pancreatitis (20,21), but some research performed outside the United States links pancreatitis more closely with overeating (21). Preliminary research suggests that alcohol's damaging effect on the pancreas may be exacerbated by a protein-deficient diet (22).

Brain

Nutritional deficiencies can have severe and permanent effects on brain function. Specifically, thiamine deficiencies, often seen in alcoholics, can cause severe neurological problems such as impaired movement and memory loss seen in Wernicke/Korsakoff syndrome (23).

Pregnancy

Alcohol has direct toxic effects on fetal development, causing alcohol-related birth defects, including fetal alcohol syndrome. Alcohol itself is toxic to the fetus,

but accompanying nutritional deficiency can affect fetal development, perhaps compounding the risk of developmental damage (24,25).

The nutritional needs during pregnancy are 10 to 30 percent greater than normal; food intake can increase by as much as 140 percent to cover the needs of both mother and fetus (24). Not only can nutritional deficiencies of an alcoholic mother adversely affect the nutrition of the fetus, but alcohol itself can also restrict nutrition flow to the fetus (24,25).

Nutritional Status of Alcoholics

Techniques for assessing nutritional status include taking body measurements such as weight, height, mass, and skin fold thickness to estimate fat reserves, and performing blood analysis to provide measurements of circulating proteins, vitamins, and minerals. These techniques tend to be imprecise, and for many nutrients, there is no clear "cut-off" point that would allow an accurate definition of deficiency (4). As such, assessing the nutritional status of alcoholics is hindered by the limitations of the techniques. Dietary status may provide inferential information about the risk of developing nutritional deficiencies. Dietary status is assessed by taking patients' dietary histories and evaluating the amount and types of food they are eating.

A threshold dose above which alcohol begins to have detrimental effects on nutrition is difficult to determine. In general, moderate drinkers (two drinks or less per day) seem to be at little risk for nutritional deficiencies. Various medical disorders begin to appear at greater levels.

Research indicates that the majority of even the heaviest drinkers have few detectable nutritional deficiencies but that many alcoholics who are hospitalized for medical complications of alcoholism do experience severe malnutrition (1,12). Because alcoholics tend to eat poorly--often eating less than the amounts of food necessary to provide sufficient carbohydrates, protein, fat, vitamins A and C, the B vitamins, and minerals such as calcium and iron (6,9,26)--a major concern is that alcohol's effects on the digestion of food and utilization of nutrients may shift a mildly malnourished person toward severe malnutrition.

Alcohol and Nutrition--A Commentary by NIAAA Director Enoch Gordis, M.D.

The combination of an adequate diet and abstention from alcohol is the best way to treat malnourished alcoholic patients. Nutritional supplements have been used to replace nutrients deficient in malnourished alcoholics in an attempt to improve their overall health. Dosages of nutritional supplements such as vitamin A that exceed normally prescribed levels may result in overdose.

Although various nutritional approaches have been touted as "cures" for alcoholism, there is little evidence to support such claims. However, renewed research attention to the nutritional aspects of alcohol leaves open the possibility that a role for nutritional therapy in alcoholism treatment may yet be defined.

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