

VEGETARIAN, GLUTEN-FREE AND KETOGENIC DIETS

Adults and children can follow restrictive diets for various reasons, including medical necessity, perceived health benefits, trendiness, animal rights, environmental impact or a desire for weight loss. Ketogenic, gluten-free and vegetarian diets are generally safe when closely supervised. However, patients adapting these diets could unknowingly place themselves at risk for nutritional deficiency without proper monitoring and supplementation.

The Ketogenic diet was originally developed for the treatment of seizures. The Ketogenic diet consists of low carbohydrate intake, leading to ketosis (when the body does not have enough carbohydrates and will burn fats for energy). Multiple regimens exist and are based on varying lipid-to-nonlipid ratios by weight. These ratios provide high fat, low carbohydrate and adequate protein intake with the ultimate goal to imitate a fasting state. In the classic Ketogenic Diet, nearly 90% of daily calorie intake is from fat. Regardless of the ratio, children on a Ketogenic diet are more susceptible to kidney stones.

Due to decreased food options, nutritional deficiencies, including thiamine (Vit B1), Vit D, magnesium, phosphorous, copper, zinc, selenium and carnitine can be associated with the Ketogenic Diet. The stricter the lipid-to-nonlipid ratio, the higher the likelihood of nutrient deficiencies. Typically, a multivitamin is prescribed with the diet, but none have been specifically designed to treat Ketogenic deficiencies. Selenium, found in high quantities in meats and grains, is often deficient and without proper supplementation can be depressed within a few months. Selenium deficiency can lead to cardiomyopathy. Restoration of appropriate levels of selenium can prevent the progression of the heart damage but will not reverse the damage. Those with concurrent GI disease are especially at risk. Other minerals, including magnesium, phosphorus and zinc can be deficient with resulting hair loss, diarrhea, and poor growth. Carnitine deficiency can be associated with low sugar, especially in the initial fast, mild muscle weakness, hypotonia, apathy, listlessness, nausea or vomiting, and constipation. Vitamin D deficiency has been found in patients with a Ketogenic Diet.

Vegetarians avoid all meat products, although some subtypes can eat fish, eggs, dairy or honey. Vitamin, mineral and macronutrient deficiencies have been reported in patients limiting animal product consumption. Vitamin B12 is a well-known complication of vegan-ism but can be seen in non vegans with low egg, dairy, fish or meat intake; without adequate supplementation, deficits occur and can cause anemia and neurologic deficits. Deficiency of Vit B12 can be seen in breastfeeding infants of a vegan mother and infant supplementation of Vit B12 should be considered. Vit D is essential for bone health and the immune system. Soy and nondairy milks may not provide adequate levels and their contents should be confirmed. Retinol, the active form of Vit A is exclusive to animal products. Vit A is essential for vision, skin health, immune function and the developing embryo. Good sources of Vit A include spinach, carrots, sweet potato and other yellow and orange fruits or vegetables. Dairy products provide up to 2/3 of total calcium intake in the US. Non-fortified foods in a vegan diet can not meet the daily requirements of calcium without producing other nutrient deficiencies or caloric excess. Combining calcium-rich foods with Vit C can improve calcium absorption. Daily supplementation is recommended. Both absolute intake and composition of protein should be closely monitored in a vegetarian diet. Protein deficiency from milk substitutes is well documented. Certain milk substitutes, such as rice milk and almond milk, have little to no protein.

Concentrations of Vit A, C, D and the B group in human milk are especially maternal diet-dependent. Vit B12 is often supplemented in vegans, nursing mothers can have borderline levels. Prolonged, severe Vit B12 deficiency can cause irreversible neurologic damage.

A Gluten-free diet consists of strict avoidance of wheat, barley and rye. These products naturally contain vitamins, minerals and fiber, and many wheat products have government-mandated micronutrient fortification that is not required in Gluten-free equivalents. Low fiber and decreased protein intake are associated with a Gluten-free diet. Amaranth, buckwheat and quinoa are substitutes that have a high fiber content. Non-wheat flours are not held to the same requirements of thiamine, niacin, riboflavin, folate and iron as enriched grain products. Concerns for these deficiencies as well as mineral deficiencies, including selenium, magnesium, iron and zinc are considerations for supplementation in a Gluten-free diet.