

NEW! Micellized Vitamin D₃ Liquid: Micellization Technology Makes Vitamin D More Bioavailable

Micellized Vitamin D₃ from Klaire Labs® is a new oral vitamin D supplement providing a highly bioavailable, micellized form of vitamin D. The micellization process makes vitamin D soluble in the aqueous media of the intestinal tract ensuring maximal absorption of this vital nutrient. Micellized Vitamin D₃ can be taken by anyone wishing to optimize their vitamin D intake and is especially recommended for persons with impaired digestion and/or malabsorption.

Vitamin D Absorption

As a fat-soluble nutrient, vitamin D is more difficult to absorb than water-soluble vitamins. The lining of the digestive tract is aqueous in nature and lipidic substances, such as vitamin D, must be made water-soluble in order to penetrate the unstirred water layer bathing enteromucosal absorptive cells. Through the action of bile salts, lipids in the intestinal lumen are first separated, or emulsified, into small droplets and then further dispersed into tiny poly-molecular aggregates called micelles. Naturally formed micelles consist of an outer layer of amphiphilic bile salts surrounding an inner core of lipid particles such as fatty acids, cholesterol, and fat-soluble nutrients. The micelle demonstrates a polarity gradient from hydrophilic outer surface to lipophilic inner region. Micelles are sufficiently water-soluble to access the intestinal brush border whereupon the lipid contents are released and diffuse into enterocytes down a concentration gradient. Once absorbed, lipid-soluble nutrients are incorporated into chylomicrons, taken up into the lymphatic system, and subsequently enter the general circulation.

The complex process by which vitamin D is absorbed may partially account for its poor bioavailability and widespread deficiency. Studies indicate only 50% of a typical dosage of vitamin D is absorbed from the intestinal lumen into the lymphatic system. Persons with impaired absorptive capacity due to hepatobiliary disease, pancreatic insufficiency or bariatric surgery absorb

even less vitamin D and often suffer from a higher risk of bone loss and other metabolic disorders.

Micellization Improves Absorption

Supplementing vitamin D is an effective means of reversing poor vitamin D status and preventing vitamin D deficiency. One of the newest breakthroughs in delivery systems for fat-soluble nutrients is the micellization process. Micellization mimics the body's natural dispersion of fatty substances into microscopic, water-soluble, micellar spheres that can reach the absorptive surface of the intestinal tract. Some data indicate micellar components may also facilitate transport across cell membranes. Micellized oral vitamin D may thus normalize absorption of this essential nutrient in persons with compromised digestive systems or malabsorption disorders. Micellization technology has long been used in the pharmaceutical industry to improve various characteristics of drugs including wetting, stability, and bioavailability. More recently, the process has been applied to nutrient delivery systems to improve absorption of fat-soluble vitamins. Vitamin D₃ absorption in animals is negligible when bile salts are unavailable for micellization. Moreover, both published and unpublished studies show micellization of fat-soluble nutrients markedly enhances their absorption. Under laboratory conditions, mucosal absorption of fat-soluble vitamin A (both as beta-carotene and retinol) has been shown to be up to 3.6 times greater from micellar solutions than from emulsions. Absorption data from human studies are even more impressive. In one randomized, crossover trial, 12 healthy subjects were administered 500 IU of vitamin E (as d-alpha tocopheryl acetate) in either a standard oil, emulsified, or micellized form. After 4 hours, plasma level increases of vitamin E in the micellized group were more than twice those observed in the emulsion group, and almost 5 times greater than those in the oil group. Another experiment utilizing 50,000

IU of vitamin A (as retinyl palmitate) in either an oil, emulsion or micellized form achieved similar results. After 4 hours, plasma level increases of vitamin A in subjects administered the micellized material were over 2 and 5 times greater than those measured in the emulsion and oil groups, respectively. These data provide compelling evidence that micellization markedly improves the bioavailability of fat-soluble nutrients.

Studies indicate micellization markedly improves bioavailability of fat-soluble nutrients.

Klaire Labs® was the first nutraceutical company to offer Micellized Vitamin A and is now proud to introduce Micellized Vitamin D₃. Micellized Vitamin D₃ is a naturally-flavored liquid that can be taken directly or mixed into food, water or beverages. Each drop provides 400 IU of natural vitamin D₃ and each 1 oz. bottle contains 600 drops. The easy-to-use liquid form allows ready control over dosage amounts to meet the individual needs of infants, children, or adults. Micellized Vitamin A and Micellized Vitamin D₃ are free from common allergens and irritants, including milk/casein, wheat/gluten, eggs, fish, shellfish, tree nuts, corn, soy, yeast, and artificial sweeteners, colors, and flavors.