

## Axona: A New Medical Food for Alzheimer's Disease

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Medical foods are products that are specially formulated and used for the dietary management of a disease that has specific nutritional needs that cannot be met by a normal diet. Defined originally by the Food and Drug Administration's 1988 Orphan Drug Act Amendments, they are subject to the general food and safety labeling requirements of the Federal Food, Drug, and Cosmetic Act. In order to be considered a medical food the product must, at a minimum: 1) be a food for oral ingestion or tube feeding, 2) be used for the dietary management of a disease with distinctive nutritional requirements, and 3) be used under medical supervision. Approval of a medical food does not have to reach the same levels of standard of a new pharmaceutical product, and is typically approved using smaller numbers of patients in the studies reviewed by the FDA. More medical foods will be approved and this area represents a growing industry.

Axona is a prescription medical food intended for the clinical dietary management of the impairment in metabolic processes related to glucose metabolism associated with mild to moderate Alzheimer's disease. Glucose is the primary source of energy for the brain. In Alzheimer's disease patients, there is a dramatic drop in the brain's ability to metabolize glucose. Inadequate metabolism of glucose may lead to damage to the brain cells resulting in impaired cognition and brain disease. Axona addresses energy deficiencies in the brain by providing an alternative source of energy. Axona is a medium chain triglyceride and is converted by the liver into ketone bodies, which provide an alternative fuel for the brain cells. Ketone bodies are naturally occurring compounds that are produced mainly by the liver from fatty acids during periods of low calorie intake or fasting states. Specifically, Axona is a proprietary formulation of caprylic triglyceride. Caprylic acid is found in coconut oil. Caprylic triglyceride increases plasma concentrations of ketone bodies, by predominantly producing a compound called BHB (Beta-Hydroxybutyrate), which can provide an alternative energy source for the brains of AD patients. Axona is administered orally once a day, supplied as a powder one packet (40 g) to be mixed with 4-8 ounces of water or other foods/liquids. Axona is administered after a meal, preferably breakfast or lunch. Axona can be taken with commonly prescribed AD medications.

Axona's adverse events are primarily limited to the gastrointestinal tract; such as diarrhea, gas, flatulence, or bloating. Axona is administered under physician supervision and dispensed by prescription and is not available over the counter. Axona contains milk, soy, and sunflower oil; so it is not recommended in patients with these allergies. It should be used with caution in patients with known hypersensitivity to palm or coconut oil; in patients at risk of ketoacidosis (e.g. alcoholics, poorly-controlled diabetics); and in patients with GI inflammatory conditions, such as irritable bowel syndrome (IBS), diverticular disease, chronic gastritis, and severe GERD.

Axona was evaluated in a double-blind, randomized; placebo-controlled study performed at multiple US clinical centers in a population of 152 patients with probable mild to moderate Alzheimer's disease. Significant difference between Axona (n = 77) and placebo (n = 63) groups in change from baseline a cognitive test (total ADAS-Cog (Alzheimer's disease Assessment Scale-Cognitive subscale) scores were noted by day 45, (P = 0.024). When the sample was analyzed according to  $\eta$ 4 carrier status (which increases the risk of Alzheimer's), there was a significant product difference favoring Axona at both day 45 and 90 in the non-carrier group, whereas the  $\eta$ 4 carriers showed no benefit from Axona. Results of the company's initial trials sound promising, but we'll have to wait for additional data to be published in larger studies and more clinical experience with the product before making a recommendation. The cost for a month's supply ranges from \$83 to \$110. The product is not covered by most insurance plans or by Medicare.

If you are interested in your loved one trying Axona please discuss this with your primary care physician.

#### References

1. Axona prescribing information, Accera, Inc, Broomfield, CO, December 2008.
2. Costantini LC, Vogel JL, Barr LJ, et al, "Clinical Efficacy of AC-1202 (Ketasyn) in Mild to Moderate Alzheimer's Disease. Paper Presented at 59th Annual Meeting of the American Academy of Neurology, "Late-Breaking Science" Session, Boston, MA, May 1, 2007.
3. Reger MA, Henderson ST, Hale C, et al, "Effects of Beta-Hydroxybutyrate on Cognition in Memory-Impaired Adults," *Neurobiol Aging*, 2004, 25(3):311-4. [PubMed 15123336]