
Benefits of MCT Oil: A Brief Review

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Abstract

The popularity of herbal medicines has significantly grown within the last decade. Dietary medium-chain triglycerides are considered healthier than long-chain triglycerides. Long-chain triglycerides are fats derived from animals such as butter and cream. Medium-chain triglycerides are fats derived from plants, specifically coconut and palm oil. Not only are medium-chain triglycerides a healthy alternative to long-chain triglycerides, but they have therapeutic actions similar to herbal medicines. Medium-chain triglyceride oil (MCT oil) supports metabolism to provide benefits for humans suffering from cardiovascular disease, digestive issues, Alzheimer's disease, epilepsy, and autism. In addition, MCT oil may aid in weight loss and exercise performance. Studies show that MCT oil is also beneficial for the metabolism of pets and livestock. This review describes the benefits of MCT oil as they apply to humans, livestock, and pets.

Human Benefits

MCT oil is concentrated medium-chain triglycerides isolated through hydrolysis, filtering, and re-esterification of palm oil and coconut oil. MCT oil is most popular for its use in weight loss because of its ability to increase satiety and energy expenditure⁹. In other words, MCT oil can decrease food intake by suppressing hunger and increase the calories burned during physical activity. The small molecules are rapidly and completely absorbed at the point of ingestion, which is believed to be the cause for the increase in satiety⁴. In addition, medium-chain triglycerides (MCTs) can enter the mitochondrial membrane without the assistance of the acylcarnitine transfer system⁴. This increases energy expenditure because MCTs are a readily available energy source

that can be utilized in an easy, rapid manner. In essence, MCT oil supports fat metabolism.

Interestingly, MCT oil treatment has been proven to improve intestinal damage from intrauterine growth restriction¹⁸. This seems contradictory because of MCTs role in weight loss, however intrauterine growth restriction is caused by a low efficiency in a fetus's intestinal metabolism. As previously stated, MCT oil modulates fat metabolism, therefore researchers assume that MCT oil treatment raises the fetus's intestinal metabolism by its ability to quickly and easily enter mitochondria.

Between weight loss and improving growth restriction, MCT oil can be acknowledged as an aid in digestive metabolism. MCTs are especially important for those suffering from many other digestive, absorbance, or energy deficiency issues;

these include disturbed bile secretion, classic coeliac disease, short bowel syndrome, inflammatory diseases of the intestines, disturbed outflow of lymph, and some metabolic disease ¹³.

MCT oil also provides cardiovascular protection due to its role in fat metabolism ¹³. MCT oil reduces levels of low-density lipoproteins, proteins responsible for carrying “bad” cholesterol through the blood ¹⁶. By reducing levels of low-density lipoproteins, MCT oil improves the body’s overall lipid profile. Improvement of lipid profiles is important in the treatment of cardiovascular diseases like high blood pressure, coronary artery disease, strokes, and even diabetes. Indeed, Sung et al. showed that MCT oil improved the lipid profiles of rats with type-2 diabetes ¹⁶. Because of its role in fat metabolism, MCT oil reduces the risk of obesity, which is often a precursor to cardiovascular disease. Altogether, research suggests the beneficial effects of MCT oil on metabolism provide cardiovascular protection.

MCT oil’s ability to increase energy expenditure exerts benefits on exercise performance. Research shows MCT oil activating muscle signaling pathways in skeletal muscle to reduce the likelihood of heat-induced impairment of exercise performance and muscle function ¹⁷. This means, muscles are not easily fatigued from the heat produced during exercise. Not only is this characteristic important for exercise performance, but it is important for elderly individuals who are easily fatigued. Research by Abe et al. compared the effects of elderly individuals consuming MCTs versus long-chain triglycerides in supplement form ¹. Opposing long-chain triglyceride supplementation, MCT supplementation showed substantially improved muscle strength and muscle function in frail elders ¹. Based on the research to date, MCT oil treatment enhances exercise endurance and

muscle function by improving mitochondrial metabolism.

MCTs are not only a great energy source for a healthy digestive metabolism, but they are a highly effective energy source for the brain ⁷. MCTs are synthesized into ketones before they are used for energy ⁵. By tracking the ketone usage in the brain, researchers found that ketone uptake in young, healthy individuals is much higher than that of individuals suffering from Alzheimer’s disease ⁵. This suggests that MCT oil could provide a readily available energy source to increase ketone uptake in the brain of Alzheimer’s patients. Indeed, Croteau et al. found that individuals with Alzheimer’s disease doubled ketone uptake in the brain after MCT supplementation, suggesting an increase in brain metabolism ⁵. Furthermore, Kimoto et al. explained that MCT oil enhances energy output in hippocampal tissue and protects hippocampal neurons from toxicity; processes essential for memory function. Individuals with mild-to-moderate Alzheimer’s disease showed cognitive improvement with MCT oil added to his or her diet ⁸. Unfortunately, individuals with severe Alzheimer’s disease did not cognitively improve ⁸. These data suggest that MCT oil enhances metabolism in the brain to provide cognitive improvement in mild-to-moderate Alzheimer’s disease patients.

Ketones, endogenously synthesized from MCTs, are an important factor in epilepsy and autism research. Ketones block acutely induced and spontaneous recurrent seizures through multiple mechanisms that yield neuroprotective activity ¹⁴. These mechanisms involve mediating brain metabolism and excitatory and inhibitory neurotransmission ¹⁴. A study by Ari et al. revealed that MCT oil supplementation may also reduce seizures induced by central nervous system oxygen toxicity through antioxidant properties ². Studies show that MCT/ketone-rich diets are effective in treating symptoms of autism

disorders in animal models ¹². Hebert et al. showed the effects of an MCT/ketone-rich diet on an individual with epilepsy and autism ⁶. After failure of pharmaceutical control of seizures, the individual was fed a strict MCT/ketone-rich diet. After 14 months the individual was mostly seizure free. After a few years of the MCT/ketone-rich diet, the individual's Childhood Autism Rating Scale score significantly decreased from 49 to 17. Ruskin et al. explained that consuming MCTs as a primary source of fat can produce seizure control that lasts even after the diet ceases ¹². Altogether MCT/ketone-rich diets act through a variety of mechanisms to provide relief of autism and epilepsy symptoms.

An experiment designed to test the effects of MCT oil treatment for brain dysfunctions in mice proved that MCT oil lowered anxiety-like behavior and enhanced social competitiveness without impairing physical responses ⁷. No other research has been completed to further prove MCTs' beneficial effects on anxiety and social competitiveness.

Livestock and Pet Benefits

Because Zhang's research included sows as the experimental animal, it is concluded that MCT oil can benefit both humans and livestock born under the normal weight ¹⁸. This suggests MCT oil could be a healthy alternative to unfavorable fattening techniques. Further research on MCTs' effects on livestock has yet to be found. However, research by Studzinski et al. showed MCT oil supplementation improves respiratory rates during physical activity in elderly dogs. They concluded that MCT oil improved physical fitness in elderly dogs by improving peripheral mitochondrial function ¹⁵. MCT oil improved mitochondrial function in the brain of dogs with cognitive dysfunction syndrome, a brain dysfunction in dogs similar to Alzheimer's disease ¹¹. Elderly dogs with cognitive dysfunction syndrome were given a 6.5%

MCT diet, and all signs of cognitive dysfunction were alleviated within six months ¹¹.

Conclusion

This brief summary of MCT oil benefits includes mediation of digestive, brain, and muscle metabolism. MCT oil is acknowledged as an effective treatment option in a wide range of health issues such as epilepsy, autism, cardiovascular diseases, muscle fatigue, and Alzheimer's disease. Furthermore, MCT oil has shown beneficial effects for livestock and pets with metabolic issues. This summary provides an overview of benefits found in literature to 19 February 2019. Research on MCT oil benefits is limited, however future research is expected.

Declarations

Availability of Data and Materials: The datasets analyzed during the current study are available in the University of Montevallo Carmichael Library or PubMed repositories, <https://www.ncbi.nlm.nih.gov/pubmed/>, http://libguides.montevallo.edu/index?group_id=15001

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