**Choline, Carnitine & Fat Metabolism**

Choline and carnitine have been shown to have some very interesting interactions. Choline supplementation decreases the urinary excretion of carnitine to less than half normal values in both humans and guinea pigs. In guinea pigs the decreased urinary excretion of carnitine is accompanied by an increase in muscle and total body carnitine, suggesting that the body recognizes an increased need for carnitine and is conserving it. Interestingly, the guinea pigs also had a much lower body fat content, as shown below.

![Choline Carnitine Interaction Diagram](image-url)

**What Are Choline And Carnitine?**
Choline and carnitine are two nitrogen containing molecules found normally in human diets. Although neither is truly an amino acid or vitamin they are sometimes referred to as vitamin-like substances or amino acids for ease of classification. Both are found in human diets and can also be synthesized by humans.

**What Does Choline Do?**
Choline, as phosphatidyl-choline, is an essential structural component of all cell membranes. Choline is also important for signaling between cells and within cells. Acetylcholine is an essential neurotransmitter both in the brain and at the neuro-muscular junction. Choline is also recognized as a lipotropic factor, meaning that it helps prevent fat accumulation in the liver, this may be a result of its role as a methyl donor in biosynthesis. Choline has only recently been recognized as an essential nutrient. There is not yet a recommended dietary allowance for choline, but there probably will be in the future. Foods rich in choline include eggs and soy beans.

**What Does Carnitine Do?**
Carnitine is essential for the oxidation of long chain fatty acids for energy. Most cellular energy is produced in organelles within cells called mitochondria. The mitochondria is the power house of the cell. Fatty acids must get into the inner part of the mitochondria (the mitochondrial matrix) before they can be used for energy. The only way that most fats can get into the mitochondrial matrix is to be transported there, attached to carnitine. Therefore, carnitine is absolutely essential for fat burning. Carnitine may also be essential for the shuttling of other fats and fat-like molecules within cells and between cells. Recent research suggests that carnitine could be important in providing acetyl groups for making the important neurotransmitter, acetylcholine. The effects of carnitine on brain function is a area of intense research in recent years.

**What Does Chromium Do?**
Chromium is an essential mineral that has been found to be critical for the proper functioning of the hormone, insulin. Patients receiving intravenous feeding solutions without chromium sometimes become diabetic, and not responsive to insulin treatment. Administration of chromium can reverse the diabetes in these patients. It is believed that chromium is somehow involved with the binding of insulin to its receptor, but how chromium works is not yet known for certain. What is known, is that chromium is essential for helping insulin to properly regulate energy metabolism. Although there is not yet an RDA for chromium the United States Safe and Adequate Dietary Intake range is 50-200 mcg for normal adults. Unfortunately the typical dietary intake is closer to 25 mcg, suggesting that chromium deficiency may be common in the USA.

**Choline - Carnitine Interactions & Body Fat: The Latest Scientific Research**
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Continued on reverse: See choline reduces body fat.

**Did You Know?**
Choline Reduced Body Fat by 20% in Normal Guinea Pigs!
Differential nutrition is a term coined by Dr. Jim Daily and borrowed from microbiologists who use differential media to encourage the growth of some organisms and discourage the growth of others. Differential nutrition uses the balance of nutrients to either encourage or discourage physiological changes in humans. Where a drug often will act directly to accomplish the same goals, differential nutrition simply provides the ideal conditions for the physiological changes to occur naturally.

About the Author
Dr. Jim Daily, Ph.D. is a research scientist in the area of carnitine and choline metabolism with sub-specialties in energy metabolism and immunology. Dr Daily received his Ph.D. in Nutritional Biochemistry from the University of Tennessee and is currently vice president for research and development at Daily Manufacturing, Inc. Dr. Daily is also actively involved in research efforts in the USA and Korea.

Active Ingredients:
Six Tablets Per Day Provide:

Chromium (chromium picolinate) 200 mcg
Choline (choline bitartrate) 2000 mg
Carnitine (L-carnitine) 500 mg

References