

Sanford Medical Center
Fargo, ND



Aunt Cathy

Aunt Cathy's Guide To:

Remembering All Those Lipids

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Cholesterol: What Does It Do Besides Kill You?

Myelin, Cell Membrane Structure, Steroid Hormones, Vitamin D, Bile
Lipoproteins: Chylomicrons, VLDL, LDL and HDL
Synthesis: HMG Co-A Reductase and the Cholesterol Thermostat

Structure Of Fats: Saturated, Monounsaturated and Polyunsaturated Fatty Acids

Saturated Fats: Stearic Acid and Palmitic Acid
Stability and Oxidation
“Trans” fat
Variable Effect on Lipoproteins

Omega 3 Vs Omega 6 Vs Omega 9 Families

18-carbon Essential Fatty Acids: Linoleic vs alpha Linolenic
Food Sources
Alpha-lipoic acid
Alpha Linolenic vs gamma Linolenic (Dihomo Gamma Linolenic)
ARA (Arachidonic), EPA (Eicosapentaenoic) and DHA (Docosahexaenoic)
Eicosanoids: Prostaglandins, Prostacyclins, Leukotrienes and Thromboxanes
Inflammation and Blood Clotting effects.
DHA and the Brain: fetal/infant development, plus mood, attention, and cognition issues.
DHA and Retinal health: infant retinal development through macular degeneration in the elderly.
Apparent “essentiality” of preformed EPA, DHA and ARA in some individuals
“The Mediterranean Diet”: Health aspects, lipids and other features

Triacylglycerol (Triglycerides) and Phospholipids

Lipid Digestion and Absorption:

Dietary Triglycerides, Lipases, Micelles, Bile, Soluble Fiber, Bile Acid Sequesterants,
“Fat Blockers”, Sucrose Polyester, Oil Slicks
GI Diseases Such As Cystic Fibrosis
Chain Length and Water Solubility: LCT, MCT, SCT
Fat Malabsorption (For Any Reason from GI Disease to “Fat Blockers”):
Effect on Vitamins A, D, E, & K, Many Important Phytochemicals (e.g. Lutein
Lycopene, Beta Carotene), Calcium, Zinc. Discomfort and Social Issues.

Burning Fat for Fuel: Beta Oxidation and the TCA Cycle

Mitochondrial membrane activity

Carnitine: part of Carnitine Polymitoyl Transferase;

The “Cart-It-In” Trucking Company

Dietary source: found in meat (carnitine comes from the word for meat in Latin-based languages: “carne”)

Made in the liver, kidney and brain from methionine and lysine, two essential amino acids.

Production of adequate amounts appears to be more variable than was previously thought and some people require supplementation to maintain appropriate fat metabolism. Primary carnitine synthetase deficiency: from essentially none to sub-adequate.

Carnitine deficiency can result in: weight gain, low muscle tone, muscle pain, lethargy, poor tolerance of endurance exercise, increased appetite, high blood triglycerides, potential fatty liver, impaired cognition, excessive fluctuation of blood sugar among people with insulin-dependent diabetes, and liver toxicity of certain medications (like the seizure-control medication Depakene (valproic acid.)

Beta-oxidation produces 2-carbon units called acetate from long chains of carbon (fat). This is the form that can enter the TCA cycle. Memory trick: To remember what beta-oxidation is, picture the chopping off of 2-carbon (acetate) units as being done by a lady named Betty with a hatchet. That is: “Betty Axidation.”

Essential Players:

Oxygen (Beta oxidation and the operation of the TCA Cycle are aerobic (oxygen-requiring) activities.

CoA (Coenzyme A) made from the B vitamin pantothenic acid. Described here as a detachable (and re-usable) “pan handle” to move metabolic products from one burner on the stove to another. It is so important it is everywhere ... which is what the partial word “pan” means, and why pantothenic acid was so-named.

Beta oxidation disorders: VLCAD, LCAD, MCAD and SCAD

Other Diet/Nutrition Factors Contributing to Cardiovascular Risk by Increasing the Likelihood of Cholesterol Sticking to Arterial Walls:

Oxidation Status of lipids and cell membrane health:

Free radicals: normal production and elevated production

Antioxidant vitamins (e.g. C and E), minerals (e.g. zinc, and selenium) and phytochemical pigments (e.g. lycopene, lutein, flavonones, beta-carotene, anthocyanins, and zeaxanthin) and others (e.g. quercetin, resveratrol

Vitamin K inadequacy and calcification of arteries: failure to activate the hormone osteocalcin (calcitonin) that deposits calcium into bone.