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Inflammation in Anxiety, ADHD and Autism

Organic Acids Reference

Fatty Acid Metabolism "O-A"

Adipate, Suberate and Ethylmalonate

These **compounds give information about your ability to process fatty acids.** **Carnitine** helps your body use fatty acids.

Long-chain fatty acids go through beta-oxidation in the mitochondria, which is a carnitine dependent step.
If inadequate amounts of carnitine, the long-chain fatty acids will get processed outside of the mitochondria.

Adipate and **suberate** are by-products of long-chain fatty acid breakdown outside of the mitochondria.
Fatty acids, including butyrate, go into mitochondria via a **carnitine dependent shuttle** to be metabolised. If carnitine is in inadequate amounts, the fatty acids cannot get into the mitochondria and get metabolised. By-products are ethylmalonate, adipate, and suberate.

Ethylmalonate, comes from the breakdown of butyrate, also has a carnitine-dependent pathway and can accumulate with an insufficient amount of carnitine.

Dietary fat, carbohydrate, and protein are all broken down to produce energy using pathways that require vitamin B2 (riboflavin).
If insufficient riboflavin, compounds such as adipate, suberate, and ethylmalonate may increase in urine.

Energy Production CAC "O-A"

α-Ketoglutarate, like pyruvate, requires a dehydrogenase enzyme which also requires vitamin B1, B2, B3, B5, and lipoic acid to function properly. **An elevation of α-ketoglutarate can indicate a need for one or more of these B vitamins.**

The mineral elements **magnesium, iron, and manganese are additional factors that are frequently needed in the Krebs cycle pathways**. Magnesium is required for conversion of **succinate**. In addition, the entire central energy pathway is dependent on iron and manganese.

Hydroxymethylglutarate (HMG) is the precursor to Coenzyme Q10 (CoQ10) production, and when it is elevated it may indicate that the body is trying to increase its production of CoQ10. Elevation of HMG can reveal a block in your body's synthesis of CoQ10.
Other functional markers such as lactate, succinate, **fumarate**, and **malate** indicate whether your body is able to produce energy efficiently by utilizing CoQ10.

B-Vitamins Methylation Cofactor "O-A"

Vitamin B12 and Folic Acid

Dietary deficiency of vitamin B12 and folic acid are associated with increased risk of many diseases, including anemia, cardiovascular disease (CVD), and chronic fatigue.

Methylmalonate is a sensitive, functional marker for vitamin B12; high levels of methylmalonate in serum or urine can indicate a need for vitamin B12.

Formiminoglutamate (FIGLU) is a compound made from the amino acid histidine. Insufficiency of folic acid can lead to high urinary FIGLU. Folic acid is especially critical for prenatal and childhood development and insufficient amounts is associated with lower risks of cardiovascular disease and cancer.

Oxidative Damage (Anti-Oxidant) Status "O-A"

P-Hydroxyphenyllactate is a marker of cell turnover. It is also a metabolite in **tyrosine degradation** and may be useful for studying disorders of tyrosine metabolism, including inborn errors of metabolism, and liver disease. High levels of p-hydroxyphenyllactate may respond to high intakes of **vitamin C,** which aids in restoration of normal metabolism and cell control.

8-Hydroxy-2'-deoxyguanosine (8-OHdG) is a marker of oxidative damage to the gaunine of DNA. Antioxidants protect your cells from damage. Conditions that increase oxidative metabolism tend to raise your requirements for increasing your intake of foods high in concentrated sources of antioxidants (fruits, berries, tomato paste, green tea, curcumin) can increase antioxidant status. High levels of p-hydroxyphenyllactate and 8-hydroxy-2'-deoxyguanosine are associated with **increased oxidative stress**, and may indicate a strong need for other antioxidants as well.

Toxicants and Detoxification "O-A"

Produced from coal tar or crude oil, xylene is used as a solvent for paints and paint thinners, and its vapors are released from many building and decorating materials such as varnishes and new carpets. Excretion of **2-methylhippurate** is a sensitive and specific marker for **xylene exposure** which increases oxidative stress. Xylene is oxidized in a Phase 1 detoxification reaction to 2-methylbenzoate; then in Phase II (glycine conjugation) it becomes 2-methylhippurate. **Glycine** supplementation can aid in xylene excretion. Urea cycle overloads cause increased orotate synthesis and spillage as a secondary ammonia detoxification pathway.

Orotate is sensitive to anything **that increases ammonia**, including a high protein diet, intestinal dysbiosis, or arginine deficiency. This leads to increased orotate urinary values. If orotate is elevated due to ammonia, generally citrate, cis-aconitase, and/or isocitrate will also be elevated. Elevated orotate may also identify a **need for magnesium**.

Glucarate serves as a biomarker for exposure to a wide array of potentially toxic chemicals, including many drugs. High urinary glucarate suggests above normal **exposure to pesticides, herbicides, fungicides, petrochemicals, alcohol, pharmaceutical compounds, or toxins produced in the gastrointestinal tract.** General detoxification treatment may be advised.

Chemical Contaminants in Milk

- Mycotoxins 1.2% (fungal colonisation of cow's foods)
- B1/M1aflotoxin resistant to pasteurization, discovered in 95.2% samples
- Pesticides, organochlorides, and PCBs 23.8%
- Antiparasitics 8.3% (macrolytic lactones)
- Antimicrobials 35.7%
- Carbamates 8.3%
- Organophosphates 14.3%
- Pyrethroids 8.3%

Bulletin of the International Dairy Federation. 465/**2013.**
Identification and Assessment of Emerging Issues Associated with Chemical Contaminants in Dairy Products
Maximum Residues Limits of some veterinary drugs in milk according to EU regulations.
European Commission, 1997

Pesticides in Food Supply

Canadian Food Inspection Agency. (2010-2011)
Pesticides in Coffee, Fruit Juice and Tea.

Samples: 297 coffee items, 510 juice items, and 267 tea items
Analyzed for over 430 pesticide residues

- 67% of juice not from concentrate had pesticide residues
- 48% of juice from concentrate had detected pesticides

All types of tea samples had pesticide residues

- 66 tea samples containing at least one pesticide violation
- 75% of Oolong tea contained pesticide residue violations
- 50% of white tea
- 32% of green tea
- 20% of herbal and black tea

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