

## *Essential & Metabolic Fatty Acids Markers (RBCs)*

### **Commentary**

#### **Fatty Acids and Your Health**

Doctors and nutritionists used to think that all fat was merely a way for the body to store calories for later use as energy, since, as we all know too well, if we eat excess food, our body converts those calories to fat. Only in the last century have we discovered that some fats are absolutely essential to health. Our bodies cannot make these fats, and so we must get them from our food, or our health will suffer. These Essential Fatty Acids (EFAs) have many functions in the body: they are the precursors for local "hormones"; they regulate all inflammation as well as all smooth muscle contraction and relaxation. These local hormones are given names like prostaglandins, leukotrienes and thromboxanes. EFAs are also essential components for all cell membranes. Their importance for health cannot be overemphasized since the brain, nerves, eyes, connective tissue, skin, blood vessels, and every cell in the body depend on a proper balance of essential fatty acids for optimal function. It is the fats found in red blood cell membranes, known as phospholipids, that this test measures.

Essential fatty acids are classified into fat "families": omega 3 fats and omega 6 fats. Non-essential fat "families" include omega-9 fats, saturated fats, omega-7 fats, and trans-fats. Optimal health depends on the proper balance of all fats - both essential and non-essential fats - in the diet. Proper balance means adequate amounts of each individual fat, without having too much, and maintaining proper balance between the various "families" of fats. Fat health also means avoiding potentially harmful fats such as trans fats found in shortening, margarine, fried foods and dairy. A proper balance of fatty acids will lead to mental health and proper nerve function, a healthy heart and circulatory system, reduced inflammation in general, proper gastrointestinal and lung function, a more balanced immune system, and even healthy skin, hair and nails. Fatty acid balance is also critical for the health of all pregnant women and their babies since the developing brain and nervous system of the baby requires large amounts of EFAs that must come from the mother. Fatty acid imbalances have been seen in many disease processes including heart disease, hypertension, insulin resistance and diabetes, asthma, painful menstruation, pre-menstrual syndrome (PMS), depression, attention deficit hyperactivity disorder (ADHD), senility, obsessive-compulsive disorder, and post-partum depression.

This Essential and Metabolic Fatty Acid Analysis allows your health care practitioner to examine the fats found in your red blood cell membranes. These fats represent the types of fats your body has available to make cell membranes and the local "hormones" that control inflammation and smooth muscle contraction throughout the body. Following your health care practitioner's advice on diet and fatty acid supplementation is likely to restore your fatty acids to a state of healthy balance.

#### **Results of Your Individual Essential and Metabolic Fatty Acid Analysis**

Dihomo Gamma Linolenic Acid (DGLA) is within the reference range, but below the functional physiologic range. DGLA is the main precursor fat for the production of highly anti-inflammatory eicosanoids, especially the series 1 prostaglandins. Low DGLA is often associated with inflammatory conditions such as heart disease, arthritis, inflammatory bowel disorders, eczema, and psoriasis. Since DGLA-derived eicosanoids also promote smooth muscle relaxation, low DGLA levels may contribute to increased smooth muscle contraction, and subsequently to conditions like hypertension, asthma, painful menstruation, and irritable bowel syndrome.

Low DGLA can result from impaired conversion of linoleic acid into gamma-linolenic acid (and subsequently into DGLA) or from an increased conversion of DGLA into arachidonic acid or both. Delta-6 desaturase is the enzyme responsible for converting LA into GLA and may be impaired with age, alcohol use, genetic defect, or nutrient deficiency. An elevated linoleic/DGLA ratio or an elevated eicosadienoic/DGLA ratio (see p.3 of this report) would strongly suggest impaired delta-6 desaturase activity. Supplementation with GLA-containing oils like evening

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primrose, borage or black currant seed oils bypasses delta-6 desaturase.

A low DGLA/arachidonic acid ratio (see p.3 of this report) would indicate a likely increased activity of delta-5 desaturase. Insulin activates delta-5 desaturase. A high carbohydrate (sugars and starch) diet increases insulin secretion and action in the body. Consumption of a higher protein and higher fiber and complex carbohydrate diet reduces insulin action in the body. Eicosapentaenoic acid (EPA) supplementation, found in fish and fish oils, has also been shown to reduce delta-5 desaturase activity, reducing the conversion of DGLA into AA.

Elaidic acid is within the reference range, but above the functional physiologic range. Elaidic acid is a trans fatty acid and may represent excess consumption of partially hydrogenated oils (shortening, margarine, fried foods, etc.) or dairy fat (cream, ice cream, whole milk, etc.). Because of their shape, trans fats behave like saturated fats and have been shown to increase LDL cholesterol levels and decrease HDL cholesterol levels, contributing to the development of heart disease. The double bond in trans fats is thought to bind to desaturase enzymes and impair the production of their metabolically necessary products. Epidemiological studies have associated increased trans fat consumption with breast, colon and prostate cancer incidence.

Pentadecanoic acid and/or Tricosanoic acid are above the reference range. Odd chain fatty acids are produced when endogenous fatty acid synthesis begins with propionic acid (3-carbon fatty acid) as substrate rather than acetic acid (2-carbon). Propionate is found in high quantities in butter and other dairy products. Propionate is also one of the short chain fatty acids produced by our gut bacteria in the fermentation (digestion) of water-soluble fiber. With adequate B12 and biotin, propionate can be converted into succinate for use in the citric acid cycle and energy production. High levels of odd chain fatty acids in cell membranes may indicate an increased need for B12 and biotin, or may result from an exceptionally high water-soluble fiber diet.

## *Oxidative Stress Markers*

### Commentary

Commentary is provided to the practitioner for educational purposes, and should not be interpreted as diagnostic or treatment recommendations. Diagnosis and treatment decisions are the responsibility of the practitioner.

## *Elemental Markers (RBCs)*

### Commentary

**Selenium** (Se) is below the reference range. This element activates glutathione peroxidase which facilitates glutathione's antioxidant function, and it activates prohormone iodothyronine deiodinase which helps to balance levels of thyroid hormone. Of whole blood selenium, approximately one-third is carried in serum (bound to alpha2 and beta1 globulins) and two thirds resides inside the erythrocytes bound to glutathione peroxidase and to other proteins. Approximately 10% of erythrocyte selenium is bound to glutathione peroxidase.

Low selenium can produce two physiological imbalances: (1) oxidant stress due to lowered antioxidant activity of glutathione, and (2) normal or high T4 and subnormal T3. Reasons for low selenium include: poor quality diet or diet of foods grown in low-selenium soils, intestinal malabsorption, and urinary wasting of selenium which may occur with cystinuria. Cystinuria, renal wasting of cystine, is assessed by urine amino acid analysis.

Symptoms and pathological consequences of insufficient selenium include: muscle aches, hypothyroid function, sclerosing of tissue, anemia, increased dental caries, and increased inflammatory responses. Also reported are higher incidence of malignancy, increased thrombosis, and increased cardiovascular disease.