DOCTOR'S DATA INC

Fatty Acids; Erythrocytes

OMEGA 3 FATTY ACIDS	RESULT %/TOTAL	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
Eicosapentaenoic (EPA) 20:5ω3	**0.7**	0.5- 5	
Docosahexanoic (DHA) 22:6ω3	**5.2**	3- 8	
OMEGA 6 FATTY ACIDS			
Linoleic 18:2ω6	**13**	7- 15	
Dihomo-γ-linolenic (DGLA) 20:3ω6	**2.0**	1.2- 4	
Arachidonic (AA) 20:4ω6	**19**	11- 20	
MONOUNSATURATED FATTY ACIDS			
Oleic 18:1ω9	**14**	12- 20	
Palmitoleic 16:1ω7	**0.20**	0.12- 0.65	
SATURATED FATTY ACIDS			
Palmitic 16:0	**26**	17- 28	
Stearic 18:0	**20**	14- 20	

TRANSISOMER FATTY ACIDS			68th 95th
Palmitelaidic 16:1ω7t	**0.015**	< 0.05	
Elaidic 18:1ω9t	**0.1**	< 0.4	

RATIOS

OMEGA 3 AND OMEGA 6 RATIOS	RESULT	REFERENCE INTERVAL	PERCENTILE 2.5th 16th 50th 84th 97.5th
AA/EPA	**28**	2- 28	
EPA/DHA	**0.13**	0.14- 1.2	
AA/DGLA	**9.7**	5- 14	
EPA/DGLA	**0.3**	0.2- 1.6	
DESATURASE ENZYME MARKERS			
Linoleic/DGLA (Δ6)	**6.4**	2.5- 10	
Stearic/Oleic (Δ9)	**1.48**	0.8- 1.4	
DGLA/AA (Δ5)	**0.10**	0.065- 0.16	

FATTY ACID DISTRIBUTION

	TOTAL	OMEGA 3	OMEGA 6	MONO	SATURATED	TRANS
Patient Distribution	**4540** µmol/L	**6** %	**34** %	**14** %	**47** %	**0.1** %
Average Distribution	**5200** µmol/L	**9** %	**29** %	**18** %	**44** %	**0.3** %

SPECIMEN DATA

Comments:
Date Collected:
Date Received:
Date Reported:
Method: **Gas Chromatography (GC)**

<dl: **less than detection limit**

v07.10

Erythrocyte Fatty Acids

This test measures the fatty acids (FAs) that are present as constituents of phospholipids in the membranes of erythrocytes (red blood cells). Each specific FA is reported as a percentage of total FAs measured. FAs are carboxylic acids that may be either unsaturated (one or more carbon-to-carbon double bonds) or saturated (no carbon-to-carbon double bonds). FAs may come from natural or synthetic sources. There are two families of essential FAs (EFAs), omega-3 and omega-6, all of which are poly-unsaturated FAs (PUFAs) meaning that they all have more than one C=C double bond.

FAs derived from the EFAs (or taken in via diet or supplements) are essential components of all cell membranes and appropriate membrane fatty acid content is pivotal for optimal membrane fluidity and cellular metabolism. The same FAs eventually give rise to hormone-like substances that are involved in the regulation of blood pressure, blood coagulation, lipid levels, immune response, tumor growth and inhibition, the inflammatory response to injury and infection, and may play a role in seizure disorders and dementias such as Alzheimer's disease. Fatty acid metabolism is very dynamic and proper balance among essential and non-essential FAs, as well as avoidance of harmful trans-FAs, is required for optimal health and wellness.

The American Heart Association's Nutrition Committee strongly advises these fat guidelines for healthy Americans over age 2:
- Limit total fat intake to less than 25-35 percent of your total calories each day; limit saturated fat intake to less than 7 percent of total daily calories
- Limit trans-fat intake to less than 1 percent (trace) of total daily calories; the remaining fat should come from sources of monounsaturated and polyunsaturated fats such as nuts, seeds, fish and vegetable oils
- Limit cholesterol intake to less than 300 mg per day, for most people. If you have coronary heart disease or your LDL cholesterol level is 100 mg/dL or greater, limit your cholesterol intake to less than 200 mg a day.
- Example: a sedentary female who is 31-50 years old needs about 2,000 calories each day. Therefore, she should consume less than 16 g saturated fat, less than 2 g trans- fat and between 50 and 70 grams of total fat each day (with most fats coming from sources of polyunsaturated and monounsaturated fats, such as fish, nuts, seeds and vegetable oils).

Stearic Acid Higher Than Expected

The level of stearic acid (SA) in this sample is higher than expected. Appropriate reduction of sources of stearic acid and/or precursors of stearic acid should be considered.

SA is a common saturated fatty acid (18:0) found in animal fats and many vegetable and oils. It can be oxidatively desaturated back to oleic acid and thus perhaps "less unhealthy" than other saturated fatty acids. Membranes that contain a high amount of saturated FAs (compared to polyunsaturated FAs) exhibit decreased membrane fluidity and sub-optimal cellular metabolism and receptor activities. Diets high in stearic acid may contribute to higher than normal plasma lipoprotein concentrations.

Possible sources of excess stearic acid:
- A natural source of SA is pure cocoa
- SA can be produced by processing animal fat in water under high temperature and pressure

(e.g. pressure cooking)
- Can also be produced by the hydrogenation of some unsaturated vegetable oils

Precautions:
- Excessive intake may cause gastrointestinal irritation

EPA/DHA Ratio Lower Than Expected

The EPA/DHA ratio is lower than expected in this sample. Check the individual results for EPA and DHA to determine why the ratio is low.

Both EPA and DHA are omega-3 FAs that can be bio-converted from the essential FA alpha-linolenic acid. However the bio-conversion process is inefficient and direct intake of EPA and DHA rich oils (e.g. fish oil) is a much more efficient way to restore the omega-3 FA content of membrane phospholipids. Retro conversion of DHA to EPA does occur but is inefficient; only about 10-12% when pure DHA is provided in the diet. DHA may be more important than EPA, especially in brain development (e.g. fetus and infants) and function (memory, concentration, attention, mood, etc).

No consensus in the literature as to the ”best” EPA / DHA ratio in foods and supplements. However, depending on the clinical presentation of the patient and, in light of the ratio reported for this patient, consider the following supplemental doses of DHA or DHA+EPA as recommended by the International Society for the Study of Fatty Acids and Lipids (ISSFAL)
- Pregnant and lactating women 300 DHA (only DHA - no EPA) mg per day
- Infants 1 to 18 months - 14.5 mg/kg (32 mg/lb) DHA+EPA
- Children 18 months to 15 years - 6.8 mg/kg (15 mg/lb) DHA+EPA
- Adults - 500 mg DHA+EPA (minimum 220 mg DHA plus minimum 220 mg EPA)
- Adults with high triglycerides should take 2 to 4 grams of DHA plus EPA daily (American Heart Association recommendation).

AA/EPA Ratio Higher Than Expected

The AA/EPA ratio in this sample is higher than expected. This means that there is an undesirable preponderance of omega-6 to omega-3 fatty acids. Synthesis of omega-3 FAs is competitively inhibited by the presence of their omega-6 analogues. Therefore omega-3 FAs can be incorporated into membranes more effectively when they are obtained directly from dietary sources or from supplementation, rather than relying solely on in vivo synthesis.

- High AA/EPA ratios are common in diets high in meat and corn oil - balance with (c)-3 fatty acids (e.g. fish oils)
-Lowering the ratio in inflammatory conditions may be of benefit (reduced availability of AA for pro-inflammatory eicosenoid production)
- Supplementation of omega-3 fatty acids (e.g. EPA) significantly reduces AA to EPA ratios; reduces triglyceride levels in healthy subjects but may not have a similar effect in subjects with CAD
- A high ratio may be associated with clinical symptoms of depression
- Children with ADHD appear to have higher AA to EPA ratios compared to normal controls. Lowering the ratio using purified fish oil high in EPA and DHA (omega-3 fatty acids) may improve symptoms of children with ADHD

Stearic / Oleic Ratio High

The ratio of stearic acid/oleic acid in this specimen is higher than desirable.

Stearic Acid (SA; 18:0) is a common saturated fatty acid found in many animal fats and oils. Oleic Acid (OA; 18:1) is a monounsaturated FA that is most abundant in olive oil (about 80% of total fatty acids). The FA content of cell membranes has a powerful impact on membrane fluidity and imbalanced membrane FA content negatively affects intracellular metabolism and hormone-receptor interactions. OA contributes to increased membrane fluidity whereas saturated SA affects decreased membrane fluidity. Diets high in stearic acid may contribute to higher than normal plasma lipoprotein concentrations. OA may improve memory and may be responsible for the blood pressure lowering effect of olive oil.

The SA/OA ratio may be low due to insufficient intake of oils rich in OA and / or excessive intake of oils rich in SA (animal fats and oils and many vegetable oils, particularly those that have been hydrogenated). Cocoa is a natural source of SA.

If dietary intake of fats is appropriately balanced there may be a problem with the enzyme (delta-9 desaturase) that converts saturated SA to monounsaturated OA in the body.