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***“An industry-initiated, placebo controlled, bioavailability study to evaluate a popular dietary supplement fish oil formulation’s effect on blood fatty acid levels (total omega-3, EPA, DHA, ALA, DPA, EPA + DHA, AA/EPA ratio, omega 6 total, AA, DGLA, GLA, omega 3/omega 6 ratio, omega 6/omega 3 ratio) and secondarily, to evaluate markers of inflammation and/or to detect immune modulator stimulation in the blood.”***

## **Background:**

*The health benefits of quality fish oil supplements with regard to prevention of many age-related health concerns such as cardiovascular disease, diabetes and many other conditions involving inflammation are now well established in the medical literature. The relative quality of many fish oil products, however, is questionable and may represent ‘purified’ products which delete many types of naturally occurring fish oils other than EPA and DHA. A natural cold-processed, extra-virgin oil has recently been developed from sustainably harvested wild Alaskan salmon. This product (Wholemega) contains natural amounts of healthy fish oils including those classified as omega-3, 5, 7 and 9 lipids. In addition, Wholemega also contains naturally occurring Vitamin D and the antioxidant astaxanthin. The relative absorption of fish oils, incorporation into cell membranes and changes in lipid chemistries were examined in human volunteers during several short term studies.*

## **Methods and Results:**

***Relative absorption:*** Human volunteers (n=8) were administered a 2 g dose and serial blood samples were obtained for specific lipid content using GC/MS instrumentation. Time dependent increases in serum content of EPA, DHA, palmitoleic acid, oleic acid and alpha-linolenic acid, for example, showed ready absorption of each class of omega fish oils across the gut membrane into the systemic circulation.

***Incorporation into cell membranes:*** Peripheral blood mononuclear cells (PBMCs) were used as a surrogate tissue membrane to examine relative changes in lipid composition before and after consumption of 2 g Wholemega per day for 3 consecutive days. Plasma lipids were analyzed by GC/MS. Membrane analyses showed 29, 35, 28 and 41% increases in EPA, DHA, palmitoleic acid and oleic acid content, respectively. Fish oil lipids remain elevated for approximately 24 hr following a single 2 g dose.

***Serum lipid composition:*** Serum arachidonic acid (AA), a pro-inflammatory eicosanoid lipid declined by close to 18% within 24 hr after consumption of only 2 g Wholemega. When expressed as a function of AA/EPA ratios there was a significant dose-dependent decline in inflammatory lipids relative to beneficial fish oils such as omega-3 oils. In addition, a single 2 g dose of Wholemega resulted in an average 16% decline in C-RP (a marker of inflammation), a 13% decline in LDL (bad cholesterol), a 12% decline in triglycerides and an 8% decline in cholesterol.

***Additional research:*** Ongoing research with Wholemega and comparison of this salmon oil product to highly processed fish oils is underway. These studies will examine specific formation of fish oil derived lipids such as PGE3 and LTB5 as opposed to AA derived lipids such as PGE2 and LTB4. In addition, the relative benefit of fish oils in reducing proliferation of human lung cancer cells is being examined.

## **Conclusions:**

***With a relatively small dose (2 g) of Wholemega significant changes considered to be clearly beneficial to human health and well being were found. These included changes in cell membrane composition which demonstrated ready incorporation of omega-3, 5, 7 and 9 lipids. Overall pro-inflammatory markers such as serum content of AA as well as levels of C-RP were also found to decline. It can be concluded that there are readily demonstrable health benefits to daily consumption of even relatively low doses (2 g) of this novel full spectrum (16 omega oils) salmon oil product.***