

Oxidation of Marine Lipids in Gastric Juice – *in vitro* Study

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The importance of long-chain polyunsaturated omega-3 fatty acids (LCPUFA) from marine sources in the diet, especially eicosapentaenoic acid (EPA, C20:5 n3) and docosahexaenoic acid (DHA, C22:6 n3), has been well established during the past two decades. Lipid radicals and oxidized derivatives (e.g. core aldehydes, hydroperoxides, and epoxy compounds) and other products of oxidative decomposition of LCPUFA (e.g. low molecular weight aldehydes) are on the other hand believed to be cytotoxic and linked to development of cancer, atherosclerosis, thrombosis, neurodegenerative, inflammation and other diseases. The state of omega-3 fatty acids entering the blood stream is therefore crucial for the overall impact of marine lipids on health. Before lipids from food are metabolized by the body, they are retained in the stomach and blended with gastric fluid, which could be an environment for oxidation processes, as some people perceive rancid odors after burping or gastro-esophageal reflux, in addition increased levels of oxidized derivatives of omega-3 fatty acids were found in blood chylomicrons after consumption of fish oil rich meal.

In the present study we followed oxidation of emulsified herring lipids in an *in vitro* digestion model containing authentic human gastric juice, and compared it to a model lacking gastric juice components apart from hydrochloric acid. The aim was to evaluate whether marine lipids oxidize in the gastric juice environment and whether gastric juice itself has the potential to act as a pro-oxidative medium. In addition the study discusses the significance of using authentic gastric juice for ingestion studies *in vitro*. The effect of several dietary prooxidants and antioxidants including common drinks rich in antioxidants, such as red wine, green tea and berry juices, on oxidation of marine lipids under the stomach conditions has been investigated as well. The study addresses a 2.5 hour ingestion period, which occurs directly after the intake of food and during a prolonged eating, where gastric juice is diluted and the pH is increased to 4. The level of lipid oxidation was determined by measuring peroxide value and TBARS in the lipids, and the oxidation was also followed continuously by recording oxygen consumption by fatty acids.