

# **Kinetic Studies of Heme-mediated Lipid Oxidation in Marine Lipids Measured by Consumption of Dissolved Oxygen**

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Lipid oxidation is an important factor for quality loss during processing and storage of food. There is a great interest in the food industry to use marine n-3 fatty acids in functional foods, but their high susceptibility to oxidation limits their utilization in processed food. Hemoglobin is known as a strong pro-oxidant, and a better knowledge of how it promotes oxidation will lead to better understanding of how heme-mediated lipid oxidation can be minimized. Rate of lipid oxidation was measured by consumption of dissolved oxygen, and liposomes made from marine phospholipids were used as a model system. Heme-mediated lipid oxidation at different hemoglobin and lipid concentration followed Michaelis-Menten kinetics. There was no significant difference in activation energy for the reaction induced by cod or bovine hemoglobin. The rate of lipid oxidation induced by bovine hemoglobin was highest around pH 6. EDTA had no significant effect on heme-mediated lipid oxidation, but  $\alpha$ -tocopherol and astaxanthin worked well as antioxidants. The results were compared with similar studies done with low molecular iron. Observations indicated that there are kinetic differences between the two types of pro-oxidants, and that the efficacy of the antioxidants depends upon the pro-oxidant in the system.