

Controlling lipid oxidation to improve health

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Numerous nutritional organizations world-wide are recommending increased intake of healthy unsaturated fats and decreased consumption of unhealthy saturated fats primarily due to their link to coronary heart disease. In addition, evidence is mounting that unsaturated bioactive lipids (e.g. ω -3 fatty acids and carotenoids) are also beneficial for health and thus consumption should be increased. One might expect that these recommendations would have been rapidly adapted by the food industry. However, this is not an easy task as these healthy fats are highly unsaturated making them susceptible to oxidative rancidity which decreases product shelf-life, causes destruction of vitamins and forms potentially toxic compounds.

Lipid oxidation has traditionally been controlled by free radical scavenging antioxidants and metal chelators. However, many of these antioxidant are synthetically produced causing rejection by many consumers. Thus novel, “natural” antioxidant strategies are needed. To develop new antioxidant technologies, it is critical to understand the mechanisms of lipid oxidation and utilize this information to develop antioxidant strategies. This paper will review lipid oxidation mechanisms in different food systems and outline how these reactions can be altered to allow for the incorporation of healthy lipids into the diet.

Biosketch:

Eric DECKER received his B.S. degree in Biology from Penn State University in 1982, his M.S. from the Department of Food Science and Human Nutrition, Washington State University in 1985 and his PhD from the Department of Food Science at the University of Massachusetts, Amherst in 1988 where he was a USDA National Needs Fellow. Dr. Decker was an Assistant Professor in the Food Science Section of the Department of Animal Sciences at the University of Kentucky from 1988 to 1993 after which he joined the Department of Food Science at the University of Massachusetts, Amherst as an Associate Professor in Food Chemistry. Dr. Decker is currently a Professor and became the Department Head and Director of the Strategic Research Alliance of UMass Food Science in 2008. The Food Science Strategic Research Alliance is an academic-industry partnership that includes over 20 food companies from around the world.

Dr. Decker has been actively conducting research to prevent the degradation of essential nutrients in foods and to improve food sustainability by decreasing food spoilage and increasing utilization of food waste products. In particular he has worked to characterize mechanisms by which lipids oxidize in heterogeneous food systems and the development of antioxidant technologies. As part of this research program, he has developed patented technologies to maximize the stability of bioactive lipids such as omega-3 fatty acids allowing them to be incorporated into foods at nutritionally significant levels. In addition, Dr. Decker has actively collaborated with other scientists to investigate the role of antioxidants, lipids and lipid oxidation products in the molecular basis of disease. He has received over \$12,000,000 in grants as a principal and co-principle investigator to support this research.

Dr. Decker has published over 350 peer-reviewed journal articles, reviews, co-edited books and book chapters. He has been named by the Web of Science (formerly called the Institute of Scientific Information) as the 6th Most Highly Cited Scientists in the world in the field of Agriculture. Dr. Decker has served as an advisor for many government agencies including the FDA Food Advisory Committee, Institute of Medicine's Food Forum and Committee for Nutritional Standard for Food in Schools and the USDA's Agricultural and Food Research Initiative program. His research and service has been recognized by the Institute of Food Technologists's Stephen Chang Award for Lipid Science, Research and Development Award and Samuel Cate Prescott Award for Young Scientist. He has also been awarded the Agriculture and Food Chemistry Division of the American Chemical Society's Advancement of Application of Agricultural and Food Chemistry Award Young Scientist Award. Finally he was honored with the American Oil Chemist Society Stephen Chang Award, the International Life Science Institute's Future Leader Award and the American Meat Science Association's Achievement Award. He is a Fellow of the Institute of Food Technologists, Agriculture and Food Chemistry Division of the American Chemical Society and the Royal Society of Chemistry.