Identification and Characterization of Oxidized Phospholipids Generated by Lipoxygenases in Immune Cells

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Phospholipids provide a permeability barrier in mammalian cells, and act as substrates for synthesis of important lipid mediators. Over the last 6 years, we identified and characterized 6-8 new families of oxidized phospholipids, termed esterified eicosanoids, that are generated acutely by agonist activated immune cells, including platelets, monocytes and neutrophils. The lipids form by enzymatic oxidation of phospholipids by cellular lipoxygenases (LOX), and comprise eicosanoids attached to phosphatidylethanolamine (PE) or phosphatidylcholine (PC). They display diverse immunoregulatory activities, including inhibition of Toll Like-receptor signaling, enhancing coagulation and regulation of neutrophil antibacterial activities. In this presentation, what is currently known regarding their structures, mechanisms of formation, cell biology, and signaling actions will be summarized. Phospholipid oxidation by acutely activated immune cells is shown to be a controlled event, likely to play a central role in regulating membrane biology and innate immune function during health and disease. The mass spectrometry methods used for identification of the lipids will also be described, and how these approaches can be used for discovery of new lipid mediators in complex biological samples will be illustrated.