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Tissue lipidomics analysis of eicosanoids using tissue microwave fixation and chiral LC-MS/MS quantification

A number of tissue bioactive lipids, including eicosanoids, are dramatically and instantly increased during tissue removal from the body and handling, thus altering quantification results for their basal levels. In addition to enzymatic synthesis, eicosanoid-like isoprostanes are also produced upon oxidative stress. We, and others, have demonstrated that high energy focused microwave irradiation (MW) prevents a rapid, 30-fold increase in brain and 150-fold increase in kidney eicosanoid mass within seconds upon tissue extraction from the body. In addition, MW is also required to prevent postmortem alterations of another bioactive lipid group, endocannabinoid, including 2-arachydonoylglycerol (2-AG) and N-arachidonoylethanolamine. We validated stability of endogenous eicosanoids and endocannabinoids under tissue exposure to MW and the application of MW to measure true basal levels of prostaglandins, isoprostanes, and endocannabinoids. We also demonstrated that chiral chromatography is required to differentiate between eicosanoids and non-enzymatically produced isoprostanes. Our results indicate that MW combined with chiral LC-MS/MS is a safe and required technique to quantify tissue levels of a number of bioactive lipids including eicosanoids.

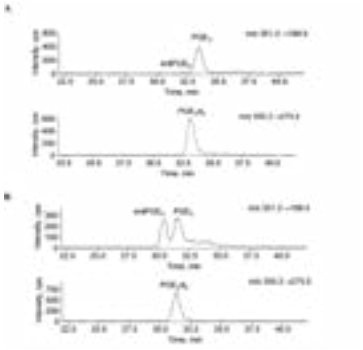

Figure 1: Chiral chromatography with MS/MS analysis for brain E2-series prostaglandins and isoprostanes. A: Brain prostaglandins/isoprostanes upon stimulation. B: Brain prostaglandins/isoprostanes under basal conditions.

Recent Publications

1. Brose S A, Thuen T B and Golovko MY (2011) LC/MS/MS method for analysis of E2 series prostaglandins and isoprostanes. J. Lipid Res. 52(4):850-859.
2. Brose S A, Golovko S A and Golovko M Y (2016) Fatty acid biosynthesis inhibition increases reduction potential in neuronal cells under hypoxia. Frontiers in Neuroscience. 10:546.

Biography

Mikhail Y Golovko obtained his PhD at Tver State Medical University, Russia. He is currently an Associate Professor in the Department of Biomedical Sciences, University of North Dakota (UND), USA. He joined UND in 2003 post completion of his PhD. His research interests are focused on brain lipid metabolism under neurodegenerative conditions including Alzheimer's disease and stroke.

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