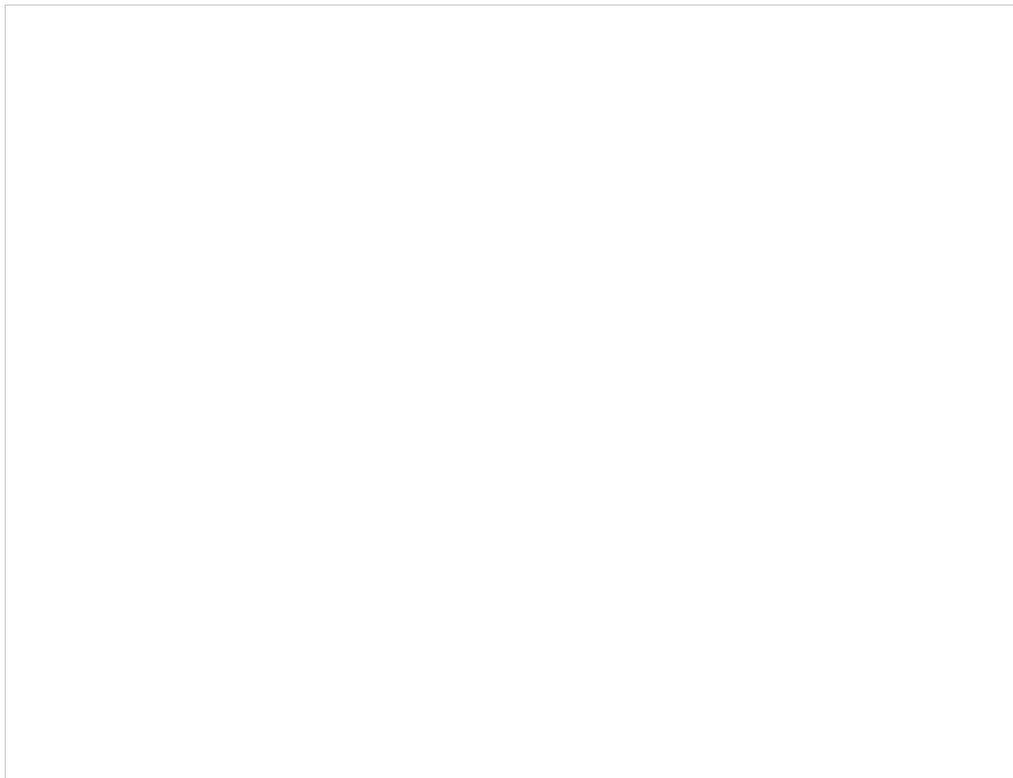


What are isoprostanes (IsoPs)?

Expand

The isoprostanes (IsoPs) are a unique series of prostaglandin-like compounds formed *in vivo* via the non-enzymatic, free radical-catalyzed peroxidation of arachidonic acid. These compounds were first discovered in the Division of Clinical Pharmacology at Vanderbilt by Drs. Jack Roberts and Jason Morrow in 1990. Over the course of the past 20 years, we and others have carried out studies defining the basic chemistry and biochemistry involved in the formation and metabolism of IsoPs. Today, one particular class of IsoPs, F<sub>2</sub>-IsoPs (shown below), is known as the "gold standard" biomarker of endogenous lipid peroxidation resulting from oxidative stress.



Because these molecules are chemically stable *and* have been identified in every biological matrix analyzed, measurement of F<sub>2</sub>-IsoPs has revolutionized the ability of investigators to quantify oxidant injury *in vivo*. In a multi-investigator study sponsored by the National Institute of Environmental Health Sciences (NIEHS), termed the Biomarkers of Oxidative Stress (BOSS) Study, it was found that quantification of plasma or urinary F<sub>2</sub>-IsoPs by mass spectrometry was the most accurate method to assess endogenous oxidative stress.

A number of mass spectrometric methods have been developed to quantify F<sub>2</sub>-IsoPs. Our laboratory uses gas chromatography/negative ion chemical ionization mass spectrometry (GC/NICI-MS) employing stable isotope dilution with [<sup>2</sup>H<sub>4</sub>]-15-F<sub>2t</sub>-IsoP as the internal standard. 15-F<sub>2t</sub>-IsoP, one abundant F<sub>2</sub>-IsoP regioisomer, and other co-eluting F<sub>2</sub>-IsoPs are quantified using this method. This approach is that originally developed by Morrow and Roberts and has been widely used in a variety of research and clinical studies. Click [here](#) to view the assay methodology as published in *Nature Protocols*. (Please note that the nomenclature of F<sub>2</sub>-IsoPs varies in the literature. 15-F<sub>2t</sub>-IsoP is also referred to as 8-iso-prostaglandin F<sub>2α</sub> or 8-iso-PGF<sub>2α</sub> as well as iPF<sub>2α</sub>-III.)

Importantly, normal levels of F<sub>2</sub>-IsoPs in healthy humans have been defined. Normal levels in plasma are 35 +/- 6 pg/mL while normal levels in urine are 1.6 +/- 0.6 ng/mg Creatinine. Defining these levels allows for assessment of various disease states on endogenous oxidant tone and allows for the determination of the extent to which therapeutic interventions affect levels of oxidative stress. Levels of F<sub>2</sub>-IsoPs are increased in human body fluids and tissues in many diseases and disorders including atherosclerosis and associated risk factors including smoking and obesity, ischemia/reperfusion injury, certain types of cancers, neurodegeneration, and asthma,

among others. Further, antioxidant supplementation as well as lifestyle changes (ie. cessation of cigarette smoking or weight loss) have been shown to decrease levels of F<sub>2</sub>-IsoPs.

Each year the Eicosanoid Core Laboratory works with investigators around the world to quantify F<sub>2</sub>-IsoPs. If you are interested in measuring F<sub>2</sub>-IsoPs in your research, please contact [Dr. Ginger Milne](#) with any questions regarding study design, [sample collection/storage](#), or pricing. We look forward to working with you!