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Evaluation of direct and indirect methods for the quantitation of plasma malondialdehyde

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Abstract

Malondialdehyde (MDA) is one of the most commonly reported biomarkers of lipid peroxidation in clinical studies with a wide range of analytical techniques being reported for the direct and indirect quantification of MDA. A range of derivatisation approaches have been employed for the indirect determination of MDA with thiobarbituric acid (TBA), yielding a TBA2-MDA adduct, being commonly employed.

Despite the widely acknowledged limitations of the non specific thiobarbituric acid reactive substances (TBARS) by UV-Vis assay it continues to be one of the most common approaches within the field of biomarkers of oxidative stress.

In light of recent studies which have reported conflicting results in terms of plasma TBARs levels compared to plasma MDA-TBA2 levels this research evaluated the performance of direct capillary electrophoresis assays for plasma MDA to indirect TBA dependent assays employing UV-Vis spectrophotometry or reverse phase HPLC-DAD-MS.

Capillary electrophoresis enabled facile sample preparation with analysis times being comparable to HPLC. The levels of total plasma MDA were significantly lower than the plasma TBARS in each of the human plasma samples examined and interestingly the inter-individual variation apparent in the level of plasma MDA by CE or HPLC-DAD-MS was not evident in the plasma TBARS assay. Each of the 4 online chromatographic detectors yielded a precise, sensitive and accurate determination of total plasma MDA and selected ion monitoring was the most accurate assay (101.3%, n=4). The online diode array detectors provided good assay specificity (peak purity index of 999), sensitivity, precision and accuracy.

Biography

Qualified to Doctoral level, Susanne Boyle has more than 20 years experience in the field of chromatography gained within the pharmaceutical industry and publicly funded Universities and research institutes. She has developed and validated quantitative methods for a range of analytes in drug actives, herbal medicines, nutraceuticals, beverages, foods and biological tissues and fluids. Her primary research interest is in biomarkers of oxidative stress with recent research focusing on levels in First Episode Psychosis and Schizophrenia.