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Lipid oxidation biomarkers

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The aldehyde malondialdehyde (MDA), is the best known and most abundant (10-20μM in plasma) end-product of the autocatalytic lipid peroxidation chain reaction. In addition to aldehydes, other common cholesterol, phospholipid and polyunsaturated fatty acid peroxidation biomarkers that are formed include ketones such as 4-hydroxynonenal), alcohols such as isoprostanes, hydroperoxides such as 1-palmitoyl-2-(5'-oxo-valeroyl)-sn-glycero-3-phosphocholine (POVPC) and cyclic endoperoxides. Polyunsaturated fatty acids (free or in phospholipids) with methylene interrupted unconjugated olefinic bonds are highly susceptible to free radical oxidation and yield hydroperoxide species in situ, which in the case of membranes, are released by phospholipases. Commonly reported examples of oxidised cholesterols (oxysterols) include 6-cholesten-5α-hydroperoxide, 7-ketocholesterol, 7-dehydrocholesterol and 25-hydroxycholesterol (25). The suitability of these molecules as biomarkers is dependent on their stability, ease of enrichment or separation and accurate detection methods in the presence of several orders of magnitude higher concentrations of parent lipid. The commonly used TBARs assay lacks specificity for MDA measurement in biological materials and is not a method of choice for MDA quantitation (Griffiths et al, 2001).

Short Biography

Helen R. Griffiths

Helen Griffiths was appointed as Professor of Biomedical Sciences and Executive Dean of the Faculty of Health and Medical Sciences at the University of Surrey from December 2016. She is a member of the University Executive Board.

Helen graduated with first class BSc (Hons) degree in Biochemistry from Bath University in 1985. She gained her PhD on “Reactive oxygen species damage in rheumatoid arthritis” from the Faculty of Medicine at Birmingham University (1989). She has previously been an academic faculty member at Birmingham University, Leicester University and Aston University where she was awarded a personal Chair in Biomedical Sciences in 2005. She founded the Aston Centre for Healthy Ageing in 2009 and was elected as a Fellow of the Royal Society of Biology in 2011.

Helen served as Associate Dean for Research in the School of Life and Health Sciences between 2005 and 2009, was then appointed as Executive Dean of the School of Life and Health Sciences at Aston University from November 2009 to November 2014. She was appointed as Pro-Vice Chancellor International Relations in April 2015.

Helen is an Editor for Redox Biology and Free Radical Research and serves on the Editorial Board of Biogerontology. She is Immediate Past Chair of the British Society for Research on Ageing and Co-Chair of the Development Board, having held the role of BSRA Chair from 2013-16. She has previously served as Secretary on the Executive Board of the Society for Free Radical Research (2008-2012) and was a member of the SFRR-E Council between 2012-2016. She chaired a European Task force for Biomarkers of oxidative damage, in the EUROfeda programme funded under framework 6.

Helen’s research has always been carried out in collaboration with clinical and industrial collaborators with the goal to develop new knowledge that has impact for health. She has worked with Unilever for over 10 years and partners with Mologic Ltd and GSK.

Helen has published over 150 peer reviewed papers. She has pursued an increase in understanding of the roles of nutrients in health, inflammatory and degenerative diseases that increase with ageing [3-5]. These studies have highlighted that a non-linear relationship exists between “vitamin E“ (alpha tocopherol) and periodontal health [3]; that carotenoids are lower in vascular dementia in a mnaner that is unrelated to intake [5]; and that the benefit of almonds, which are rich in alpha tocopherol, on vascular health is unrelated to antioxidant effects [4]. Most recent studies in this field have characterised the profile of dietary lipids [1] and their oxidised products in ageing and dementia [2], shedding new light of regulation of cellular metabolism.

Relevant publications

1: Ademowo OS, Dias HKI, Milic I, Devitt A, Moran R, Mulcahy R, Howard AN, Nolan JM, Griffiths HR. Phospholipid oxidation and carotenoid supplementation in Alzheimer's disease patients. Free Radic Biol Med. 2017 Mar 14;108:77-85. doi: 10.1016/j.freeradbiomed.2017.03.008. [Epub ahead of print] PubMed PMID: 28315450.

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10: Dias IH, Polidori MC, Li L, Weber D, Stahl W, Nelles G, Grune T, Griffiths HR. Plasma levels of HDL and carotenoids are lower in dementia patients with vascular comorbidities. J Alzheimers Dis. 2014;40(2):399-408. doi: 10.3233/JAD-131964. PubMed PMID: 24448787; PubMed Central PMCID: PMC4230763.

11: Weber D, Milkovic L, Bennett SJ, Griffiths HR, Zarkovic N, Grune T. Measurement of HNE-protein adducts in human plasma and serum by ELISA-Comparison of two primary antibodies. Redox Biol. 2013 Feb 8;1:226-33. doi: 10.1016/j.redox.2013.01.012. eCollection 2013. PubMed PMID: 24024156; PubMed Central PMCID: PMC3757688.

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