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Measurement of oxidatively modified DNA bases and nucleosides by isotope-dilution mass spectrometry

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Among cellular structures, the genome is particularly prone to damage, which can result from spontaneous reactions, replication linked failures, or oxidative processes due to metabolic derivatives or to external agents. Damage to DNA causes more severe consequences than damage to replaceable cellular macromolecules because the genome must be preserved for the life of the cell, and because it can be copied and proliferated into next generations of the cells. Reactions of free radicals and other redox capable agents with DNA generate an abundance of products in nuclear and mitochondrial DNA of living organisms. Growing evidence points to the involvement of this type of damage in the etiology of numerous diseases including carcinogenesis. Comprehensive understanding of the mechanisms, cellular repair, and biological consequences of DNA damage requires accurate measurement of resulting products. There are various analytical techniques, with their own advantages and drawbacks, which can be used for this purpose. Mass spectrometric techniques with isotope dilution provide structural interpretation of products and accurate quantification, which ascertain reliable measurement. Gas chromatography-mass spectrometry or liquid chromatography-mass spectrometry, in single or tandem versions, have been used for the measurement of numerous DNA products such as sugar and base lesions, 8,5´-cyclopurine-2´-deoxynucleosides, base-base tandem lesions, and DNA-protein crosslinks, *in vitro* and *in vivo*. Basic concepts and results will be presented and discussed.

Biography

Pawel Jaruga received his PhD in Medical Biology from Medical University in Bydgoszcz, Poland, in 1994 and DSc degree from Collegium Medicum of Nicolaus Copernicus University in Torun, Poland in 2004. He held Postdoctoral fellowships at Chemical Science Laboratory at National Institute of Standards and Technology (NIST) (1994-1996, 2000-2002). Between 2002-2010, he remained affiliated with NIST as Senior Research Scientist at Department of Chemical and Biochemical Engineering, University of Maryland, Baltimore, MD and then as Senior Life Scientist at Science Applications International Corporation, Homeland Protection and Preparedness Business Unit, Washington, DC. In 2010, he was appointed as a Research Chemist at NIST in the Biomolecular Measurement Division. He published 87 papers in peer-reviewed journals.

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