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Detection and quantification of protein post-translational modifications using novel microchannel plate autoradiographic imagers

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It is likely that the majority of proteins are modified post-translationally either enzymatically or non-enzymatically. The commercial availability of radiochemicals has facilitated the study of protein post-translational modifications by provision of tracker molecules, such as the utilization of [γ-^{32}P]-ATP for tracking modification as protein phosphorylation. However, relatively strong β-emitters such as ^{32}P, or even medium strength β-emitters such as ^{33}P, have the drawback that they may require safety requirements of radioactivity containment, and suffer from short activity half-lives. Tritium (^{3}H) is the weakest commonly employed β-emitter used for studying biological systems. It can readily be incorporated into organic radiochemicals, but its weak signal strength evokes a requirement of relatively long autoradiographic exposure times; typically days to weeks at low tempertatures. Herein I detail the use of a novel digital microchannel plate (MCP) autoradiographic device which enables detection of tritium radiochemicals in real-time, at room temperature, and using exposure times of hours to days (Tarhoni et al., 2011). The superior sensitivity and reduced exposure time of MCP imagers has enabled us to track protein post-translational modifications that would normally lie below that detected using conventional film autoradiography.

Biography

Wayne Grant Carter received his Honours degree in Biochemistry with Nutrition from the University of Southampton. He then completed a PhD at the University of Southampton and post-doctoral studies at the Babraham Institute, Cambridge; Imperial College, London; University of California at Irvine; and University of Oxford, before taking up an industrial post with Mobious Genomics, Exeter.

In 2003, Dr Carter joined the staff of the University of Nottingham, where he is currently a Principal Investigator and Lecturer. His research studies pioneered the use of proteomic purification techniques coupled to novel imaging of radiolabels to detect and purify proteins that are modified post-translationally.

He has received external funding for his studies from the Wellcome Trust, UK Sport, the National Institutes of Health, USA, and Syngenta, UK. He has peer-reviewed manuscripts for numerous academic journals, and is currently an editorial board member of the World Journal of Biological Chemistry, Current Chemical Research, Journal of Analytical Sciences, Methods and Instrumentation, and executive editor for the Journal of Chromatography & Separation Techniques.

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