08 *ABSTRACT*

Anne Dell

Ph.D.
Professor
Department of Biological Sciences, Imperial College of Science, Technology and Medicine, UK

Glycomics and Glyco-proteomics: The Power of Mass Spectrometry

profile

Anne Dell

Professor Anne Dell FRS graduated from the University of Western Australia in 1972 having received the Royal Australian Chemical Institute Prize for the best Australian chemistry graduate. With funding from an 1851 Exhibition Scholarship, she carried out her PhD at the University of Cambridge. In 1975 she moved to a postdoctoral position in the Biochemistry Department at Imperial College in London. She was promoted to a lectureship in 1979, a readership in 1986 and to a personal chair in 1991. She was Head of the Biochemistry Department from 1999 to 2001. She was elected to the Fellowship of the Royal Society in 2002. Her research interests lie in the development and application of ultra-high sensitivity mass spectrometric strategies for solving structural problems in the field of carbohydrate chemistry and biochemistry. Anne received the Tate and Lyle medal of the Royal Society of Chemistry in 1986, the Roy L. Whistler Award of the International Carbohydrate Organisation in 2000 and will deliver the Haworth Medal Lecture of the Royal Society of Chemistry in 2003. She has recently been awarded a prestigious Professorial Fellowship by the UK Biotechnology and Biological Sciences Research Council which allows her to focus full time on research for the next five years. Over the past twenty years Anne has collaborated extensively with glycobiologists around the world and enjoys close links with several laboratories in Japan.

Ultra-high sensitivity mass spectrometric strategies for defining the primary structures of highly complex mixtures of glycopolymers are revolutionising structural glycobiology in the post-genomic era [1]. MS strategies incorporating FAB-MS, MALDI-MS and ES-MS/MS are applicable to diverse glycopolymers including natural and recombinant glycoproteins, glycosaminoglycans, glycolipids and polysaccharides, and mapping strategies lie at the heart of many of our protocols [2]. They enable very complex mixtures from biological extracts or glycopolymer digests to be screened thereby revealing the types of glycans present and, importantly, providing clues to putative novel structures.

This lecture will overview strategies employed in our laboratory which enable the glycome of cells, tissues and organs to be examined and the glycoforms of individual glycoproteins to be identified using glyco-proteomics-based methodologies (Fig 1). In particular the power of quadrupole orthogonal acceleration time-of-flight (Q-TOF-type) mass spectrometers for ultra-high sensitivity sequencing will be discussed.

Data will be presented from our knockout mouse and *C. elegans* glycomics research programmes where we have identified a number of novel glycosylation pathways [3-6] (Fig 2). We will also report on some of our proteomics and glyco-proteomics research including studies of tyvelose-containing glycoproteins in *Trichinella* [7], glycosyltransferases in *Dictyostelium* [8], novel glycoproteins in *Campylobacter* and *Mycobacterium bovis*.

Recently we have initiated a major programme of work aimed at rigorously defining glycosylation changes occurring during leukocyte development, activation and trafficking. Data will be presented for glycomics and glyco-proteomics studies of T and B-cells, including the characterization of N- and O-glycans from the T-cell derived CD8 glycoprotein.

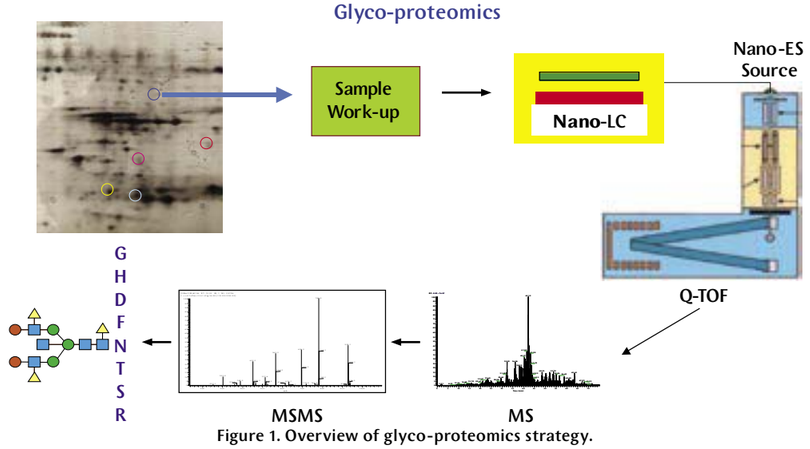
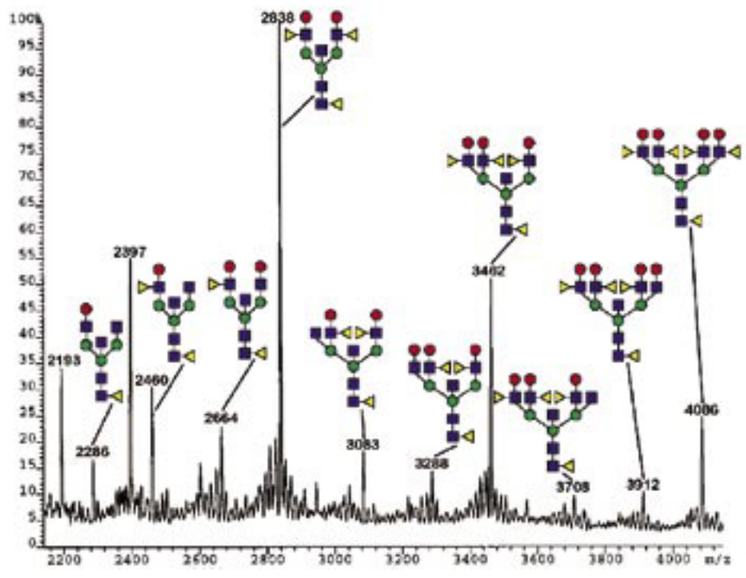


Figure 1. Overview of glyco-proteomics strategy.

A



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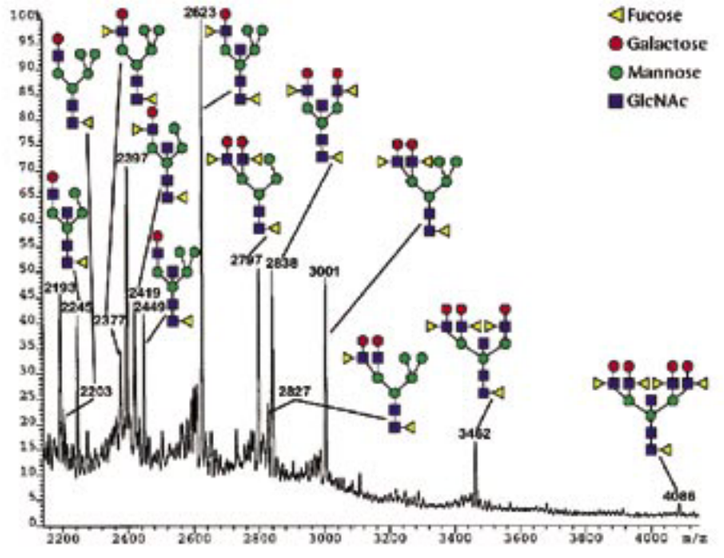

Figure 2. FAB-MS Data from glycomics screening of the kidney of (A) wildtype mouse and (B)α -mannosyltransferase II knockout mouse. See Ref 8 for further information.

References

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