

## HEADS OR TAILS? WHAT IS THE IMPORTANT LINK BETWEEN MEMBRANE PHOSPHOLIPIDS, BODY MASS AND METABOLISM?

Jessica R. Nealon,<sup>1,2</sup> Stephen J. Blanksby,<sup>3</sup> Paul L. Else<sup>1,2</sup> and Todd W. Mitchell<sup>1,2</sup>

<sup>1</sup>Metabolic Research Centre, <sup>2</sup>School of Health Sciences and <sup>3</sup>Department of Chemistry  
University of Wollongong, 2522, Australia

Membrane fatty acid composition has been implicated as an important factor in mass-specific variations in basal metabolic rate. Specifically, larger animals with a lower metabolic rate have phospholipids containing a higher level of 18:1 n-9 and 18:2 n-6, and a lower level of 22:6 n-3 than do smaller more metabolically-active animals. This difference has been commonly observed in most tissues (including kidney), yet to a lesser extent in the brain. The distribution of the different fatty acids among the membrane phospholipid classes and molecular variation with body mass has, however, been hitherto undetermined. The aim of the current study was to examine this relationship at a molecular level in both the kidney and brain to gain further insight into its regulation. Accordingly, the kidney and brain of mice, sheep and cattle were excised, lipids extracted and phospholipids analysed by electrospray ionisation mass spectrometry. Subsequently, the identity and quantification of all 18:1-, 18:2- and 22:6-containing phospholipids in the respective tissues was accomplished for the first time. The greatest variations were observed in phosphocholine and phosphoethanolamine molecules, *i.e.*, increases in PC16:0/18:1 ( $p < 0.001$ ), PC16:0/18:2 ( $p < 0.01$ ) and PE18:1/18:2 ( $p < 0.001$ ), and a concomitant decrease in PC16:0/22:6 ( $p < 0.001$ ) in the cow compared to the mouse kidney. In the brain, no variation was observed in 22:6 n-3- phospholipids, although PC16:0/18:1 ( $p < 0.001$ ) demonstrated similar differences to the kidney. These phospholipids that characterise body mass variations in mammals are synthesised *de novo*. This suggests that the body mass-associated differences in membrane fatty acid composition are regulated through phospholipid synthesis rather than remodelling.