Plenary 4: Bioactives: From Composition to Activity and Beyond

Developments in QA of chemical measurements in food
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Background – Challenges in the analysis of food include new residues that need monitoring, and ever lower concentrations of target compounds. New methods of analysis have provided clever approaches but now quantitative methods need adequate validation and laboratories using those methods need proper quality control. Food analysis has traditionally relied on mutually agreed standard methodology, eschewing approaches such as the Guide to Uncertainty in Measurement (GUM) 1, and thereby foregoing metrological traceability. This paper will explore aspects of quality assurance and will argue that food analysis can be brought into the orbit of normal chemical analysis.

Quality Assurance – Australia has led the world in aspects of metrology ever since minister Dedman stated in Parliament “Measurements must be what they purport to be” 2. The National Association of Testing Authorities (NATA) was the first such accreditation body in the world. A proper quality assurance program will have the following elements: 1. Accreditation of the laboratory, 2. Participation in proficiency testing schemes, 3. Use of certified reference materials (CRMs) for calibration and quality control, 4. Estimation of measurement uncertainty, 5. Appropriate qualification and training of personnel, 6. A client focus to the operations of the laboratory.

Measurement uncertainty – Horwitz has argued against the GUM approach, debating that matrix effects and sampling are so much greater than any ‘bottom up’ uncertainty components 3,4. However it is possible to treat recovery and other aspects in a correct manner that can be justified in terms of accreditation to ISO 17025. A recent approach, that is GUM compliant, uses repeatability and a measurement of run bias to quickly assess uncertainty, has been published by O’Donnell and Hibbert 5. Using suitable CRMs it is possible to construct an uncertainty budget. An example of creatinine in urine will be given to illustrate this method.

Certified reference materials – A consistent approach to quality control requires CRMs that are appropriately matrix matched. Australia’s National Measurement Institute produces reference materials, both pure and matrix, with property values that are certified with stated uncertainties. CRMs are expensive and do not cover the gamut of required materials, but the effort required to certify a material is considerable. An example will be given of the analysis of nitrofurans in prawns by isotope dilution mass spectrometry.

References