Oestradiol measurement is traditionally performed by immunoassays which have poor performance at lower concentrations. It is clinically important to be able to accurately measure oestradiol at low concentrations in certain patient groups such as females undergoing treatment for breast cancer. In this population the measurement of oestradiol is important for determining menopausal status as this may guide treatment choices. Immunoassay in this setting may be compromised due to lack of sensitivity. Additionally, some treatments for breast cancer have been reported to cause interferences in immunoassays.

We have developed a liquid chromatography tandem mass spectrometry (LC-MS/MS) assay for the measurement of oestradiol and oestrone using the Waters Online SPE manager coupled to a Xevo TQS mass spectrometer. The assay does not require derivitisation and has a novel sample preparation that results in a rapid run time making it suitable for routine clinical use. The sample preparation step involves extracting serum samples using supported liquid extraction followed by C18 on-line solid phase extraction which is a novel approach. The simultaneous measurement of oestrone gives additional information towards calculating total oestrogen status.

Further investigation into the interference of breast cancer medications has shown that one in particular, fulvestrant causes direct interference in two immunoassays when spiked into serum. The interference of fulvestrant in the immunoassays has also been confirmed in a clinical sample. In this case the mass spectrometry measurement was <10 pmol/L, the Abbott immunoassay gave a result of 117 pmol/L and the Centaur gave 371 pmol/L. Although fulvestrant does interfere directly with the immunoassay, the effect seen in this patient sample exceeds this, suggesting that metabolites of this drug may also have an effect. The other medications (anastrozole, exemestane and tamoxifen) do not appear to directly interfere; previous reports in the literature of interference are therefore likely to be mediated by metabolites.
Due to the low concentrations and the potential for interferences, we recommend that all patients with breast cancer, having an oestradiol measurement performed, access a mass spectrometry assay for reliable results.

Dr. Jo Adaway  
Principal Clinical Scientist, Department of Clinical Biochemistry, University Hospital South Manchester NHS Foundation Trust, United Kingdom

Graduated with a First Class (Hons) BSc in Biochemistry from UMIST in 2000.

Started training in Clinical Biochemistry at Wythenshawe Hospital in 2003 whilst writing up a PhD thesis entitled ‘Proteomic Analysis of Stem Cell commitment’.

Awarded PhD from the University of Manchester in 2005.

Graduated with an MSc in Clinical Biochemistry from the University of Manchester also in 2005.

Finished Clinical Scientist training in 2006 and started work in the Clinical Biochemistry department at Christie Hospital.

Returned to Wythenshawe Hospital in 2009 as a Senior Clinical Scientist and was promoted to Principal Clinical Scientist in 2010.

Awarded FRCPath in January 2011.

Honorary Lecturer at the University of Manchester since April 2011.

Current research interests: Biogenic amines and drug monitoring by LC-MS/MS.