



## Strontium Isotopes and Trace Elements in Horse Hair; Feasibility for Provenancing

Catherine Hoggett, Henriette Ueckermann, Hilary Bathgate, Robert Posey, and Jurian Hoogewerff  
Centre for Forensic Provenancing, School of Chemistry, University of East Anglia, Norwich, UK

In recent years the equine industry has experienced problems with fraudulent trading of horses. At present there is an urgent need to validate claims of provenance in documentation with a reliable independent scientific method. As part of an undergraduate research project this study examines the feasibility of using strontium isotopes and trace elements to identify the geographic origin and/or migration of horses.

Mane hair has been collected from thirty-two horses from a number of sites in the UK, Mallorca and Australia. From each site also water, soil and grass has been collected. All information about paddock coordinates, turnout, grazing, diet and other information has been collected from the owners using a questionnaire. Using geological maps strontium isotope ratios were predicted based on lithology and age of the rock. The hair has been microwave digested and analysed using an Agilent 7500ce inductively coupled plasma mass spectrometer (ICP-MS) for trace elements and a VG Isoprobe multiple collector inductively coupled plasma mass spectrometer (MC-ICP-MS) for  $^{87}\text{Sr}$  /  $^{86}\text{Sr}$  ratios. Analysis of water, soil and grass will be completed by the time of this presentation.

The hair provides expected  $^{87}\text{Sr}$  /  $^{86}\text{Sr}$  ratios in the range 0.708-0.710. The  $^{87}\text{Sr}$  /  $^{86}\text{Sr}$  ratios do differ between the different sites more than within each site ( $p=0.16$  at 95%CL). Although the small sample number prohibits any definitive conclusions, it appears that the strontium isotope ratios of the hair of those horses that spend the most of their time grazing in the meadows, reflects the local geology best. This might seem trivial but it confirms that local strontium isotope ratios are reflected, to an extent, in the mane hair. Further confirmation will come from the analysis of the water, soil and grass.

The trace elements measurements show significant differences in hair levels between the sites. A few individual "rescue" horses in the cohort, show unexpected anomalies for certain elements. Additional temporal analysis of tail hair of those horses, combined with the results of the water, soil and grass, will be used to elucidate the possible origin and importance of these anomalies.

Conclusion:  $^{87}\text{Sr}$  /  $^{86}\text{Sr}$  ratios of mane hair have the potential to link a horse to local geology and further research is ongoing.