Stable Isotope Profiles from a Lock of Hair Provide Information of Illegal People Trafficking Route used by a Vietnamese Organised Crime Group.

W. Meier-Augenstein[1,2] & H.F. Kemp[1] and G. Ronayne[3]

[1]Stable Isotope Forensics Laboratory, SCRI, Invergowrie, Dundee DD2 5DA [2]Centre for Anatomy & Human Identification, University of Dundee, DD1 5EH [3]Gwent Police, HQ CID Operations, Croesyceiliog, Cwmbran NP44 2XJ.

Introduction

- Chemical elements consumed as food and beverages become incorporated into body tissue.
- Chemical elements have naturally occurring different forms called isotopes, with distinct differences in isotopic abundance of a given compound such as human tissue protein being indicative of differences in dietary habits and/or geographic origin.
- There is a relationship between isotopic composition of human tissue and geographic location, which can be exploited forensically to aid in human provenancing.

Isotopically speaking "you are what you eat and drink, and where you eat and drink". For example, at least 30% of the chemical element hydrogen incorporated into human hair in its stable isotopic forms ^{1}H and ^{2}H is directly derived from water and water based beverages. Similarly all food and drink we consume and the elements contained therein contribute to the isotopic signature or profile of human tissue (**Figure 1**).

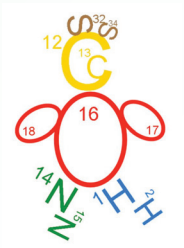


Figure 1: Stable Isotope Man Showing Major and Minor Stable Isotopes in the Human Body.

Case Background

A young man with Asian features was left in the A&E department of a hospital in Gwent, South Wales (UK) by persons unknown and died shortly thereafter. A hit in the Interpol fingerprint database provided some information regarding the victim's nationality but there was no record of this individual ever having entered the UK, at least not legally.

On behalf of Gwent Police, stable isotope analysis was carried out on a lock of scalp hair to generate chronological profiles for diet or nutritional changes as well as a recent geographic life trajectory.

Materials and Methods

On 28 November 200x, a sample of scalp hair (**Figure 2**) pertaining to 'Operation Compass', Case No A/06/13011, sample ID 'SL35' was delivered by Mrs Janet Williams (Crime Scene Investigator, Gwent Police, Newport Central Station) to the Stable Isotope Forensics Laboratory for stable isotope profiling (SIP). The sample was logged in by completing a lab internal chain-of-custody sheet, which was countersigned by Janet Williams who retained one copy.

The hair sample received had been cut from and close to the scalp of the deceased. Overall length was approx. 145 mm representing 14.5 months worth of growth. Starting from the scalp end and, hence youngest or most recent part of the strands, the hair was cut into segments of 5 mm length representing a time period of half a month.

All segments were cleaned according to standard procedure as described by O'Connell and Hedges, 2001. Stable isotope instrumentation set-up and analyses were performed according to our standard laboratory procedures, as described by Farmer *et al.*, 2005, and Fraser *et al.*, 2006. An ANCA elemental analyser coupled to an isotope ratio mass spectrometer (both SerCon Ltd, Crewe, UK) was used for $^{13}C/^{12}C$ and $^{15}N/^{14}N$ isotope ratio measurement. A Thermo DeltaPlus XP High Temperature Conversion / Elemental Analyser (Thermo-Fisher Corporation, Bremen, Germany) was used for $^{2}H/^{1}H$ and $^{18}O/^{16}O$ isotope ratio measurement.

Figure 2: Lock of Scalp Hair Submitted for Stable Isotope Analysis

Results

Results from the ^{2}H isotope analysis of the hair segments are shown in chronological order from left (oldest part of the hair) to right (most recently formed part of the hair) in **Figure 3**. At 14.5 months prior to death, ^{2}H isotope records showed a geographic stationary period lasting 2.5-3 months, which was spent in Eastern Europe (e.g. Ukraine) followed by a direct move to Central Europe (e.g. Germany). After this almost instantaneous move from location A to location B the victim resided in Central Europe (location B) for about 6 -7 months. From here he was moved to the UK, eventually arriving at his final West Coast destination where he spent the last 2.5 months of his life.

A hit in the fingerprint database of the German Police confirmed the information provided by forensic stable isotope analysis that the victim had spent some time in Germany. From there, more and more pieces of the jigsaw fell into place as the investigation by Gwent Police progressed. It turned out the victim was of Vietnamese origin and had been smuggled illegally into the UK by a Vietnamese Organised Crime Gang (VOCG), which did indeed use the countries determined by the sequential ^{2}H stable isotope analysis of the victim's hair as staging points of their people trafficking route (**Figure 4**). To pay off his debt of £30,000 to the VOCG for smuggling him into the UK, the victim was forced to work as Cannabis farmer for this VOCG. Unfortunately for him, his entire crop was stolen by a rival gang. Due to this incident he was been kidnapped from his premises in Gwent by the VCOG for interrogation elsewhere. He ultimately died from multiple injuries sustained during a punishment beating administered by members of the VCOG who smuggled him into the UK .

Ultimately, the investigation code-named Operation Compass uncovered influence and its extent of two Vietnamese OCGs on local, regional and international organised crime, which were hitherto unknown. Two Vietnamese men were subsequently prosecuted and convicted of manslaughter.

Figure 3: Geographic Life Trajectory of the Victim during the 14.5 Months prior to Death as Established by the ^{2}H Stable Isotope Profile from the Victim's Hair.

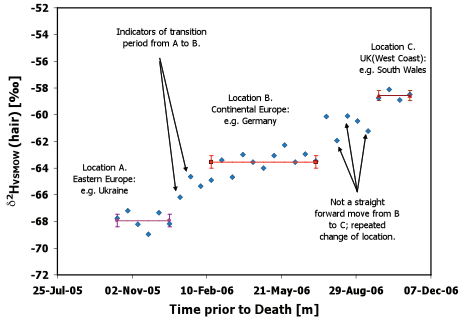
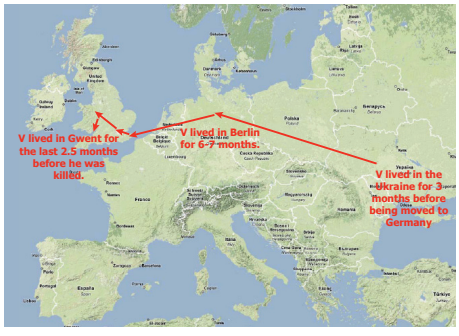


Figure 4: Trafficking Route used by the Vietnamese Organised Crime Gang for the Victim as Established through Investigations by Gwent Police.



Conclusions:

The data and results presented here are an excellent example for the power of intelligence led policing and the great potential "stable isotope forensics" holds for intelligence led policing by providing valuable information regarding sample history and provenance of physical evidence that cannot be obtained by any other analytical method.

ACKNOWLEDGEMENTS:
SCRI gratefully acknowledges the financial support by the Scottish Government Rural and Environment Research and Analysis Directorate (RERAD).

References
N. Farmer, W. Meier-Augenstein, and R.M. Kalin, 2005, *Rapid Commun. Mass Spectrom.*; **19**, 3182-3186. I. Fraser, W. Meier-Augenstein, and R.M. Kalin. 2006, *Rapid Commun. Mass Spectrom.*; **20**, 1109-1116. O'Connell TC, Hedges REM, Healey MA, Simpson AHRW. 2001, *J Archaeol Sci.*; **28**: 1247-1255.
W. Meier-Augenstein, 2010: ***Stable Isotope Forensics***, John Wiley & Sons Ltd, ISBN 978-0-470-51705-5.