D37 Multi-Element and Stable Isotope Analyses in Hair

Jisook Min, 331-1 Sinwol7-dong Yangcheon-gu, Seoul 158-097, SOUTH KOREA; Kiwook Kim, MS, 331-1 Shinwol7-dong Yancheon-gu, Seoul 158-097, SOUTH KOREA; Sangcheol Heo, 331-1 Shinwol7-dong, Seoul 158-707, SOUTH KOREA; Hasun Park, PhD, 331-1 Shinwol7-dong, Seoul, SOUTH KOREA; Jaekyun Kim, PhD, 331-1 sineol7-dong, Seoul, SOUTH KOREA; and Yunshin Park, PhD, 331-1 Sinwol7-dong, Seoul, SOUTH KOREA*

After attending this presentation, attendees will gain valuable Korean data that they can compare to their own data. They can also discuss how to obtain information concerning occupations, sex, and smoking habits from the data.

This presentation will impact the forensic science community by providing data from Korean people because a variety of data from many countries is needed for identification.

The application of Isoptope Ratio Mas Spectrometry (IRMS) and Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP/MS) to forensic hair samples was investigated. Identification of forensic hair samples was carried out using stable isotopes and multi elements, as well as examining what types of information can be developed from hair samples using these analyses. Isotopic data (C, N, O, S, and H) for bulk hair indicated that this signature can be used as an alternative tool of identification in cases where no material is available for DNA comparison or where no DNA match can be found. The single hair strand was analyzed for information such as sex, smoking habits, and occupation using LA-ICP/MS. Even though this study was preliminary, good results were obtained.

Hair specimens from 16 people (5 females and 11 males) living in Seoul and the Gyunggi province were collected for this study. The scalp hair samples were stored in glass vials at room temperature before washing. The results are as follows: (1) gender can be determined by the amount of Hg and Pb in hair; (2) smokers are distinguished from non-smokers as the content of La and Na in the hair of smokers is higher than non-smokers; and, (3) the samples are divided into four groups depending on occupation. The amount of Al is high in people working at the laboratory and the amount of Hg and Na is high in fishermen. The content of Sn is high in painters and the content of Mn and Fe is high in blacksmith workers. These results indicate that the concentrations of metals in hair are influenced by the environment of an individual work place; and, (4) bulk stable isotope analysis of hair can provide information concerning a person's dietary intake and the geo-location in which a person has lived. These isotope results will have forensic application. The average of δ2H(‰), δ18O(‰), δ13C(‰), δ15N(‰), and δ34S(‰) is -75.6±5.3, 11.8±1.1, -19.1±0.4, 8.8±0.6, 9.8±0.5, respectively. These results indicate that Koreans have their own chemical fingerprint even in hair.

Further study with more hair samples is needed. In cases using the LA-ICP/MS standard, fewer methods (including Aridus) or house-working standard methods should be examined.

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 ** Presenting Author*