A97 Stable Isotope Investigation of Mother-Infant Pairs and the Implication for Forensic Casework

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After attending this presentation, attendees will gain: (1) an understanding of the significance of stable isotope analysis and tooth histology in evaluating the survival time of disposed neonates; and, (2) knowledge of the applicability of bioarchaeological research for forensic science.

This presentation will impact the forensic science community by providing results using an innovative approach of stable isotope analysis combined with tooth histology in the context of stillbirth or infanticide. The research will add information to the knowledge of neonatal stable isotope values.

The news frequently reports on forensic investigations in relation to disposed dead infants. The greater the decomposition, the more difficult it becomes to evaluate the cause of death. The main question often raised is whether the neonate was stillborn or was a victim of infanticide. An indication of whether a neonate was born alive is the presence of a Neonatal Line (NNL); however, current research has shown that the NNL is detectable after seven to ten days of survival.[1,2] Stable isotope analysis is frequently used in forensic and archaeological settings and the relationship of the values between mother and infant has been studied.[3-6] In contrast, the question of detecting stillbirth or infanticide has received less attention.

It has been shown that breastfed children exhibit increased δ15N values based on stable isotopes of the hair and fingernails.[3,4] This is not applicable when decomposition is too advanced. Therefore, the goal was to investigate the collagen values of δ15N of mother-infant pairs as neonatal bones are often recovered at forensic scenes.

Three mother-infant pairs with reliable relations from St. Poelten, Austria, were used to evaluate the hypothesis that breastfed neonates express higher δ15N values than their mothers. For the stable isotope analysis, samples of the same skeletal element were taken. Tooth histology was performed if teeth were available. Additionally, 17 human remains from the archaeological site of Petinesca, Switzerland, were analyzed.

The collagen extraction was performed following a modified acid-base extraction method.[7] Isotope ratio mass spectrometry was used for the calculation of the 15N/14N ratio and collagen quality was evaluated. For the tooth histology, a standard protocol was followed, a light microscope and a scanning electron microscope were employed, and micro radiography was performed.[2]

The stabile isotope results of the mother-infant (estimated age: six to ten lunar months) pairs indicate that no breastfeeding signal is present and no NNL was observed. For the second series (estimated age: 8.5 lunar months to 2 months *ex utero*), a breastfeeding signal was observed for all except one individual that exhibited decreased δ15N values compared to the other infants and similar δ15N values to the female average. The tooth histology of this individual revealed no NNL.

It is seen that stable isotope analysis can assist in the evaluation of the survival time of neonates; however, limitations such as the unknown turnover rate of collagen in developing bones require controlled studies. In conclusion, it is believed that stable isotope analysis could become a useful tool for forensic science when dealing with neonatal remains.

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