Stable Isotope Investigation of Mother – Infant Pairs and the Implication for Forensic Casework: Preliminary Results

Inga Siebke¹, BA, BSc; Fabian Kanz², PhD; Carsten Witzel³, PhD; Sandra Lösch¹, PhD
¹Department of Physical Anthropology, Institute of Forensic Medicine, University of Bern, Switzerland
²Institute of Forensic Anthropology, Department of Forensic Medicine, Medical University of Vienna, Austria
³Department of Biology and Chemistry, University of Hildesheim, Germany

Abstract

In forensic cases it can be challenging to differentiate between a live birth and a stillbirth. Few methods are accepted which become less precise with an increased post mortem interval. Therefore, it is aimed to evaluate the utility of stable isotope analysis and tooth histology to detect stillbirth. Up to now archaeological “mother-infant-pairs” (MIP) were screened for their stable isotope composition of nitrogen (\(\delta^{15}N\)) and carbon (\(\delta^{13}C\)) and tooth histology was performed in 2 cases. A slight trend in the stable isotope data is visible however, further samples are required to fully evaluate their utility.

Introduction

In forensic cases that involve remains of a neonate it is necessary to establish if the child was born alive (Fig. 1). Forensic experts have limited methods and with increased decomposition the evaluation becomes more difficult.

The examination of a neonatal line (NNL). It can be observed in the enamel of deciduous teeth and is related to labor. To be clearly visible the child has to survive birth at least 7 to 10 days (1, 2). Stable isotopes are used in archaeological studies in the context of weaning but to date no study has addressed the identification of stillbirth. The aim is to investigate if the stable isotopes \(\delta^{15}N\) and \(\delta^{13}C\) could provide additional information about the survival of birth.

Results

• The collagen quality criteria were fulfilled in 7/8 cases.
• The deviation of \(\delta^{15}N\) and \(\delta^{13}C\) for each of the 7 MIP was calculated.
• Less deviation is seen for \(\delta^{15}N\) than for \(\delta^{13}C\) values (Fig. 3).
• The roman series indicate the beginning of a breastfeeding signal for 14/15 neonates (Fig. 4).
• No NNL was observed on the examined teeth (Fig. 5).

Discussion

The preliminary data indicate that \(\delta^{13}C\) is more indicative for the survival of birth than \(\delta^{15}N\). This is contrary to the present knowledge (4-7) which is presented by the roman series. Problematic for this series is that the actual mothers are not known. An assumption about the relation of \(\delta^{15}N\) and \(\delta^{13}C\) could provide fundamental information for further in depth studies.