

LEAD LEVELS IN TEETH AS A MEASURE OF LIFE-TIME LEAD EXPOSURE IN CHILDREN

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Background and Aims: Lead exposure has irreversible health effects in children who are susceptible even at very low levels of exposure. The usual test for lead exposure is blood lead level (BLL), but this indicates only recent exposure. This study aimed to develop a method to assess the use of tooth lead levels as a histological marker to reveal the history of lead exposure during the child's life-time. We will ascertain whether milk teeth are suitable biomarkers of lead exposure.

Methods: Two deciduous molars each were collected from 15 children aged 6-8 years living in Northeast England. Using histological sections, the distribution of lead in different growth layers was quantified by Laser Ablation Inductively Coupled Plasma Mass Spectrometry (LA-ICP-MS). BLLs were measured using ICP-MS. Calcium normalised lead ratios ($^{208}\text{Pb}^{44}\text{Ca}$) were measured as lead body burden. For each tooth surface, five ablation transects (minimum 10 points/line) were sampled. Incremental growth lines in enamel and dentine were used to determine the ages and time interval of exposure at each point. The data were grouped into age intervals of 42 days, based on the mean time interval sampled. Lead intensities were plotted for each interval along each transect.

Results: BLLs ranged from 0.5-6.8 $\mu\text{g}/\text{dl}$, none of the children had a BLL above the WHO threshold (10 $\mu\text{g}/\text{dl}$). Lead ratios vary across individual teeth. Comparatively low intensities were observed in enamel, higher ratios were found around the dentine close to the pulp cavity. In the initial four teeth examined, $^{208}\text{Pb}^{44}\text{Ca}(\times 10^7)$ in primary dentine ranged from 1.65-95.96 (median=4.45), Standard sigma errors ranged from 0.15-13.88 (median=2.08).

Conclusions: Preliminary results indicate that lead ratios in primary dentine are consistent between teeth from the same child, and at the same age within each tooth, indicating that the history of exposure may be determined using one ablation transect in primary dentine.