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*corresponding author: corresponding author. Institució Milà i Fontanals - Consejo Superior de Investigaciones Científicas, Archaeology of Social Dynamics Research Group, Department of Archaeology and Anthropology Barcelona, Spain. bertamorell@imf.csic.es

Chemical pretreatment of $^{87}Sr/^{86}Sr$ & $\delta^{18}O$ isotopic samples

The chemical pretreatment of the $^{87}Sr/^{86}Sr$ & $\delta^{18}O$ isotopic samples was conducted at the Isotope Laboratory from the Biogeologie group at the Department of Geosciences of the University of Tübingen according to established procedures.

Approximately 12mg of enamel was extracted from each molar by drilling with a Dremmel© device equipped with diamond-tipped drilling bits. Organic material was removed using 2% NaOCl solution for 24 hours, followed by a 0.1M Ca-acetate acetic acid buffer solution for another 24 hours (Bocherens et al. 1996). After that, samples were dried at 70°C using a ThermoFinnigan Gasbench II connected to a Finnigan Delta Plus XL CFIRMS. Isotopic abundances are expressed as δ (delta) values in parts per mil (‰), as follows: $\delta^{18}O$ = (18O/16O sample/ 18O/16O standard - 1) x 1000. The standards are the marine carbonate V-PDB for carbon and oxygen and V-SMOW for oxygen. For oxygen fossil samples the analytical error is 0.2‰, based on multiple isotopic analysis of tooth enamel of elephant and hippopotamus prepared and analysed at the same time as the bioarchaeological samples.

Strontium separation and analysis of aliquots of the pretreated samples was conducted at the Curt Engelhorn-Zentrum Archäometrie, Mannheim, Germany. ~5 mg of enamel were dissolved in 250 µl of HNO3 under clean-lab conditions. Teflon columns with Eichrome Sr-Spec resin were preconditioned with 500 µl of 3 N HNO3, the samples loaded, and washed in with 3 × 400 µl of 3 N HNO3. The Sr was eluted with 1.5 ml of 0.4 N HNO3 (0.5 ml + 1 ml steps). Sr concentrations were determined by Quadrupole Inductively Coupled Plasma Mass Spectrometry (Q-ICP-MS), and the solutions were diluted for strontium isotope analysis by High-Resolution Multi Collector-ICPMS (Neptune). Raw data were corrected according to the exponential mass fractionation law to 88Sr/86Sr = 8.375209. Blank values were lower than 10 pg Sr during the whole clean-lab procedure. The NBS 987 and Eimer & Amend (E & A) standards run along with the samples yielded 87Sr/86Sr ratios of 0.71026 ± 0.00003, 2σ; n = 19 and 0.70804 ± 0.00002, 2σ; n = 26, respectively. The certified $^{87}Sr/^{86}Sr$ ratio of NBS-987 is 0.71034 ± 0.00026 [95 per cent confidence interval]. The inter-laboratory comparative value for AMES (Eimer & Amend) is 0.708027 ± 0.000035 (1 SD) (Müller-Sohnius, 2007).