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Testing sequential extraction methods for the analysis of multiple stable isotope systems from a bone sample

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Stable isotope composition of bones, analysed either from the mineral phase (hydroxyapatite) or from the organic phase (mainly collagen) carry important climatological and ecological information and are therefore widely used in paleontological and archaeological research. For the analysis of the stable isotope compositions, both of the phases, hydroxyapatite and collagen, have their more or less well established separation and analytical techniques. Recent development in IRMS and wet chemical extraction methods have facilitated the analysis of very small bone fractions (500 μg or less starting material) for PO_4^{3-}-O isotope composition. However, the uniqueness and (pre-) historical value of each archaeological and paleontological finding lead to preciously little material available for stable isotope analyses, encouraging further development of microanalytical methods for the use of stable isotope analyses. Here we present the first results in developing extraction methods for combining collagen C- and N-isotope analyses to PO_4^{3-}-O-isotope analyses from a single bone sample fraction. We tested sequential extraction starting with dilute acid demineralization and collection of both collagen and PO_4^{3-}-fractions, followed by further purification step by H_2O_2 (PO_4^{3-}-fraction). First results show that bone sample separates as small as 2 mg may be analysed for their δ^{15}N, δ^{13}C and $\delta^{18}O_{PO4}$ values. The method may be incorporated in detailed investigation of sequentially developing skeletal material such as teeth, potentially allowing for the investigation of interannual variability in climatological/environmental signals or investigation of the early life history of an individual.