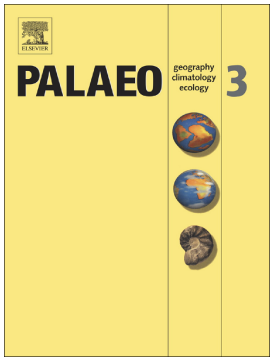

Oxygen (δ18O) and carbon (δ13C) isotopic distinction in sequentially sampled tooth enamel of co-localized wild and domesticated caprines: Complications to establishing seasonality and mobility in herbivores

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Oxygen ($\delta^{18}O$) and carbon ($\delta^{13}C$) isotopic distinction in sequentially sampled tooth enamel of co-localized wild and domesticated caprines: Complications to establishing seasonality and mobility in herbivores

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Abstract

The relationship between leaf water, meteoric water, and the amplitude of seasonal oxygen isotopic change associated with dietary and environmental inputs recorded in the time-sensitive record enamel bioapatite have yet to be fully explored. Here, we measure oxygen and carbon isotopes of tooth enamel carbonates obtained from the sequentially sampled teeth of sympatric wild and domesticated caprines inhabiting the northern Gobi C_3/C_4 steppe-desert. The pattern of high $\delta^{13}C$ values year-round and elevated winter season carbon isotope values expressed in domesticated sheep indicates a high intake of grasses throughout the year with receipt of a C_4 fodder source during the winter months. This pattern contrasts with low $\delta^{13}C$ values visible in wild caprines indicating these animals ingested both graze and browse throughout the year. Domesticated sheep also demonstrate a wider amplitude of intra-tooth oxygen isotope change compared to wild caprines as well as higher maxima summer season and lower minima winter season $\delta^{18}O$ values. The greater contribution of graze to the domesticated sheep diet suggests ^{18}O enriched leaf water heavily contributes to higher summer season $\delta^{18}O$ values visible in the sequence, while the ingestion of ^{18}O depleted groundwater is likely responsible for low winter season $\delta^{18}O$ values. The wide differences in the $\delta^{18}O$ values expressed in co-occurring wild and domesticated sheep populations affirms previous observations that the ingestion of isotopically distinct water sources impacts body water oxygen isotopic composition and subsequent expression of $\delta^{18}O$ values in herbivore tooth carbonates. This has important implications for the use of $\delta^{18}O$ values obtained from serially sampled teeth for reconstructing paleoenvironment, seasonality and also the movement of wild and domesticated herbivores through modern and ancient landscapes.