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On the palaeobiology of the extinct cave bear Ursus spelaeus ROSENMÜLLER. Insights from stable isotope analysis

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Isotopic signatures (13C, 15N) of bone collagen are used more and more to obtain the paleobiological data of fossil species. By means of these signatures, for example, the diet type of an extint species may be inferred. Also, the climate in which this species developed may greatly influence on the isotopic signature of its bone collagen. This influence is firstly produced in the initial material of the trophic chain but also may produce variations due to physiological changes caused by climatic changes in the species involved in this trophic chain.
The cave bear (Ursus spelaeus ROSENMÜLLER) is a species of broad distribution in the European Pleistocene sites that has been studied from the isotopic point of view, trying to establish its diet type. For the moment, the results vary: though in most cases the isotopic values indicate a preferably herbivore diet type, differences exist between sites of different geographic zones and chronologies.
Taking into account that climate influences on the cave bear's physiology through the physiological mechanism of hibernation, it is expected that in bears that lived in different climatic phases, the isotopic signatures will be also different. During hibernation a recycling of nitrogenised compounds is produced for protein synthesis, including bone collagen, so it is expected that the isotopic signature, at least of Nitrogen, will be altered with respect to the synthesized collagen when the bear is active and feeds normally.
However, it is difficult to establish up to what extent the isotopic signatures due to hibernation or diet are overlapped. To study the physiological effect of hibernation on isotopic signatures we have selected bone remains of cave bears from populations whose chronologies correspond to different climatic moments, and in different ontogenetic stages, coming from Galician caves (NW of the Iberian Peninsula). Adult individuals show different isotopic signatures depending on their chronology. Juvenile individuals show differences originated by the effect of a greater or less contribution of maternal milk in their diets. Finally, the neonate individuals or still in foetal stage show isotopic values that directly reflect their mother's physiology in the hibernation, during which foetal development is produced.
Interestingly, all the individuals of this age class present similar isotopic values in spite of belonging to populations with different values in the adults. This indicates, on one hand, that there exists a physiological effect on the isotopic signals produced by hibernation, effect that is similar in all the studied populations, and on the other, that this physiological effect of hibernation only appears in adult individuals of populations corresponding to cold moments, in which the hibernation period is longer.
According to the results, we suggest the use of isotopic values of adult cave bears as climatic proxy for European Pleistocene sites.

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