

論文の内容の要旨

論文題目

Dietary reconstruction of prehistoric Japanese populations based on nitrogen isotopic composition of individual amino acids in bone collagen

(骨コラーゲン構成アミノ酸の窒素同位体比を用いた先史日本人集団の食性復元)

氏 名 内藤 裕一

Varieties of prehistoric human populations in Japan across geographical regions and chronological time periods were investigated in light of dietary habits. Using the new analytical technique, nitrogen isotope analysis of individual amino acid, I successfully answered some of the questions previously raised by archaeological and anthropological studies.

It has been pointed out that this technique has the following advantages over the traditional isotope analysis of bulk materials: (I) Exogenous substances other than the objective compound can be eliminated; (II) Physiological and biochemical processes in which each compound has experienced could be investigated. Owing to the above advantage, the high resolution trophic level analysis of organisms in modern ecosystems and its application to the archaeological human remains based on this technique now provide us more precise and detailed picture of the dietary habits for ancient humans.

In this study, I aimed (i) to explore special utilities of the nitrogen isotope analysis of amino acids in

bone for human palaeodietary research and (ii) to reconstruct prehistoric Japanese diets in higher resolution in order to examine several archaeological and anthropological issues. Towards these ends, I focus on four case studies and try to investigate dietary habits of: the coastal Jomon population (ca. 6,000-5,300 cal BP); the Okhotsk Culture populations (ca. AD. 550-1200); the inland Jomon populations (ca. 9,700-9,100 cal BP and 5,000-3,000 BP); and the late Pleistocene Ishigaki Islanders (ca. 20,000-16,000 BP).

With respect to the methodological aspects in human dietary reconstruction, the new findings in this study are as follows: (1) it is possible to clearly separate marine and terrestrial ecosystems based on the nitrogen isotope composition of phenylalanine, though there could be some exceptions as shown in the case of the Okhotsk Culture sites where unexpectedly large variation was observed in this indicator for faunal species; (2) the nitrogen isotope composition of phenylalanine could serve as an indicator for marine protein consumption by ancient humans; (3) the TL_{AA} (amino acid trophic level) estimates can be applied to archaeological faunal remains both from marine and terrestrial ecosystems; (4) the TL_{AA} estimates could be applied to ancient humans who strongly adapted to terrestrial ecosystems and it is possible to evaluate their extent of carnivory based on this value. The latter three findings could be useful for quantitative evaluation of ancient human diets. In addition to the above findings, (5) archaeological samples with very poorly preserved conditions in this study can show reasonable $\delta^{15}N$ values at least for glutamic acid and phenylalanine. This suggests that the poorly preserved samples in light of established criteria (i.e., the C/N atomic ratio) might be still applicable for palaeodietary study.

With respect to the archaeological and anthropological questions, the new findings are as follows: (a) some regional differences in dietary habits of the Okhotsk Culture peoples, especially between northern (Rebun Island) and eastern (Abashiri) Hokkaido, were observed for the first time; (b) the Jomon populations in inland central Honshu may have had more carnivorous diets (ca. 54-70% dietary animal protein contribution) than is traditionally assumed; (c) the late Pleistocene human population in Ishigaki Island clearly adapted to terrestrial ecosystem and exploited not much amount of marine food resources (less than 10%). The last finding is not consistent with previously proposed hypothetical models about the adaptations to coastal and island environments for Pleistocene human populations and may require further examinations of these models at least around Japan.

The above new findings suggest that the nitrogen isotope analysis of individual amino acids in bone is quite useful to precisely evaluate dietary habits of prehistoric human populations.