

Ancient Diet and Occupational Stress Marker Studies to Determine Dietary Habits and Life Strategies Among the Neolithic Human Group Discovered in Trasano Near Matera, Southern Italy

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KEY WORDS: occupational stress markers, paleonutrition, trace elements, Neolithic.

Introduction

The study aims at determining existing relations - if any - between dietary habits and occupational activities within the human group discovered in the Neolithic site of Trasano, southern Italy.

Materials and Methods

Occupational stress marker and paleonutrition analysis was carried out on four individuals from Trasano. Among them, tombs 1 and 2 date back to the Middle Neolithic Age and Silos 9 and 12 to the Later Neolithic Age. The occupational stress marker analysis was conducted through a macroscopic observation of the imprints of the muscles on the bones. This way, it was possible to deduce the main activities done by the individuals analyzed (Donatelli, 2004). The paleonutrition analysis was conducted through Atomic Absorption Spectrometry (AAS), and aimed at reconstructing dietary habits. AAS was used to detect the concentration of two trace elements in the bones: strontium as an indicator of a prevalently vegetarian diet, and zinc as an indicator of a prevalently protein diet. Leaf vegetables, mollusks and small fish contain a significantly high concentration of strontium (Sillen and Kavanagh, 1982; Brown, 1974), whereas red meat, dairy products, mollusks and crustaceans contain a significantly high concentration of zinc (Underwood, 1977).

The samples, taken from the cortical portion of the bone finds, are subject to an appropriate laboratory procedure (Bartoli and Bacci, 2009): they are deprived of their surface through mechanical removal and washed in ultrasound bowls in order to eliminate inorganic contaminants. Then the samples are subjected to dry-ashing in a muffle furnace at 600°C in order to destroy the organic components. Subsequently, the samples are pulverized in a particular mortar and finally subjected to two consecutive acid treatments with HNO₃ and HCl, in order to obtain a solution that is analyzed through spectrometry. The results of the analysis are elaborated on the basis of the different dilution levels and standardized in ppm (parts per million).

In order to make our data comparable with those of other contemporary human groups, the paleonutrition analysis is conducted by interpreting the element/calcium ratio. The results are furtherly standardized by comparing the concentration levels of the samples with those of the herbivores that lived at the same time in the same site.

Results

The occupational stress marker analysis carried out on male individual no. 1 showed particularly strong muscle imprints on the upper limbs: the two humerus have evident

Samples	Sr/Ca c.s.	Zn/Ca
Individual 1 ♂	0,79	0,51
Individual 2 ♀	0,95	0,57
Silo 9 ♀	0,69	0,38
Silo 12 ♂	1,02	0,40
Standard	0,71	0,67

Tab. 1. Paleonutrition analysis results. Data expressed as ratio element/Ca.



Fig. 1. Individual 1. Right humerus, cortical defects.

cortical defects caused by the imprints of the pectoralis major and the teres major. These muscles are responsible for adduction and abduction movements of the arms, such as in weight lifting activities. Throughout the lower limbs the analysis has shown strong muscle imprints: the imprint of the gluteus i in the femur is the most pronounced one. This muscle is responsible for the standing posture and deambulation. The analysis led to the assumption

that individual no. 1 was a farmer. The analysis on female individual no. 2 showed a considerable use of the supinator and the pronator quadratus, responsible for pronation

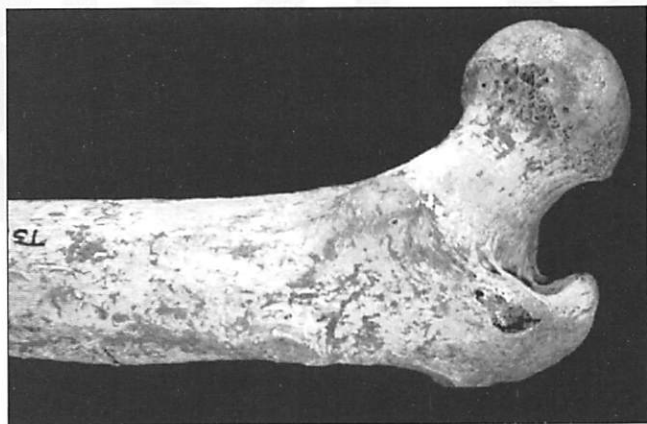


Fig. 2. Individual 2. Right femur, imprint of the gluteus maximus.

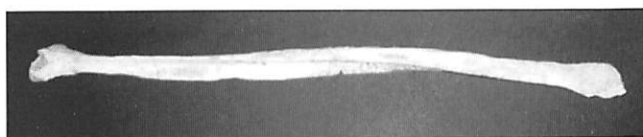


Fig. 3. Silo 12. Right fibula.



Fig. 4. Silo 9. Right femur. Bone proliferation, caused by the gluteus minimus enthesopathy.

movements of the forearm and the hand by keeping the humerus still. The strongest imprints on the lower limbs are those of the gluteus maximus, the fibularis brevis, the tibialis posterior and anterior, responsible for the medial and lateral rotation of the feet. The analysis led to the assumption that individual no. 2 did an activity similar to that of a weaver or a spinner. The study on male individual found on silo no. 12 showed significant muscle imprints on the lower limbs. Noteworthy are the soleus enthesopathy, caused by the activity of keeping the foot on tiptoe, and the flexor hallucis longus enthesopathy, caused by medial rotations of the feet. The analysis led to the assumption

that the individual worked with a particular clog, a ploughing instrument made up of deer antlers, largely used in the Bronze Age. We could this way formulate the hypothesis that this instrument was also used in the Neolithic Age.

The study on female individual found on silo no. 9 showed particularly pronounced imprints on the upper limbs, especially on the muscles responsible for shoulder raising and adduction movements and on those responsible for forearm extension movements. On the lower limbs the analysis showed a gluteus minimus enthesopathy on the two femurs, caused by a prolonged and intense thigh abduction activity. Also noteworthy are the imprints of the gastrocnemius and the presence of squatting facets on the tibiae and the necks of the astragalus. The analysis led to the assumption that the woman milled wheat with her hands, by standing on her knees with her thighs completely flexed on her legs.

The paleonutrition analysis showed a prevalently vegetarian diet. The strontium concentration is definitely higher than the optimal levels and indicates a high consumption of vegetables, as well as a regular consumption of additional resources such as small fish and mollusks.

The zinc concentration showed that the protein consumption did not play a crucial role in the dietary habits, but was at any rate characterized by a regular, though modest, use of products of animal origin.

Discussion

The occupational stress marker analysis was useful to detect the main activities carried out by the individuals. What emerged is a distinction between men – dedicated to farming activities – and women – dedicated to weaving and wheat milling activities. What emerged from the paleonutrition analysis is a substantial homogeneity in the dietary habits. Therefore, the data analyzed do not seem to indicate a correlation between dietary habits and occupational activities.

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