A multidisciplinary approach to reconstruct Upper Palaeolithic and Mesolithic dietary habits: Human adaptation to Pleistocene-Holocene environmental change in northeastern Italy

Gregorio Oxilia1,2, Federica Fontana1, Luca Fiorenza1,4, Ottmar Kulmer2,6, Gwenaëlle Goude3, Valentina Gazzoni1, Federico Lugli2, Marco Peresan1, Matteo Romandini1,2, Elisabetta Cilli2, Claudio Tüniz7,10,11,12, Federico Bernardini1,10, Eugenio Bortolini3, Jessica C. Menghi Sartorio1, Sahra Talamo1,2, Stefano Benazzi1,3, Emanuela Cristiani1

1 - Department of Oral and Maxillofacial Sciences, Sapienza University, Via della Porta Rossa 18, Rome, Italy - 2 - Department of Cultural Heritage University of Bologna Via delle Armi 1 - 40121 Bologna, Italy - 3 - Department of Environmental and Developmental Biology (MiCBio), University of Trieste, Via Ugo Foscolo 24, Trieste, Italy - 4 - Department of Anatomy and Developmental Biology, University of Trieste, Via Ugo Foscolo 24, Trieste, Italy - 5 - Department of Palaeobiology and Palaeoecology, Georg-August-University, Göttingen, Germany - 6 - Department of Prehistory and Archaeology, Johannes Gutenberg-University, Mainz, Germany - 7 - Al-Mamzar University, CNRS, Meca, UMR 7299 - Laboratoire Méditerranéen de Paléontologie Évolutive, Allélie Université Météropole Montpellier 3, France. – 8 - Al-Mamzar University, CNRS, Meca, UMR 7299 - Laboratoire Méditerranéen de Paléontologie Évolutive, Allélie Université Météropole Montpellier 3, France.

In this work, we investigated different aspects of the cultural and dietary adaptations of three hunter-gatherer male individuals who were buried between Late Palaeolithic and the Early Holocene in three sites of northeastern Italy of Riparo Tagliente (Verona), Riparo Villabruna (Belluno) and Mondeval de Sora (Belluno).

Materials and Methods

We combined Dental Calculus, Macrowear Pattern and Stable Isotope Analyses on the three individuals. Macrowear analysis was conducted on horse M2s in all the individuals as well as on our reference sample, which included fossils from the Middle and Upper Palaeolithic (PALAEO, n = 29), Natufians (NAT, n = 8), and recent populations with known diet. Inuit (n = 4), Vancouver Islanders (n = 3), and Khoe-Sen (n = 4).

Results

All the studied individuals show δ13N bone collagen values well above a trophic step shift (3-5‰) when compared to the local fauna. This indicates that their diet was largely based on terrestrial animal proteins rather than plant foods (Vercilotti et al., 2008; Gazzoni et al., 2013). For all these individuals we cannot exclude the additional intake of aquatic resources. In particular, a possible explanation for the relatively high δ13N and δ15N values of one of the Tagliente individuals is the consumption of marine and/or freshwater resources (ca. 20% of the total protein intake).

Conclusions

Dental wear patterns of the three individuals are concentrated in the Lingual area (Figure 2) and consistent with a plant-based diet (Fiorenza et al. 2011). Exploratory analyses, however, found significant differences only for Bucal phase I between Natufians and Neanderthals (W=145.5, p.0029; corrected p-value=0.043), as well as between Middle and Late Upper Palaeolithic individuals (W=170.5, p.0032; corrected p-value=0.019). Considering the relationship between the three samples of interest (Villabruna, Tagliente and Mondeval) and reference groups, significant differences were found between Villabruna and Khoe San for Phase II (t=4.45, p.0012) and Bucal Phase I (t=4.22, p.0012) (Figure 2b and 3).

While the distribution of dental macrowear can be probably related to a number of variables affecting the oral cavity such as diet (Fiorenza et al. 2011) and para-functional asymmetries (Oxilia et al. 2018), our results suggest that its use as the only reliable proxy for dietary habits is statistically supported when differences between groups are extreme. Isotope results indicate that animal proteins and freshwater resources were likely consumed by Upper Palaeolithic and Mesolithic individuals of north-eastern Italy together. Resides may have been left by para-masticatory activities. In conclusion, we highlight the importance of using different analytical methods to overcome the limitations imposed by a single method. A multi-proxy approach can shed light on the stratified traces left by both dietary and non-dietary habits in human fossils.

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References


Figure 1. (a) Bone collagen stable isotope values in human remains from Upper Palaeolithic sites of Italy (b) Differences between human and herbivore δ13N (‰) of bone collagen.