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RESPONSE TO BONSALL ET AL. "FOOD FOR THOUGHT: RE-ASSESSING MESOLITHIC DIETS IN THE IRON GATES"

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ABSTRACT. Here, we reply to the attempt by Bonsall et al. (2015) to re-assess our results from the sulfur isotopic study of bone collagen from Mesolithic and Neolithic sites along the Danube in the Iron Gates Gorges area (Nehlich et al. 2010). Although we are highly interested to see our data re-assessed, we found certain misinterpretations, mistaken assumptions, and factual errors regarding our results. Therefore, we want to respond and re-assess our previous data, too. We establish for a few individuals a quantitative dietary reconstruction to demonstrate the reliability of our earlier interpretations.

RESPONSE

We thank Bonsall et al. (2015) for their re-assessment of our dietary reconstruction by stable sulfur isotope analysis of Mesolithic and Neolithic humans bone collagen from the Iron Gates Gorges, Serbia. They nicely summarized our results and interpretation and attempted to reinterpret the data. However, there are some mistaken assumptions and misinterpretations, which lead the authors to a biased conclusion. First, they note the small sample size of animals and human remains analyzed in our previous study. The reason for such a low number of samples is due to the fact that this study was designed as a proof-of-concept, pilot study involving a select number of individuals from several sites and was not envisaged as a full-blown research project. When we designed our study and collected samples, there was no study published that presented clearly the advantages and applicability of sulfur isotopes in an archaeological freshwater dietary context. Therefore, the selected number of samples chosen were deemed to be sufficient for interpretation regardless of their dates or precise archaeological context. Secondly, the study never intended to address any chronological issues or participate in any discussion regarding dates from these sites. Thirdly, in challenging our interpretation of the results, Bonsall and colleagues contradict some of their own interpretations published in earlier works (e.g. Bonsall et al. 1997). We would like to respond to the majority of reinterpretations by Bonsall et al. (2015) by discussing our interpretations of our own results.

We are fully aware that the data set by Nehlich et al. (2010) is far from substantial and comprehensive but may still be representative. While the re-assessment of the chronological order in this region by Bonsall et al. (2015) might be more reliable than before, it does not increase the small number of direct radiocarbon dates substantially and therefore is no more precise than before. Additionally, the chronological sorting of the data does not help in any way with the dietary reconstruction despite clear differences in sulfur values between periods that our sample of burials cover, which we explicitly noted in our original study. Therefore, we have re-assessed five individuals from our earlier study and applied a quantitative dietary reconstruction using a Bayesian mixing model (FRUITS, Fernandes et al. 2014) to estimate the proportional input of dietary resources. The following food sources have been established: (1) adult (non-suckling) terrestrial animals; (2) suckling terrestrial animal; and (3) freshwater fish. The corresponding isotopic values for each resource are presented in Table 1. The isotopic offsets between the consumer and its diet have been taken for carbon and nitrogen isotope values as 1.5 ± 0.5‰ and 4.0 ± 1.0‰, respectively. However, for sulfur, the isotopic offset used was 0.8 ± 2.5‰, as has recently been discussed in Nehlich (2015). We have used five

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individuals where we re-assessed the isotopic values and estimated their quantitative dietary inputs (see Table 2). Three out of the five were discussed by Bonsall et al. (2015) and we will use them to justify our earlier interpretations (see Nehlich et al. 2010:1137–8). Bonsall et al. (2015) dismiss a significant input of young animals, which might still provide high nitrogen isotope values in the dietary composition. While this might be justified on the grounds of archaeological findings (but see below), it is not regarding the interpretation of the isotopic results. Three individuals (IG-HV-3; IG-P-4; IG-V-1) have high percentages of dietary contributions from young animals following our calculations. It is not possible to identify which form this high percentage of food supply has. It could be either dairy products or meat. Therefore, zooarchaeological evidence may not account for the supply of some resources. Furthermore, the other two individuals show quantitative results that are in agreement with our earlier interpretations (high percentages of freshwater fish: IG-V-6; high percentages of terrestrial adult animals: IG-VBB-1).

Table 1 Food sources with corresponding carbon, nitrogen, and sulfur isotope ratios with standard deviation (data from Nehlich et al. 2010).

Food source	$\delta^{13}C$ (‰)	$\delta^{15}N$ (‰)	$\delta^{34}S$ (‰)
Terrestrial adult	–22.0 ± 1.2	6.4 ± 1.3	4.1 ± 1.1
Terrestrial suckling	–21.4	13.0	3.2
Freshwater fish	–19.6 ± 0.6	7.3 ± 0.5	14.1 ± 0.1

Table 2 Quantitative calculation of the dietary contributions of different food sources (see Table 1) in different humans from the Iron Gates Gorges (in percentages).

Sample ID*	Terrestrial adult	Terrestrial suckling	Freshwater fish
IG-HV-3	11 ± 9	51 ± 13	38 ± 12
IG-P-4	22 ± 15	55 ± 14	22 ± 11
IG-V-1	27 ± 16	50 ± 15	22 ± 11
IG-V-6	7 ± 7	29 ± 11	63 ± 12
IG-VBB-1	60 ± 25	28 ± 16	11 ± 8

*Corresponding to the IDs in Nehlich et al. (2010).

We should also mention that the existing zooarchaeological evidence from the Danube Gorges Mesolithic and Neolithic sites is highly biased, and, with the exception of the two most recent projects at Schela Cladovei and Vlasac, no sieving was undertaken during the 1960–1970s excavations of the largest sites discussed herein (Borić 2001). Therefore, the remains of young (suckling) animals might have easily been missed and these are certainly underrepresented, especially for the thinly documented Early to Middle Mesolithic periods. Hence, contrary to what Bonsall and colleagues claim, the existing Mesolithic-Neolithic zooarchaeological evidence from this region cannot be taken at face value to either support or challenge the results of isotopic analysis.

We agree with Bonsall et al. (2015) that there is a need for more direct ^{14}C dates and a larger number of samples to study the dietary preferences at the Iron Gates Gorges in more detail, and a more extensive application of sulfur isotopes on this material is forthcoming by our research group. However, we disagree with the interpretation, especially the quantitative estimations of dietary resources, by Bonsall et al. (2015). We have demonstrated here that the dietary input of young animals can be quite substantial and that it cannot be easily dismissed due to a lack of archaeological finds. However, we acknowledge the case that the contribution might just be overestimated due to the fact of the low number of samples.

We would also like to note that contrary to what Bonsall and colleagues claim, there exists one published direct AMS date for the group burial from the site of Vinča-Belo Brdo: OxA-15996 dates a human skull fragment from this collective burial to 6620 ± 45 BP, i.e. 5624–5486 cal BC (95% confidence) (Borić et al. 2009:Table 7; cf. Borić 2015:footnote 98). In addition, while Bonsall and colleagues suggest that in the context of the burials from the lowermost levels of the site of Vinča-Belo Brdo the "$\delta^{15}N$ range of 11.5 ± 0.8‰ could be interpreted as including a contribution from aquatic resources," we note that elevated $\delta^{15}N$ values in this Middle Neolithic context could more likely reflect the effect of manuring that has already been suggested for the earliest Neolithic communities of central Europe (Bogaard et al. 2014).

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