Stable isotope data of Neolithic and Eneolithic populations in the Balkans, 6600 to 4000 BC

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Abstract

Stable isotopic ratios of carbon and nitrogen performed on collagen and tooth enamel offer invaluable insight into the diet of ancient populations. In the northern Balkans, most of these isotopic data have been collected as auxiliary information of radiocarbon dates, to correct a potential marine reservoir effect. In order to facilitate the access of the academic community to these data, we present a set of isotopic carbon and nitrogen ratios of human collagen samples for 188 individuals from 12 previously published sites together with hitherto unreleased data for 24 individuals from 4 sites from the Neolithic and Eneolithic period in Bulgaria and Romania. This collection also includes previously published carbon isotopic ratio measurements on tooth enamel of 34 individuals.

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Specifications Table

| Subject                    | Social Sciences – Archaeology |
|----------------------------|-------------------------------|
| Specific subject area      | Stable isotope analysis       |
|                            | Bone and dentine collagen     |
|                            | Tooth enamel                  |
|                            | Carbon                        |
|                            | Nitrogen                      |
|                            | Palaeodiet                    |
|                            | Subsistence economy           |
| Type of data               | Table                         |
|                            | Figure                        |
| How the data were acquired | A systematic literature review was conducted using Google Scholar, focusing on academic journals dedicated to archaeological science and archaeological research in Eastern Europe. |
| Data format                | Raw                           |
| Description of data collection | An extensive literature review was conducted on material published before January 2021. |
| Data source location       | Carbon and Nitrogen isotopic data from human samples dated of the Neolithic and Eneolithic period, between 6600 and 4000 BC. The remains were found in Bulgaria and Romania. Geographic coordinates are provided for each site, as indicated by the authors of the original scientific articles; if the coordinates were not mentioned in the scientific articles, the approximate location of the sites were extracted from Google Earth. |
| Data accessibility         | Repository: IsoArch (https://isoarch.eu/) [1] DOI of the dataset: 10.48530/isoarch.2021.015 Direct URL of the dataset: https://doi.org/10.48530/isoarch.2021.015 Data is available under the Creative Commons BY-NC-SA 4.0 license. |

Value of Data

- Stable isotope analysis has made a substantial contribution to our understanding of the passage from a way of subsistence based on hunting and gathering to the Neolithic mode of food production in other regions of Europe [2]; however, in the northern Balkans, this kind of analysis has not received much attention from the scientific community. This collection should demonstrate the usefulness of such data to explore this topic.
- Except for two studies [3,4], stable isotope analysis has been performed to correct a potential marine reservoir effect in radiocarbon dating. This collection includes the resulting data and should make them more accessible to researchers focusing primarily on the issue of ancient diet.
- This collection consists of data from sites located in an area that is now divided into two different countries, Bulgaria and Romania, but that belonged to the same material culture during the period of interest. Combining data from sites located in both states should offer a new perspective on the issue.

1. The Data

This work collects carbon and nitrogen isotope data of Neolithic and Eneolithic populations (6600 to 4000 BC) from various scientific articles focused on chronological issues, where such isotopic data were mainly used to identify and correct a potential marine reservoir effect. This collection presents isotopic data on 246 individuals from 17 different sites, for a total of 288 entries. These entries consist of 257 pairs of carbon and nitrogen isotopic ratios measured on collagen from 212 individuals from 16 sites, including unreleased data on 24 individuals. These unpublished data were also used to correct potential marine reservoir effect on the radiocarbon measurements. Carbon isotopic ratio measurements on tooth enamel of 34 individuals from one site constitute the rest of the dataset. Auxiliary information regarding the location, time period...
Table 1
Site ID, site name, coordinates in WGS 84, time period, type of sample analyzed, number of individuals analyzed, and references for each site. The coordinates for the sites 1, 8, 11, and 13 were extracted from Google Earth.

| Site ID | Site Name | Latitude | Longitude | Time Period | Type of Sample   | Number of Individuals | References |
|---------|-----------|----------|-----------|-------------|-------------------|-----------------------|------------|
| 1       | Durankulak, Bulgaria | 43.669   | 28.532    | Early/Middle | Bone Collagen | 77                     | [3,4]      |
| 2       | Dzhuluyntsa, Bulgaria | 43.161   | 25.883    | Early Neolithic and Middle Eneolithic | Bone Collagen | 3                     | [5]        |
| 3       | Ivanovo, Bulgaria | 43.099   | 26.719    | Early Eneolithic | Dentin Collagen | 1                     | [5]        |
| 4       | Ohoden, Bulgaria | 43.374   | 23.729    | Early Neolithic | Bone Collagen | 1                     | [5]        |
| 5       | Samovodene, Bulgaria | 43.140   | 25.604    | Early Neolithic | Bone Collagen | 1                     | [5]        |
| 6       | Smyadovo, Bulgaria | 43.060   | 26.980    | Middle Eneolithic | Bone and Dentin Collagen | 8                     | [6,5]      |
| 7       | Sushina, Bulgaria | 43.059   | 26.767    | Middle Eneolithic | Dentin Collagen | 3                     | [5]        |
| 8       | Varna, Bulgaria | 43.213   | 27.864    | Middle Eneolithic | Bone Collagen | 71                    | [7,3,4]    |
| 9       | Yabalkovo, Bulgaria | 42.100   | 25.750    | Early Neolithic | Bone Collagen | 1                     | [5]        |
| 10      | Cîncea, Romania | 44.263   | 23.900    | Early Neolithic | Bone Collagen | 1                     | [5]        |
| 11      | Cernica, Romania | 44.424   | 26.270    | Middle Neolithic | Bone Collagen | 20                    | [8]        |
| 12      | Cojatu, Romania | 45.482   | 26.996    | Middle Neolithic | Bone Collagen | 1                     | [5]        |
| 13      | Pietrele, Romania | 44.068   | 26.156    | Middle Eneolithic | Tooth Enamel | 34                    | [9]        |
| 14      | Brâliţa, Romania | 45.296   | 27.971    | Early and Middle Neolithic | Bone Collagen | 8                     | This work |
| 15      | Dridu, Romania | 44.698   | 26.477    | Middle Eneolithic | Bone Collagen | 3                     | This work |
| 16      | Ostrovul Corbului, Romania | 44.515 | 22.742 | Middle Eneolithic | Bone Collagen | 10                    | This work |
| 17      | Popeşti, Romania | 44.305   | 26.402    | Early Eneolithic | Bone Collagen | 3                     | This work |

Table 2
Average $\delta^{13}C$ (%VPDB) and $\delta^{15}N$ (%AIR) values per period, with number of individuals analyzed for each period. The values for one individual from Brâliţa and for one individual from Ostrovul Corbului, which did not pass the quality control criteria established for this study, are not included in the calculation.

| Period            | n | Average $\delta^{13}C$ (%VPDB) | Range $\delta^{13}C$ (%VPDB) | Average $\delta^{15}N$ (%AIR) | Average $\delta^{15}N$ (%AIR) |
|-------------------|---|--------------------------------|-----------------------------|-------------------------------|-------------------------------|
| Early Neolithic   | 12| $-18.9 \pm 1.2$               | $-20.6$ to $-17.2$          | $14.5 \pm 4.8$               | $9.2$ to $20.8$              |
| Middle Neolithic  | 24| $-20.1 \pm 0.6$               | $-20.9$ to $-17.4$          | $10.4 \pm 1.7$               | $9.2$ to $18.7$              |
| Early Eneolithic  | 78| $-19.1 \pm 0.8$               | $-20.3$ to $-12.3$          | $9.4 \pm 1.1$                | $7.6$ to $13.7$              |
| Middle Eneolithic | 98| $-19.3 \pm 0.5$               | $-21$ to $-17.8$           | $10.3 \pm 1.1$               | $8$ to $14.2$                |

and cultural affiliation of the sites is summarized in Table 1. The average $\delta^{13}C$ (%VPDB) and $\delta^{15}N$ (%AIR) values per period are given in Table 2. A map of the different sites is also included (Fig. 1).

2. Research Design

Data were collected from sites located on the territories of the present-day countries of Bulgaria and Romania. A systematic literature review was conducted on Google Chrome using Google Scholar, focusing on academic journals dedicated to archaeological science and archaeological research in Eastern Europe, using keywords such as Romania, Bulgaria, Neolithic, Eneolithic, Copper Age, Stable Isotopes, and Radiocarbon Dating. The current border between these two countries largely corresponds with the Danube River; however, it was not the case during Prehistory, as most archaeological cultures existed on both banks of the river. We chose to only present data that could be ascribed to the Neolithic and Eneolithic periods, as most authors consider that the period between 6600 and 4000 BC constitutes a consistent cultural block [10]. Although they refer to similar cultural phenomena, Bulgarian and Romanian chronological
Fig. 1. Map showing all the sites included in this work. The site IDs are provided in Table 1. The sites with hitherto unpublished data are indicated in bold with a larger font size.

Table 3
Chronological framework used in this work.

| Period      | Phase | Duration          |
|-------------|-------|-------------------|
| Neolithic   | Early | 6600 to 5500 BC   |
|             | Middle| 5500 to 5000 BC   |
| Eneolithic  | Early | 5000 to 4500 BC   |
|             | Middle| 4500 to 4000 BC   |

divisions differ. In this work, for convenience, we chose to adopt the Romanian chronology that consists of two periods, the Neolithic and the Eneolithic, each of them being subsequently subdivided into an early and a middle phase (Table 3). In addition, radiocarbon dates are reported when they are available.

Whenever they were mentioned, we indicate the geographic coordinates of the sites as they appeared in the related scientific articles. For cases where such information was missing, we provide approximate locations extracted from Google Earth. The altitude and the distance to the modern coastline were also extracted from Google Earth. Finally, the coordinates from the unpublished sites are those published in Lazăr et al. [10].

The majority of the source scientific articles are concerned with radiocarbon dating rather than with ancient diet, with information about the collagen extraction and sample analysis methods sparse. Only Honch et al. [3] and Higham et al. [7] provide details regarding the methodologies they followed, which were published in Bronk Ramsey et al. [11] and Brock et al. [12], respectively.

Regarding the quality control of the collagen samples, we followed Ambrose’s [13] recommendations and rejected samples that had a C/N ratio below 3.2 or above 3.6. Based on this criterion, we did not include the data available for one sample from Brăiļişa and for one sample
from Ostrovul Corbului. Whenever possible, other useful indicators of collagen integrity [14] are also reported.

Ethics Statements

This study does not involve any modern human or animal subject.

Declaration of Competing Interest

The author declares that they have no known competing financial interests or personal relationships which have or could be perceived to have influenced the work reported in this article.

CRediT Author Statement

**Aurélien Tafani**: Conceptualization, Methodology, Writing – original draft; **Cătălin Lazăr**: Writing – review & editing, Visualization, Funding acquisition; **Robert H. Tykot**: Writing – review & editing.

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