

Anthropology and provenance analysis of human cremations from Iron Age North-Rhine-Westphalia

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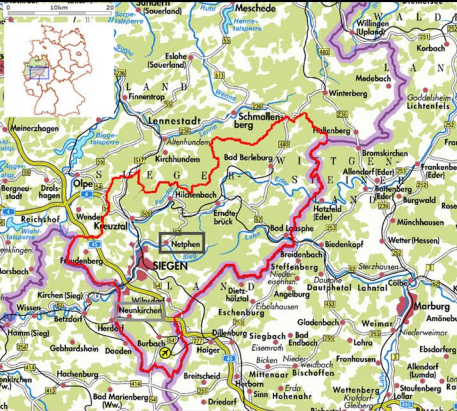


Fig. 1a: Geographical map of the Siegerland (North-Rhine-Westphalia; framed red) with markings of Netphen-Deuz (dark gray) and Neunkirchen-Zeppenfeld (light gray). Created with GEOportal.de and PS Elements 12.

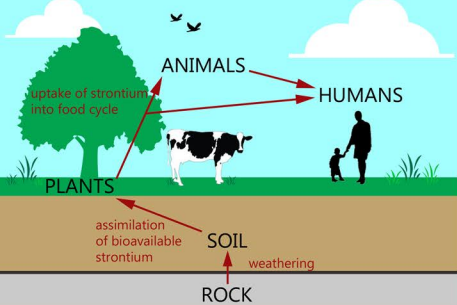


Fig. 1b: Intake of stable strontium isotopes from rock through food chain into the human body. Created with PS Elements 12.

Background

Deuz

- burial mound with: 66 cremation burials
- 1 inhumation grave
- not everything was excavated
- > more graves?
- usage of grave site: younger Iron Age to Late Latène Period
- similar grave goods found in Hesse, esp. Wetterau

Zeppenfeld

- burial site with: 2 urns
- But: probably more graves
- dating of site: 50 BC - 16 AD
- similarities in type of grave site + grave goods found in Hesse, esp. Wetterau and Dünsberg

The Siegerland, characterized by a low mountain range landscape, has its economic importance in rich ore deposits like copper and silver.

Since the second half of the 4th century BC a large-scale mining landscape has eventually been developed there. This results in a potential "pull factor" which highly likely attracted people and technology. Additionally, parallels to archaeological finds and grave sites in Hesse leads to:

Hypothesis: Migration to the Siegerland

In such cases stable strontium isotope analysis is performed. The strontium gets through the food cycle into the human tissue (Fig. 1b). During development and remodeling strontium is built into bones and teeth. While teeth only reflect values from the childhood, bones show ratios of the last 10 to 20 years of an individual.

Objective: Anthropological examination + systematic strontium analysis to proof/refute migration into the Siegerland



Fig. 2a: Four different burials (left: burial 5; 2nd left: burial 2; 2nd right: burial 12; right: burial 4) as exemplary depiction of the overall high fragmentation rate and low status of preservation.

Material & Methods

Overall 61 human cremations, 60 from Netphen-Deuz and urn no. 2 from Neunkirchen-Zeppenfeld were available for analysis. All cremations were investigated osteologically, according to standard criteria. This includes sex and age determination as well as rating of fragmentation and temperature exposure. Because of high degree of fragmentation, all individuals were examined histologically for age-at-death determination. Therefore, one piece of compact femur or humerus per individual was chosen and embedded into epoxy resin. For age-at-death appraisal, qualitative traits and quantitative regression formulas were used.

For strontium isotope analyses 29 dentin and 15 bone samples were chosen and proceeded after Toncala et al. (2017).

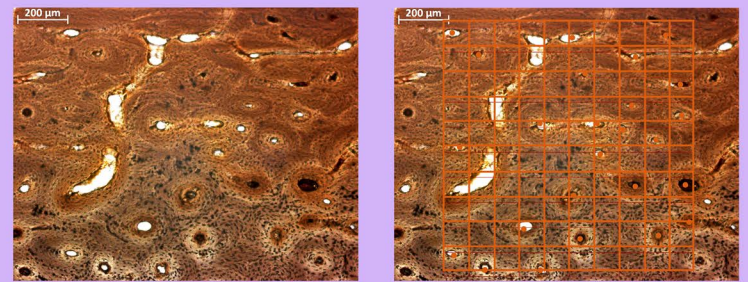


Fig. 2b: Only by analysis of histological sections age-at death determination was possible. Example of histological sections (burial 53). Left: 100 µm, 10x, without evaluation; Right: 100 µm, 10x, with evaluation after Hummel and Schutkowski (1993).

Results

As expected for Iron Age burials, the preservation of the cremations was relatively poor, resulting in an average weight of 360.3 g only. Additionally, the fragment size with variability between <15 and 35 mm was very small. With the highest burning grade possible, the color of the finds was indicative of heat exposure over 800°C.

The strontium isotope analysis was conducted successfully as expected (Snoeck et al. 2015).

Strontium isotopic ratios in our study varied between 0.70797 and 0.7146 (difference: 0.00663) and are sorted in figure 3. In the diagram, two plateau phases can be seen. The first one emerges between 0.7098 and 0.7118, which is congruent with literature data for the Wetterau in Hesse. Therefore, it seems to be a possible region of origin. The second plateau includes ratios between 0.7122 and 0.7136.

By using the Isoplot software, no outliers are detected if the conventional twofold standard deviation is set. However, with a standard deviation of 1.47 most of the data fall into a range between 0.71186 and 0.71390. This result matches the expected isotopic data for the local bedrock.

Special emphasis lies on the individuals Deuz 36 and Deuz 56, since both dentin and bone samples were analyzed. While the strontium ratios from Deuz 56 differ only slightly (0.00077), the difference between the values of Deuz 36 are striking. Also, two other individuals (Deuz 34, Deuz 10) did not match with one of the two phases.

The strontium isotopic ratio of the individual from Zeppenfeld falls within the range of the second plateau.

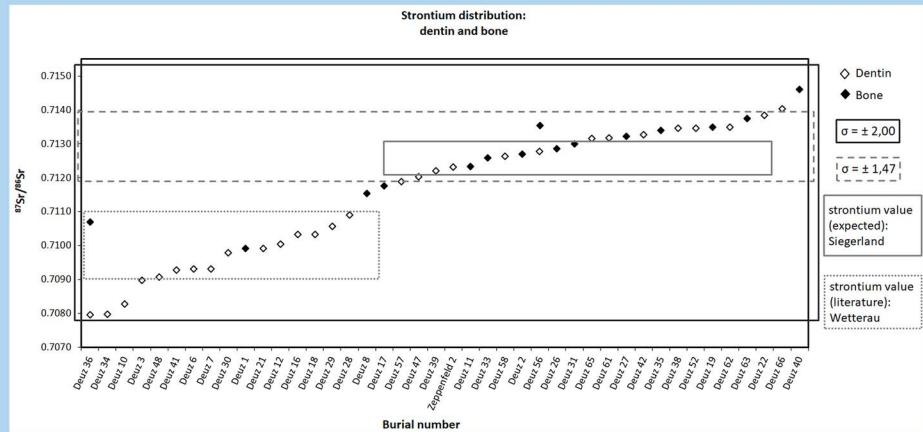


Fig. 3: Distribution of the strontium isotopic ratios from the 61 analyzed individuals.

Interpretation

The results of this systematic stable strontium isotope analysis confirm the existence of migration patterns of some individuals. Unfortunately, there are no data on bioavailable strontium isotopic ratios in the Siegerland, therefore, there is no proof that individuals with isotopic values between 0.71186 and 0.71390 were really native to the site of Netphen-Deuz. But, as a rule of the thumb, the majority of individuals on a burial site that share similar strontium ratios are considered local which is also the most parsimonious interpretation ("Occam's razor"). For the Wetterau region, otherwise, isotopic ratios of archaeological skeletons are reported by Knipper et al. (2014) and also Bentley and Knipper (2005). The respective values of 14 individuals gathering around strontium isotopic ratios between 0.709 and 0.712 coincide with the literature values. This supports not only the hypothesis of migration to the Siegerland, which was postulated before, but also states the Wetterau in Hesse as the most probable place of origin of the non-locals.

Next to individual Deuz 36, the individuals Deuz 34 and 10 spent their childhood neither in the Siegerland nor Wetterau but at an unknown third place of origin. Likewise, individual Deuz 40 could have originated from another unknown region with higher strontium values.

Since the strontium values of urn no. 2 from Zeppenfeld emits a signal, similar to the values of the Siegerland, does it mean that this individual is local? It is entirely possible, but its grave goods show parallels to the region of Dünsberg (also Hesse) that has similar bedrock like the Siegerland, resulting in a similar signal. Hence, origin of this individual remains uncertain.

Conclusion

- approximately 1/4 of individuals in this study were non-locals
- individual from Neunkirchen-Zeppenfeld potentially non-local
- most likely place of origin: Wetterau region.
- > Siegerland having a potential "pull factor" leading to migration is emphasized
- confirmed: cremated bones are suitable for provenance analysis by use of stable strontium isotopes

In prospects: stable strontium isotope analysis of archaeological animal bones will be analyzed to define a more specific range of the local ratio spectrum.



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