BIOARCHAEOLOGY OF THE MEDIEVAL POPULATION OF CENTRAL EUROPE: RELATIONSHIP AMONG HEALTH STATUS AND NUTRITION

Dissertation Summary

The submitted thesis written in the English language comprising of 257 pages, numerous illustrations and tables, abstracts (in Czech, French and English) and a 33-page bibliography consists of eight chapters including the introduction and conclusion.

In the introduction, the author’s goals and hypotheses she had determined in terms of the Slavic population of Great Moravia, which was one of the first state formations in Central Europe, are analysed.

In Chapter 2, the biocultural context of Great Moravia (9th - early 10th century) with extent into the Hillfort period (11th century Late Settlement period) is presented.

In Chapter 3, the basic principles of stable isotope analysis used for dietary reconstruction are introduced.

In Chapter 4, the relation between diet and health status is described briefly and the skeletal indicators of health included in this study are introduced.

In Chapter 5, all the basic information on the skeletal material included into the study is summarized. *The diet reconstruction* using stable carbon and nitrogen isotopes was performed on five adult skeleton sets (N = 189):

1. “Centres of Great Moravia” were represented by skeletal remains from Mikulčice - Castle (N = 70 samples) and Pohansko-North-Eastern Bailey (N = 56 samples).
2. “Great Moravian Hinterland” was represented by the Josefov I burial site (N = 32).
3. “Late Hillfort Settlement Set” originated from smaller or only partially uncovered burial sites at Josefov II (N = 21) and Louky (N = 10).

*For the analysis of breast feeding* a group of preteen individuals was analysed (N = 41) comparing a population of the Great Moravian centre Mikulčice-Castle (N = 23) with the hinterland of Josefov I (N = 18).

*Isotope values of bone tissue mineral component* were measured in a selective sample (N = 30) which included the Great Moravian centre Mikulčice (N = 10), Josefov I (N = 10) of the Great Moravian hinterland and the Late Hillfort Settlement Louka in the Břeclav region (N = 10).

In Chapter 6, the methods of sample preparations and analysis used in the study are discussed.

For the reconstruction of human diet through bone analysis comparison with animal bone matter is important.
Animal bone material used by the author:

Great Moravian centres included Mikulčice (N = 42), Pohansko (N = 10), Josefov (N = 3), Mutěnice-Zbrod (N = 15).

Late Hillfort Settlement animal skeleton material was represented by material from the Kostice-Zadní Hrůd settlement (N = 10).

In Chapter 7, the results of all stable isotope analyses as well as osteological examinations are presented. This chapter represents almost half of the thesis and contains: animal isotopic data, isotopic data of adults, isotopic data of subadults, and discourse on the relation between isotopic and osteological data.

In Chapter 8, the main conclusions are summarized.

Dissertation Thesis Assessment

1. An asset of Sylva Kaupová's work is the precision of its execution. The author has employed her knowledge in the new field of bioarchaeology. She has shown ability in critical examination during the interpretation and analysis of nutrition trends. In her effort to process the findings in terms of population she relies on her knowledge of statistical methods and computer programs solving the given issue of dietary reconstruction. Her theoretical reasoning and hypotheses solutions are logical and inspiring.

2. The thesis is relevant, because the author has broadened the knowledge about the diet of the Slavs beyond the possibilities of archaeozoology and paleobotany increasing the predictive value of bone matter and through trends in nutrition expanding our insight into the Slavs' lifestyle in the 10th and 11th centuries in Central Europe.

3. The methods used are adequate considering the available technical possibilities.

4. I consider her finding that the diet of both the population of Great Moravia and the Late Hillfort complex was based on land resources with a significant proportion of C4 plants and an increased consumption of millet a scientific novum.

5. The formal execution of the dissertation thesis is exemplary. Especially concerning the illustrative tables and graphs.

6. The thesis is of great significance for the development of bioarchaeology, as the main source of learning about the diet and health during prehistory which is the longest period of human past and for which there are no written records.

7. The application of results in further educational and scientific work will contribute to further development of the aforementioned scientific field.
The Opponent’s Objections and Comments

1. The title itself is not accurate. After reading the title I thought that the work would deal with bone health of the medieval population. This was due to the inaccurate use of the word “nutrition”. Only after having read the thesis I understood that it dealt with dietary trends reconstruction. I would recommend replacing the word “nutrition” with “diet” or “dietary reconstruction”.

2. On page 55, the author excluded from comparison the dietary reconstruction at Mikulčice-Kostelisko which we had conducted with colleagues Velemínský and Bůzek in 2008. She justified this by stating that collagen separation was conducted after Stafford TW et al.1988 which differed significantly from the method she implemented, i.e. Longin R. 1971 with modification according to Bocherens H. 1992.

I consulted F. Bůzek, who conducted the separation and analyses and I received the following resolution:

M. L. S. Jorkov, J. Heinemeier, N. Lynnerup (2007): Evaluating bone collagen extraction methods for stable isotope analysis in dietary studies. J. Archaeological Science 34, 1824-1829. They compared medieval samples from Denmark extracted using the DeNiro Epstein GCA 1981 method together with the NaOH method with ultra filtration (Brown, Nelson Vogel, 1988) with the improved Longin method modified by Richards and Hedges 1999. The results for d13C differ by + 0.3 permil (GCS1981) at max, for d1N there was no difference at all – that means, if only the total collagen content and not individual amino acids analysis is conducted, the NaOH for removing possible humic acid contaminants has only minimal impact.

J. Sealy, M. Johnson, M. Richards, O. Nehlich (2014). Comparison of two methods of extracting bone collagen for stable carbon and nitrogen analysis: comparison whole bone demineralization with gelatinization and ultrafiltration. J. Arch. Sci. 47, 64-69. The authors compared both modern and old animal samples from South Africa – there is no statistically significant difference in d13C and d15N in the two methods for well preserved bone matter. They also compared simple demineralization with more complex one (Richards is the co-author, therefore it is a modification of Richards and Hedges, or also others) i.e. acid demineralization, gelatinization and ultrafiltration – that is, with NaOH and the removal of any possible humic contaminants and ultrafiltration. They tested it on samples as old as 6000 years. The newer complicated method was developed for the analysis of badly preserved bones which tend to crumble on demineralization.

From this it follows that it was unnecessary to exclude the Mikulčice-Kostelisko research of 2008 from the comparison.

3. Bioarchaeology /which is also included in the title/ and biomolecular paleopathology focus on the study of organic molecules, they are helpful in cases where there are no macroscopic pathological changes on bones and they inform about the changes in the environment. Besides the study of stable isotopes, the study of trace elements and DNA are also included.

The author did not take her research with stable isotopes to its full potential when she did not perform analysis of trace elements in bone tissue. Cumulation of heavy metals and rare earth elements on forest fruits (especially Pb, Cd, Yb, Lu – see our work on the Neolithic period and Trace Elements in Bone Tissue) would show how these affected the diet of wild animals and of the human population, especially children. Multielemental analysis would help identify the health state of the population overlapping towards
pathological changes in the period of these centres and the change in diet that occurred in the 11th century.

Conclusion

Despite the above mentioned objections and comments which form an essential part of opponent reviews and which may help improve the possible publishing of the thesis, I am convinced that Mgr Sylva Kaupová meets all the requirements for independent creative work and is to be granted the Doctor of Philosophy title.

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