An Interdisciplinary Project on the Neolithic Population of Modern Switzerland

Inga Siebke[1], Anja Furtwängler[2], Albert Hafner[3], Johannes Krause[2,4,5], Sandra Lösch[1]

[1]Department of Physical Anthropology, Institute of Forensic Medicine, University of Bern, Switzerland;
[2]Institute for Archaeological Sciences, Archaeo- and Palaeogenetics, University of Tübingen, Germany;
[3]Department of Prehistory, Institute of Archaeological Sciences, University of Bern, Switzerland;
[4]Max Planck Institute for the Science of Human History, Jena, Germany;
[5]Senckenberg Centre for Human Evolution and Palaeoenvironment, University of Tübingen, Germany

1. Introduction

The introduction of sedentary life and farming entailing a major change of lifestyle marks the beginning of the Neolithic. Genetic studies propose different migration waves in the Late Neolithic period. However, it is uncertain how the new influences changed the populations and what led to these migration waves. Human remains from the time between those events provide the possibility to study the population dynamics shaping contemporary Europe. However, Neolithic burials are rare in Switzerland and little is known about the populations' state of health, social stratigraphy, and diet. Thus, the recent discovery of a dolmen with multiple burials in Oberbipp might provide new information. The aim of the project is to obtain biological data regarding the population by analysing the bones morphologically and biochemically, for example via radiocarbon dating, stable isotope ratios and ancient DNA.

2. Materials and Methods

Skeletal remains from the Operbipp dolmen (3300-3000 BCE) and from 13 other Neolithic sites (fig.1) were investigated by means of:

- Morphological analysis [1,2] to establish biological profiles and the minimal number of individuals (MNI)
- Stable isotope ratios of $\delta^{13}C$, $\delta^{15}N$, $\delta^{34}S$, $\delta^{2}H$, $\delta^{18}O$ to reconstruct dietary and migration patterns [3,4]
- Ancient DNA analysis for population genomics and kinship analysis
- Radiocarbon dating to establish the relations within one burial site and between the different sites
- For all biochemical analyses unilateral pars petrosa are sampled to ensure that each dataset belongs to one and the same individual (fig. 2)

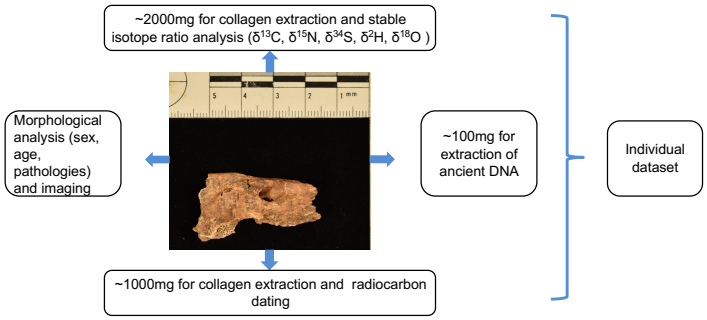

Figure 2: Sampling process for biochemical analyses to ensure that one dataset represents data for one individual only.

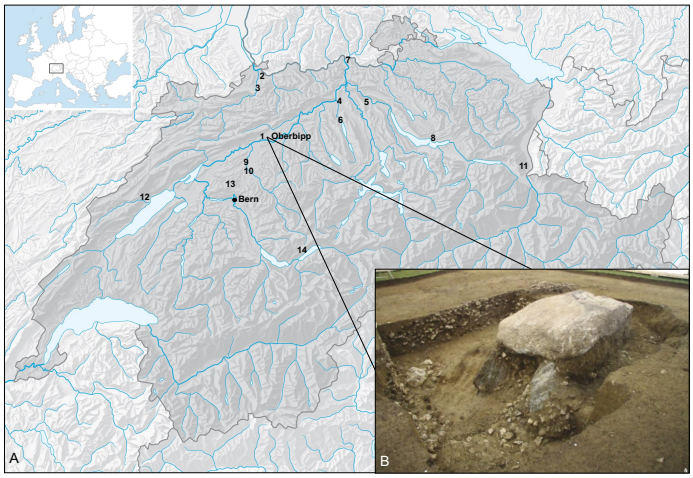

Figure 1: A) Map of modern Switzerland with main cities and the archaeological sites that provide skeletal remains : 1: Oberbipp; 2: Muttenz; 3: Arlesheim; 4: Lenzburg; 5: Spreitenbach; 6: Seengen; 7: Zurzach; 8: Rapperswil; 9: Burgäschisee; 10: Seeberg-Seemoos; 11: Wartau; 12: Auvernier; 13: Moosseedorf; 14: Niederried. B) Dolmen of Oberbipp during the excavation

3. Results

- Based on right femora the MNI is 40 for the Oberbipp dolmen
- The age estimation shows the presence of all age classes (fig. 3)
- Pathological changes such as trauma or degenerative alterations can be found on approx. 40 bones
- Ancient DNA shows, that 63% of the individuals have haplogroup K, more specific 45% have haplogroup K1a+195

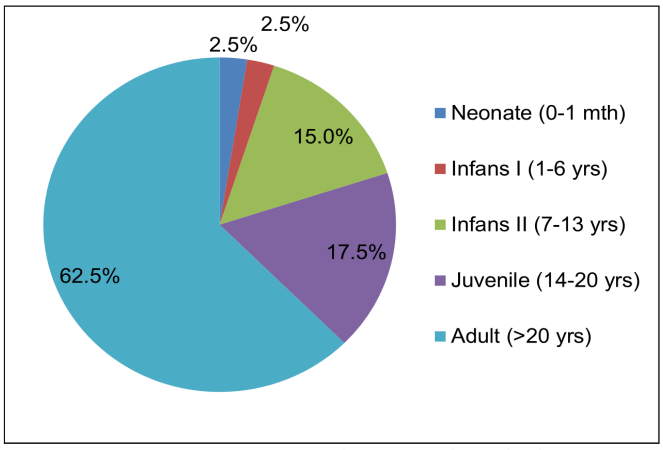

Figure 3: Age classes based on the skeletal element used for the estimation of the MNI (n=40). Total numbers: 1 nenoate; 1 infans I; 6 infans II; 7 juveniles; 25 adults.

4. Conclusion

- The morphological analyses indicate a "normal" demographic distribution in the dolmen, including infants, which are widely missing in other sites (fig. 1) [5,6]
- Lesions typical for lethal interpersonal conflicts were not observed, but signs for healing, inflammations and unspecific deficiency symptoms were present
- First stable isotope ratios show relative negative $\delta^{13}C$ values. Hence, a regular consumption of C4-plants, such as millet, is not assumed for the Oberbipp population
- The aDNA data can be traced back to a migration wave around 5500 BCE via principal component analysis [7]
- By the end of the project a comprehensive dataset of morphological and biochemical information will be available for the Neolithic population from Switzerland

References: 1. Buikstra JE, Ubelaker DH. Standards for data collection from human skeletal remains: Proceedings of a seminar at the Field Museum of Natural History, organised by Jonathan Haas. Fayetteville, Arkansas: Arkansas Archeological Survey; 1994. **2.** Scheuer L, Black S. The Juvenile Skeleton. London, San Diego: Elsevier Academic Press; 2004. **3.** Ambrose SH. Preparation and characterization of bone and tooth collagen for isotopic analysis. J Archaeol Sci. 1990;17(4):431-51. **4.** DeNiro MJ. Postmortem preservation and alteration of invivo bone-collagen isotope ratios in relation to paleodietary reconstruction. Nature. 1985;317:806-9. **5.** Doppler T, editor. Spreitenbach-Moosweg (Aargau, Schweiz): Ein Kollektivgrab um 2500 v. Chr. Basel: Archäologie Schweiz; 2012. **6.** Simon C, Langenegger E, Cueni A. 6. Anthropologie. In: Stöckli WE, Niffeler U, Gross-Klee E, editors. SPM II Neolithikum - Néolithique - Neolitico II. Basel: Verlag Schweizerische Gesellschaft für Ur- und Frühgeschichte; 1995. p. 259-73. **7.** Brandt, G., Haak, W., Adler, C. J., Roth, C., Szecsenyi-Nagy, A., Karimnia, S., Moller-Rieker, S., Meller, H., Ganslmeier, R., Friederich, S., Dresely, V., Nicklisch, N., Pickrell, J. K., Sirocko, F., Reich, D., Cooper, A., and Alt, K. W. Ancient DNA Reveals Key Stages in the Formation of Central European Mitochondrial Genetic Diversity, Science 342, 2013. p. 257–261.

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