Growing Up in the Cis-Baikal Region of Siberia, Russia

Growing Up in the Cis-Baikal Region of Siberia, Russia

Reconstructing the childhood diets of Middle Holocene hunter-gatherers

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Cover: View of Shamanskii Mys ('Shaman's Cape'), west coast of Ol'khon Island, Lake Baikal.

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Preface

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Chapter 1

Introduction

Significance of the research

The Cis-Baikal is a vast region in Northeast Asia encompassing the western part of Lake Baikal in Siberia, Russia. During the middle Holocene (*c. 8200–3700* cal BP[1]), the Cis-Baikal was inhabited by many individuals who left behind a rich archaeological and mortuary record. Archaeological research in the Cis-Baikal has been ongoing since the 19th century and has uncovered and documented many cemeteries, human and faunal remains, as well as cultural assemblages. The human burials are assigned to mortuary traditions dating to the region's Late Mesolithic (LM) between *c. 8200–7500* cal BP, the Early Neolithic (EN) between *c. 7500–7000* cal BP, the Late Neolithic (LN) between *c. 5500–4500* cal BP, and the Early Bronze Age (EBA) between *c. 4500–3700* cal BP. During the Middle Neolithic (*c. 7000–5500* cal BP) the use of formal cemeteries is abandoned for over a 1000-year period. Understanding the discontinuity in cemetery use, as well as the development of hunter-gatherer adaptations in the Cis-Baikal, has been the underlying goal of the Baikal Archaeology Project (BAP) over the last three decades (Weber 1995; Weber and Bettinger 2010; Weber *et al.* 2002, 2010, 2016). The BAP is an international and collaborative team of scholars that use a multidisciplinary approach to examine the Cis-Baikal's Middle Holocene hunter-gatherers. The BAP utilizes an approach known as life-history theory, which is a framework designed to study important events (i.e. birth, childhood development, reproduction, and death) that occur during an individual's lifetime. Each individual can provide important information on biological as well as cultural variation.

The skeletal remains, excavated from the Cis-Baikal cemeteries, underwent extensive examination and research, which resulted in a large set of isotopic data ($^{87}Sr/^{86}Sr$, ^{14}C, $\delta^{13}C$, and $\delta^{15}N$). This work produced information on diet, subsistence, migrations, and social relations (Katzenberg *et al.* 2009, 2010, 2012; Weber and Bettinger 2010; Weber and Goriunova 2013; Weber *et al.* 2002, 2011). Particularly interesting, is that the stable isotope research demonstrated that several individuals migrated from the north of the Cis-Baikal area (known as the Upper Lena micro-region), toward the coast of Lake Baikal (the Little Sea micro-region) during the Early Bronze Age (Haverkort *et al.* 2008; Scharlotta and Weber 2014). Research further demonstrated that people from both micro-regions formed what appears to be a very cohesive social structure. In some cases, elements of cultural identity (dietary patterns) from the Upper Lena micro-region were retained by individuals after migrating to the Little Sea micro-region (Weber and Goriunova 2013). However, not all individuals retained these cultural elements and some instead adopted new dietary patterns. Furthermore, the migrations between these two micro-regions appear to have been asymmetrical: people migrated from the Upper Lena to the Little Sea but not the other way around (Scharlotta and Weber 2014; Weber and Goriunova 2013; Weber *et al.* 2011).

[1] All modelled dates are presented in italics, following Weber *et al.* 2016.

The work presented here further investigates these dietary and migratory patterns at the individual level, by applying stable carbon and nitrogen isotope analysis on human tooth dentine of Late Neolithic and Early Bronze Age hunter-gatherers. While the former stable isotope analyses (Katzenberg *et al.* 2009, 2010, 2012; Weber and Goriunova 2013; Weber *et al.* 2011) on long bones (i.e. bulk bone sampling) revealed information relating to the diet and migration of individuals during the last stages of life, this research reveals information on diet and migration during the first 20 years of life on some of the same individuals. The studies complement each other to establish an unprecedented glimpse into past human lifeways.

For this research, a novel technique known as dentine micro-sampling was used. Dentine micro-sampling is the sectioning of primary dentine of permanent human molars into 1mm sections from crown to root (Beaumont *et al.* 2013a, 2013b). Each dentine sample was analyzed for stable carbon and nitrogen isotopes, which were embedded into the tooth's tissue via consumption during dental development. As tooth tissues (enamel and dentine) form at genetically controlled time intervals (Avery 1992; Hillson 2005), and the timing of tooth formation is relatively well established (AlQahtani *et al.* 2010), it is possible to pinpoint the age at which an individual completed breastfeeding, changed diet, or endured periods of nutritional stress. The dentine of the three permanent molars represents their development time from birth to around the age of 20 years. The first molar (M1), begins to mineralize around birth and is completed by approximately nine to 10 years; the second molar (M2) develops between approximately two and 16 years; and the third molar (M3) between ~12–20 years (Beaumont 2013a; Eerkens *et al.* 2011; Henderson *et al.* 2014; Hillson 1996; Sandberg *et al.* 2014). In contrast to bone, primary dentine does not undergo remodeling during an individual's life (Nanci 2018) and remains chemically inactive once formed. Therefore, a tooth retains the chemical signatures of the food ingested during dental development, whereas bone has a turnover rate, which provides a dietary average of the individual's last years of life. How much time the average will represent will be dependent on the type of bone examined. For example, a rib will represent the carbon and nitrogen isotope ratios of roughly the last two to five years of an individual's life, whereas a long bone (e.g. femur) will represent the last ~10 (Cox and Sealy 1997; Hedges *et al.* 2007; Parfitt 2002; Tsutaya and Yoneda 2015).

Table 1. Summary of the sites and samples.

Cemetery and micro-region	Number of teeth	Number of individuals	Culture period
Khuzhir-Nuge XIV – Little Sea	30	19	EBA
Shamanskii Mys – Little Sea	3	2	EBA
Ust'-Ida I – Angara	27	13 (9 LN, 4 EBA)	LN/EBA
Ust'-Ilga – Upper Lena	11	11	EBA
Obkhoi – Upper Lena	6	3	EBA
Manzurka – Upper Lena	3	1	EN
Total	80	49	

A total of 80 permanent molars taken from 49 hunter-gatherers have been used for this research. These samples come from six cemeteries within the Cis-Baikal region: Khuzhir-Nuge XIV (EBA) and Shamanskii Mys (EN/LN/EBA) in the Little Sea area; Ust'-Ida I (LN/EBA) in the Angara valley; and Obkhoi (EBA), Ust'-Ilga (EBA), and Manzurka (EN/EBA) in the Upper Lena valley (Table 1).

Research goals

The two main research goals are to further investigate (1) the dietary patterns and (2) the migratory patterns of mid-Holocene hunter-gatherers from Cis-Baikal. While the previous bulk bone sampling methods are useful for examining individuals at a population level, there are limitations to tracking individual life histories as it entirely masks short-term events as well as events that occur during the first segment of life. Dentine micro-sampling overcomes these issues and has the potential to generate new knowledge regarding intra- and inter-individual dietary variation as well as subsistence and migration.

Insight and answers will be drawn from dentine collagen using stable isotope analysis, targeting carbon and nitrogen isotopes. To increase our understanding of the Cis-Baikal hunter-gatherers, the two primary goals (examining diet and migration) are subdivided into the three following research questions:

1. How did infant feeding practices look during the Late Neolithic and Early Bronze Age?
2. Was childhood diet similar to adult diet in Late Neolithic and Early Bronze Age hunter-gatherers?
3. What inferences can be made on migration based on dietary reconstruction alone?

Organization of the monograph

Chapter 2 presents a biogeography alongside a historical and cultural background of the Cis-Baikal region. The region is discussed, providing insight into the geography, flora, fauna, and climate. Previous archaeological research and the current cultural history model (which has evolved) are also explained. In Chapter 3, a background of stable isotope analysis is provided, elaborating on carbon and nitrogen isotopes in more detail. Previous stable isotope results from the region are also presented. Chapter 4 discusses the development of teeth, particularly dentine and how this tissue relates to examining life-histories. Chapter 5 focuses on the materials and methods used for this study and explains the laboratory protocol, the micro-sampling method, collagen extraction, and preparation of samples for mass spectrometry. The analytical chapters start with Chapter 6, which examines the early life dietary history of individuals who were buried in the Upper Lena micro-region during the EBA. Chapter 7 examines the early life dietary history of LN and EBA individuals interred at Ust'-Ida I in the Angara micro-region, while Chapter 8 focuses on reconstructing the early dietary life histories of the EBA individuals in the Little Sea micro-region. Discussion and conclusions are presented in Chapters 9 and 10, respectively.