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Data Article

Laser ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) $^{87}Sr/^{86}Sr$ isotope data from scythian Iron age barrows in Altai, Russia

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ABSTRACT

This paper reports LA-ICP-MS $^{87}Sr/^{86}Sr$ isotopic data collected from archaeological human remains uncovered in Manzherok region, Altai Republic, Russian Federation ("Mobility of nomads in central Asia: chronology and $^{87}Sr/^{86}Sr$ isotope evidence from the Pazyryk barrows of northern Altai, Russia" [1].

The skeletal remains derive from Scythian barrows dated to 6th – 3rd century BC located at Chultukov Log 1 cemetery. The Chultukov Log cemetery, located approximately 470km south of Novosibirsk, is considered the biggest nomadic burial ground in the Upper Altai and the Sayan Mountains.

To enrich the information on prehistoric mobility of ancient nomadic populations in Central Asia, strontium isotopic data were collected using a Nu plasma (II) MC-ICP-MS equipped with ESI NWR193-based laser ablation system from premolar teeth of 8 adult individuals (4 males and 4 females), associated mainly with the Pazyryk culture. Additionally, we report bioavailable strontium data from single *Equus caballus* specimen (found at Chultukov Log 9 settlement) from Manzherok territory. In this study we have successfully applied and tested new in-depth decontamination

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protocol for total (<95%) removal of contaminants, necrotic tissue and dental calculus in archaeological materials based on a clinical irrigation procedure with NaOCl and EDTA. Strontium LA-ICP-MS $^{87}Sr/^{86}Sr$ isotopic data presented in this paper were obtained from prehistoric human teeth previously decontaminated according to this method.

These data will provide valuable resources for isotopic analyses of prehistoric transportation systems in Central Asia, including residential mobility of ancient nomads inhabiting steppe zone, Mongolia and NW China.

Specifications Table

Subject area	*Archaeology, Chemistry, Osteology, Geography*
More specific subject area	*Analyses of prehistoric mobility based on strontium isotopes; chemical analyses of prehistoric bone materials; Atomic Spectrometry*
Type of data	*Diagrams, table*
How data was acquired	*Nu plasma (II) Multiple-Collection ICP-MS*
Data format	*Raw isotopic data with diagrams*
Experimental factors	*Ancient teeth have been decontaminated for total removal of dental calculus according to Castagnola* et al. 2014 *irrigation protocol based on NaOCl and EDTA.*
Experimental features	*Nu plasma (II) MC-ICP-MS; System: ESI NWR193 ArF eximer based laser ablation system*
Data source location	*Manzherok, Altai Republic, Russian Federation, Chultukov Log 1 cemetery N 51°49,151′E 85°46,721′*
Data accessibility	*In this paper*
Related research article	*Pokutta, D.A., Borodovskiy, A.P., Oleszczak, Ł., Tóth, P., Lidén, K.* 2019. *Mobility of nomads in Central Asia: chronology and $^{87}Sr/^{86}Sr$ isotope evidence from the Pazyryk barrows of Northern Altai, Russia. Journal of Archaeological Science: Reports (in press).*

Value of the Data

- This is the first published LA-ICP-MS$^{87}Sr/^{86}Sr$ isotopic data available for the Pazyryk culture population (6th-3rd century BC) and offers an essential comparative material for future isotopic analyses.
- The$^{87}Sr/^{86}Sr$ isotopic data was measured on archaeological dental materials using new decontamination protocol.
- Measurements were designed to capture dental perikymata lines and intra-tooth variation.
- The data can be useful for comparative analysis of residential mobility in prehistoric and modern nomadic populations in Central Asia.
- The data can be used to reconstruct prehistoric transportation systems along Chuysky Trakt, Russia.

1. Data

The dataset contains Nu plasma (II) MC-ICP-MS instrument settings, standard measurements, and $^{87}Sr/^{86}Sr$ isotopic data for human samples (premolars) [1]. Each skeleton has assigned ID, with number of scans, interspacing (μm), internal and external precision 2SE, and diagram. The measurements were adjusted to perikymata lines visible on the surface of the tooth, running from enamel from tip to cervix. The total number of scans was adjusted to scale of dental ware and tooth height. The detailed information regarding tombs analysed in shown in Table 1.

Skeletal materials were obtained during excavations of Chultukov Log 1 barrow burial ground, led by A. Borodovskiy (Russian Academy of Sciences) and L. Oleszczak (Jagiellonian University in Cracow)

Table 1
Summary of the of the archaeological materials analysed.

Sample ID	Species	Location/site	Barrow ID	Age/sex of the deceased	Archaeological culture affiliation
LA-ALT 47	Homo S.S	Chultukov Log site no.1, Altai Republic, Russia	Barrow no. 47	Adult female	Pazyryk culture
LA-ALT 53	Homo S.S	Chultukov Log site no.1, Altai Republic, Russia	Barrow no.53	Adult male	Bystrianka culture
LA-ALT 46	Homo S.S	Chultukov Log site no.1, Altai Republic, Russia	Barrow no.46	Adult female	Pazyryk culture
LA-ALT 12	Homo S.S	Chultukov Log site no.1, Altai Republic, Russia	Barrow no.12	Adult female	Pazyryk culture
LA-ALT 10	Homo S.S	Chultukov Log site no.1, Altai Republic, Russia	Barrow no.10	Adult male	Kara-Koba culture
LA-ALT 35	Homo S.S	Chultukov Log site no.1, Altai Republic, Russia	Barrow no.35	Adult female	Pazyryk culture
LA-ALT 112	Homo S.S	Chultukov Log site no.1, Altai Republic, Russia	Barrow no.112	Adult male	Pazyryk culture
LA-ALT 62	Homo S.S	Chultukov Log site no.1, Altai Republic, Russia	Barrow no.62	Adult male	Early Scythian period affiliation uncertain
LA 2 ALT AB 10	*Equus caballus*	Chultukov Log site no.9, Altai Republic, Russia	Not applicable	Unknown	Not applicable

in Manzherok region since 2000. This cemetery is comprised of 123 barrows and flat inhumations. Chronologically, it covers 1100 years, spanning the 7th century BC – 4th century AD. The cemetery is associated with three archaeological cultures, which represent distinct nomadic ethnic groups: the Pazyryk culture (7th–3rd century BC), the Bystrianka culture, and the Kara Koba culture (6th–3rd century BC; [3–5,8,9]). The isotopic analyses were performed at Archaeological research Laboratory University of Stockholm and at Vegacenter, Natural History Museum in Stockholm, Sweden.

2. Experimental design, materials, and methods

2.1. Sample preparation and decontamination

In order to capture intra-tooth variation, dental calculus, necrotic tissue and other contaminants had to be removed [7]. The surface of the teeth (premolars) was cleaned with a brush and deionized water (Stockholm University ARL tap water: $^{87}Sr/^{86}Sr$ 0.726). The samples were then sonicated in deionized water for approximately 10 min and subsequently rinsed with deionized water; this procedure was repeated twice. The samples were then left to dry at room temperature. Samples were left for 10 min in warm (50–60 °C) solution of 5.5% sodium hydrochloride (NaClO) in a water bath [2]. After 10 minutes the solution was discarded and samples were ultrasonificated in SEASTAR™'s BASELINE® Water for 10 min in the same temperature range (50–60 °C). Samples were immersed in EDTA (Millipore Merck) for 1 min. To reach subsurface level of cleansing we immersed samples in isopropanol for 2 min. Samples were again submerged for 10 min in warm (50–60 °C) solution of 5.5% sodium hydrochloride, and ultrasonificated in SEASTAR™'s BASELINE® Water for 10 min. Before laser ablation analysis was performed, the enamel surface was cleaned with ethanol.

2.2. Analytical settings

Decontaminated materials were analysed in Nu plasma (II) MC-ICP-MS, equipped with ESI NWR193 ArF eximer based laser ablation system. Rodent *Otomys* specimen 26-r52 was used as a standard. Mass spectrometer settings: cooling gas flow rate: 13 L/min; aux gas flow rate: 0.84–0.89 L/min; low, mass resolution, common Ni cones, glass torch. Laser ablation adjustment: Ar flow rate (Mix Gas): 0.83–0.85; He flow rate 0.32L/min; preablation frequency: 10 Hz; preablation translation rate: 100 μm/s; preablation spotsize 150 μm; ablation frequency: 25 Hz; ablation translation rate: 5 μm/s; ablation spotsize 148 μm; line raster length 450–600 μm. Data collection: gas background 45 s; integration 0.5 s.

Corrections: $^{86}Sr/^{88}Sr$ factor calculated with accepted value of 0.1194 [6]. Fractionation: Kr subtracted by measuring gas blank (30 sec) before each measurement; Rb measured on mass 85, applied on mass 87 (fractionation corrected); $^{87}Rb/^{85}R$ assuming = 0.3861; Ca-Argides measured on mass 82, applied for masses 84, 86, 88; Yb-measured on mass 86.5 (173Yb2+) applied for masses 86, 87, 88; Er-

measured on mass 83 (166Er2+) applied for masses 84, 85; Dy- measured on mass 81.5 (163Dy2+) applied for mass 82.

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Conflict of Interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.dib.2019.105026.

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