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Diet reconstruction of the Sarmatians at Madaras

A preliminary survey

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Abstract

117 samples from the proximal femora were taken from 50 skeletons excavated from the Sarmatian cemetery at Madaras, situated on the southern part of the Hungarian Plain between the Danube and Tisza rivers. These skeletons date from the 3rd to the 5th century A.D. A trace element analysis was used in order to reconstruct their basic diet. The primary part of the Sarmatians' diet was vegetable as Sr levels were high whereas the Zn levels were low. Low Pb concentrations in the Sarmatians' bones, as compared to those of surrounding populations, testify to the low Pb of those surrounding populations, testify to the low Pb contamination in their diet.

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Introduction

The Iazyges, who were known as the Sarmatians by the Romans, came to the Hungarian Plain approximately in the year 20 A.D. and stayed there for 450 years. Due to a certain degree of isolation their development and history differ from those of their kindred peoples who stayed in the original localities – the Roxolani on the lower Danube and the Alans on the Pruth [SULIMIRSKI 1970]. Sufficient number of finds makes it possible to reconstruct the diet of the Sarmatians at Madaras on the basis of an analysis of chemical elements and compare them with the burial grounds in Pannonia and those of the Germanic tribes in the area of Halle [SMRZKA et al. 1988].

Material and method

The Madaras burial ground is situated on the southern frontier of modern Hungary between the Danube and Tisza rivers. This cemetery (burial ground) was used from the 3rd to the 5th century A.D., known as the Late Sarmatian Period. The skeletal material from its 615 graves is very fragmentary because some 90% of the graves had been ransacked. The bodies in this cemetery were buried in wooden coffins. On ransacking a grave,

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Table 1. Age structure of the analysed skeletal material from the Madaras cemetery

Age	Infants I	Infants II	Juveniles	Adults	Matures	Seniles	Total
	0-6	7-14	15-20	20-40	40-60	over 60	
Males	0	0	0	14	9	0	23
Females	0	0	3	18	0	0	21
Unidentified	1	4	1	0	0	0	6
Total	1	4	4	32	9	0	50

the looterstook part of the grave goods from the coffin along with the bones from the pelvis to the skull [KOHEGYI 1980, 1982].

Two bone samples from each of 50 femora and 7 soil samples were used in the trace element analysis for diet reconstruction. The demographic structure of the excavated materials used in the analysis is presented in Table 1. Two samples were taken from each femur: one from the cancellous tissue of the head, the other from cortical tissue of the femur against the lesser trochanter. This allowed elemental comparisons between cortical and cancellous tissues.

The amount of each trace element in this study was determined by flame emission and arc spectroscopy methods as outlined by JAMBOR [1988]. In all, 15 elements were analized (see Table 2). For diet reconstruction amounts of Zn, Sr, and Pb and their ratios to Ca were used, while Ti and Mn were used as archaeological environmental controls [JAMBOR 1988, SMRZKA et al. 1988].

The dietary practices are reflected in the trace element contents of skeletal remains. Elevated levels of Zn would serve as an indicator of animal protein intake, while increased levels of Sr would serve to indicate increased dependence on vegetation in the diet [PRICE, KAVANAGH 1982, LAMBERT et al. 1984].

Results

Mean concentration levels of all analized elements, cancellous and cortical tissues combined for 117 samples are presented in Table 2. Table 3 displays mean concentrations of the elements analized from the soil samples taken in critical proximity to the skeletal remains in graves (inv. no. 5290, 5305, 5309, 5311, 5316, 5322, 5323).

The Madaras Sarmatian population shows higher relative concentrations of Ar than of Zn as seen in Figure 1. Most Sr concentrations range from 100 to 700 $\mu g\ g^{-1}$ bone. When divided into groups by sex and age (children can not be sexed), females and infants show higher Sr concentrations than males (Fig. 2). *T*-test and analysis of variance show this difference to be significant at a high level ($P < 0.05$).

When comparing Sr, Zn, and Pb concentrations at Madaras with other materials dated to the same period (Germanic tribes the Niemberg region of Germany, and two Pannonia groups, Gerulata I and III, from the Bratislava region), we find that in the Madaras Sarmatians Sr levels in their femora are higher than Niemberg and Gerulata III, and about the same as Gerulata I. When comparing Zn and Pb concentration levels with these same populations we find the Sarmatians have a depressed level relative to the other three populations' samples.

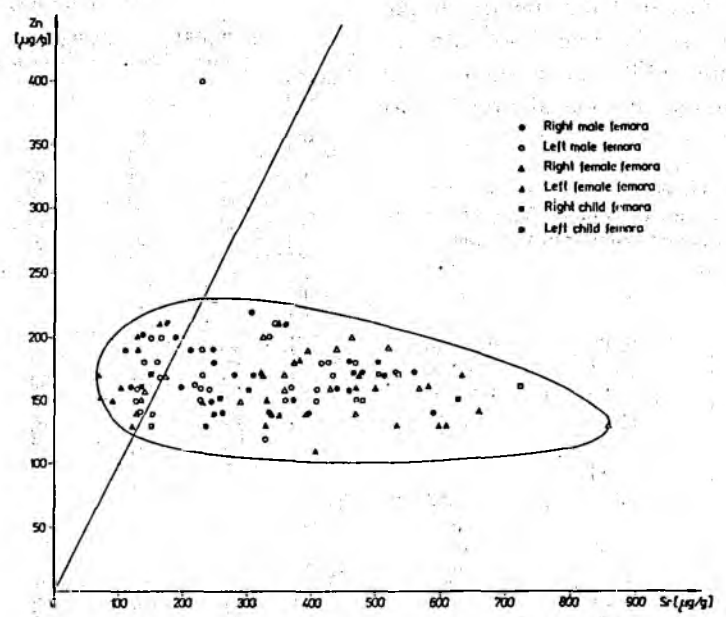

Fig. 1. Diagram of Zn and Sr concentrations in Madaras population samples

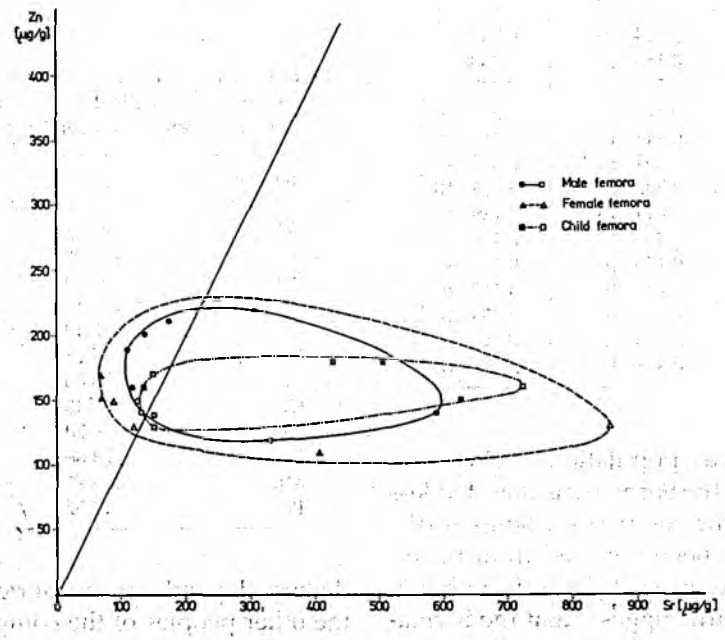

Fig. 2. Distribution limits of Zn and Sr concentrations, by sex and age, in Madaras population samples

This suggests that the dietary intake of vegetable foods was elevated in the Sarmatians while meat made up a lower percentage of their diet relative to the compared populations. This also suggests that the Sarmatians ingested less Pb than did the comparison samples (the Pb may have been ingested from plates, cups of pewter or lead glazes from pottery). This in turn suggests that the Sarmatians were more sedentary with a grater dietary dependence on agriculture than the other peoples of the compared populations.

Table 2. Mean elemental concentration ($\mu g \cdot g^{-1}$ bone) in 117 samples of compact and cancellous bones combined taken from Madaras

Elements	$\bar{x}$	*SD*
Ca	277 692.00	39 284.40
Sr	329.21	162.89
Na	4 153.59	1 705.93
K	67.57	48.21
Li	3.29	1.31
Co	3.84	3.10
Ti	7.69	7.63
Ag	0.74	0.93
Zn	167.52	32.00
Cu	23.53	9.79
V	0.38	0.34
Ni	0.53	0.50
Cr	0.40	0.36
Pb	6.52	8.37
Mn	13.51	9.97
(Ratios)		
Sr/Ca	$0.124 \cdot 10^{-2}$	$0.702 \cdot 10^{-3}$
Na/Ca	$0.155 \cdot 10^{-1}$	$0.768 \cdot 10^{-2}$
K/Ca	$0{,}259 \cdot 10^{-3}$	$0.245 \cdot 10^{-3}$
Li/Ca	$0.123 \cdot 10^{-4}$	$0.581 \cdot 10^{-5}$
Co/Ca	$0{,}148 \cdot 10^{-4}$	$0.150 \cdot 10^{-4}$
Ti/Ca	$0{,}301 \cdot 10^{-4}$	$0.329 \cdot 10^{-4}$
Ag/Ca	$0.282 \cdot 10^{-5}$	$0.368 \cdot 10^{-5}$
Zn/Ca	$0.614 \cdot 10^{-3}$	$0.139 \cdot 10^{-3}$
Cu/Ca	$0.873 \cdot 10^{-4}$	$0.410 \cdot 10^{-4}$
V/Ca	$0.150 \cdot 10^{-5}$	$0.167 \cdot 10^{-5}$
Ni/Ca	$0.205 \cdot 10^{-5}$	$0.213 \cdot 10^{-5}$
Cr/Ca	$0.155 \cdot 10^{-5}$	$0.154 \cdot 10^{-5}$
Pb/Ca	$0.256 \cdot 10^{-4}$	$0.342 \cdot 10^{-4}$
Mn/Ca	$0.515 \cdot 10^{-4}$	$0.403 \cdot 10^{-4}$

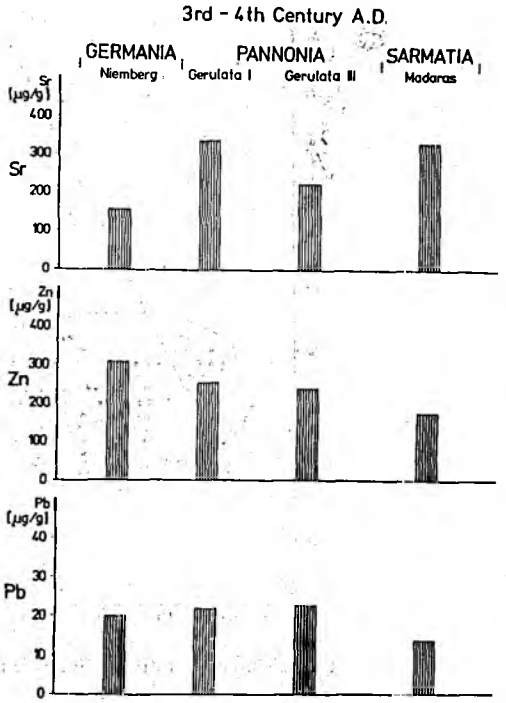

Fig. 3. Sr, Zn, and Pb concentrations in Madaras and compared population samples

Table 3. Mean concentration of chemical element samples ($\mu g \cdot g^{-1}$ of soil) taken from the close vicinity of the skeletons in seven Madaras graves

Elements	$\bar{x}$	*SD*
Ga	81.71	20.20
Sr	108.86	40.10
Na	693.28	168.48
K	221.14	176.19
Li	6.40	3.27
Co	17.28	12.02
Ti	53.86	37.92
Cu	35.43	27.19
Ag	0.70	0.57
Zn	23.86	10.38
Mn	175.71	57.05
Pb	13.57	8.94

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Streszczenie

W celu rekonstrukcji diety ludności pochowanej na cmentarzysku w Madaras (Sarmaci), zbadano 117 kości udowych pochodzących z 50 szkieletów. Badane cmentarzysko znajduje się w południowej części Niziny Węgierskiej, pomiędzy Dunajem i Cisą, i datowana jest na III-V w. Rekonstrukcję diety oparto na analizie zawartości śladowej pierwiastków w kościach. Podstawowym składnikiem diety badanej grupy ludzkiej były rośliny, ponieważ poziom Sr przewyższał poziom Zn. Niska koncentracja Pb w stosunku do materiałów z terenów ościennych wskazuje na mniejszą ilość tego pierwiastka w pokarmie.