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DENTAL BUCCAL MICROWEAR OF THE MEDIEVAL POPULATION FROM DOLNÍ VĚSTONICE, CZECH REPUBLIC

ABSTRACT: Dental microwear analyses have shown to reflect important information concerning diet in bioarchaeological populations. By assuming a correlation between ingested diet and microwear patterns on the enamel surface of teeth and quantifying enamel microwear, diet can be reconstructed. Buccal dental microwear analysis was carried out on a sample of 62 individuals from Dolní Věstonice – Na Pískách site, and 36 individuals from Dolní Věstonice – Vysoká zahrada site, Czech Republic. The former population is dated to the early medieval period (late 8th – mid-11th century AD), thus this sample has been associated with Old-Slavonic population, and the latter falls into the 12th century AD. For each individual negative and positive replicas of molars and premolars' buccal surface were made, and subsequently analysed in secondary electrons of scanning electron microscopy. The length, orientation and number of all observed striations in a 0.56 mm^2 square surface area were quantified using SigmaScan Pro 5.0, image analysis software. Ultimately, obtained results were compared with published datasets acquired from studying various modern hunter-gatherers, pastoral, and agricultural populations with different dietary habits (Lalueza et al. *1996). The analysis yielded a distinct microwear pattern for both Dolní Věstonice populations. The density and the length of microstriations showed inter-group sex and age related variability in the 9th century AD, which presumably resulted from a different ratio of meat intake and vegetal meals. These differences in dietary habits did not endure in this site till the 12th century, when agricultural resources and food preparation technology were probably on higher level that required no more social stratification.*

KEY WORDS: Buccal dental microwear – Diet – SEM – Dolní Věstonice – Czech Republic

INTRODUCTION

The buccal microwear analyses have been carried out on numerous past populations. Focusing mainly on inter- and intra-population variability within non-occlusal striation pattern on postcanine dentition, these analyses have yielded valuable information about dietary habits (Puech, Pant 1980, Pérez-Pérez *et al.* 1994, Lalueza *et al.* 1996, Pérez-Pérez 1990, 2004, Romero *et al.* 2004, etc.). As proved, there is a tendency to exhibit less striations and higher frequency of vertical striations on the dental surface in meat eaters than in vegetarians. High incidence of abrasive particles in plant foods (phytoliths) results in higher scratch densities and increasingly horizontally oriented vestibular microwear pattern in agricultural populations (Lalueza *et al.* 1996). Embedment and classification of phytoliths in enamel surface has been proved in previous research made by Lalueza Fox and his colleagues (1994) in La Olmeda sample. In addition, buccal microwear is independent from individuals' analysed teeth as the intergroup variability seems to be significantly higher than the intragroup one and seems to be independent in regards to seasonal variations in dietary habits because of its long-termed "turnover" effect in comparison to occlusal microwear pattern (Pérez-Pérez *et al.* 1994).

FIGURE 1. Location of Dolní Věstonice, Czech Republic.

MATERIAL AND METHODS

Dolní Věstonice site

The archaeological site is located near Břeclav (Czech Republic) in south Moravia (*Figure 1*) and was being excavated in the mid-1950s. There were two Slavonic burial sites discovered in the area of present-day Dolní Věstonice village. The larger and older one, called Na Pískách ("On the Sands"), is dated between the late-8th and mid-11th century, with predominance for the graveyard in the 9th century AD (Poulík 1948–50, 1949, 1950, Tichý 1958, 1959, 1960). This extensive, but generally not well-preserved skeletal sample represents one of the three largest archaeological populations (893 individuals with more than 8,800 teeth) from the early medieval period in the area of the Czech Republic. The smaller one falls to the 12th century and is named Vysoká zahrada ("The High Garden"). Within this burial site around the church, 129 individuals were discovered with almost 1,000 teeth (Jarošová 2007).

Because of the location of both localities on the Dyje river bank, the osteological material was strongly damaged by repeated floods and after drying out both dental enamel and bone surfaces were in many cases flaking off the teeth and bones. That is why it was possible to study only some individuals for microwear analysis, i.e. those with well-preserved enamel surface.

The final analysed skeletal sample from Dolní Věstonice – Na Pískách consisted of 22 (35.5%) adult males, 26 (41.9%) adult females and 14 (22.6%) juveniles (0–19 years old). From Dolní Věstonice – Vysoká zahrada, only 17 (47.2%) adult males, 11 (30.6%) adult females, one adult individual and 7 (19.4%) juveniles (0–19 years old) were suited for microwear analysis. All data on the individuals' sex and age-at-death was adapted from previously carried out estimations in paleodemographic analysis (Hrnčířová, Jarošová 2004, 2005, 2007, Jarošová, Hrnčířová 2005).

Comparative modern human samples

Buccal microwear has been studied in modern hunter-gatherers, pastoralists, and agriculturists originating from different ecological conditions and food gaining from all over the world. In regard to ecological criteria that, as shown, correspond with the geographical latitude underneath these people have been living, these populations might be divided into four broad groups: (1) agriculturalists (Hindus), (2) mix-diet hunter-gatherer populations from tropical forest (Andamanese and Veddahs), (3) carnivorous hunter-gatherer and pastoralist populations, including Fueguians (mainly hunting and fishing), Inuits (exclusively hunting strategies), Vancouver Islanders (mainly fishing and hunting), and Lapps (predominantly reindeer herding); and (4) mix-diet hunter-gatherer populations from arid and mesothermal environments, including Bushmen, Australian

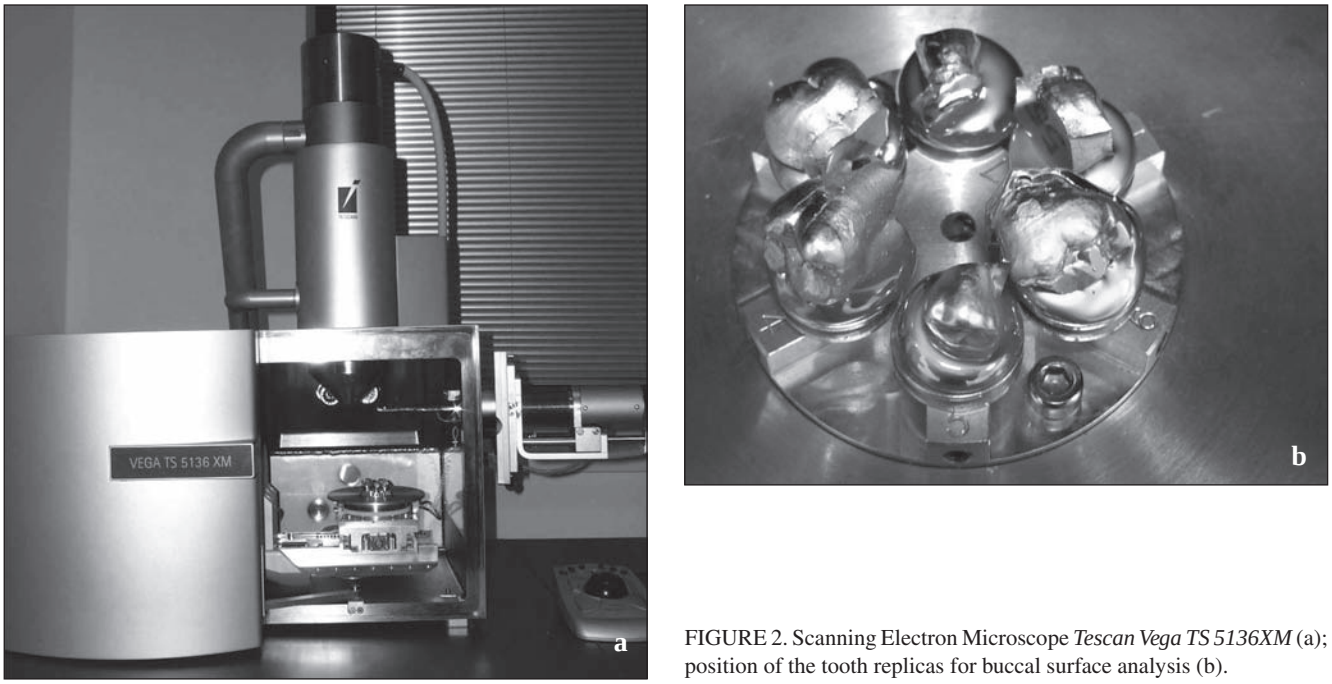


FIGURE 2. Scanning Electron Microscope *Tescan Vega TS 5136XM* (a); position of the tooth replicas for buccal surface analysis (b).

aborigines, and Tasmanians (Lalueza, Pérez-Pérez 1993, Lalueza *et al.* 1996).

Data collection

Teeth moulding. Although both molars and premolars from 98 individuals from Dolní Věstonice site were considered for buccal microwear analysis, only a single tooth per individual was finally analysed (Jarošová 2007). Negative impressions of the tooth's buccal surface were obtained using polyvinylsiloxane Affinis Regular Body (Coltène®). Afterwards the bicomponent polyurethane resin Feroca Feropur was applied to make positive moulds (Galbany *et al.* 2004). Ultimately, the tooth replicas were sputtered coated with a 400 Å gold layer using SCD Balzers Unions 040 and proceeded for SEM imaging.

SEM imaging. SEM images were obtained with Scanning Electron Microscope Tescan Vega TS 5136XM at Masaryk University, Brno (*Figure 2*). Micrographs were taken at 226× magnification on the medial third of the buccal surface of the tooth crown (Pérez-Pérez *et al.* 1994). (Note: the 226× magnification was computed because of wide-angled scanning window of Tescan Vega. These micrographs are compatible with 100× magnification of SEM Cambridge Stereoscan 120 at the SCT, University of Barcelona). All SEM pictures were digitalized using SEM Vega TC Software Image Processing, obtaining 1024×1024 pixels images that were subsequently enhanced with Adobe Photoshop v. 5.0, where the selected area of 0.56 mm^2 was cropped (Jarošová 2007) (*Figure 3*).

Data acquisition

Using image analysis software package SigmaScan Pro 5.0, the length (X), standard deviation of the length (SD), and number (N) of all striations present (T) were computed and 4 categories of orientation from 0˚ to 180˚ – in 45-degree intervals – were determined with respect to the given tooth's orientation: V=vertical, MD=mesio-occlusal to disto-cervical, DM=disto-occlusal to mesio-cervical, and H=horizontal. Mean values for each individual's tooth were characterized by a sum of 15 variables (Puech *et al.* 1980, Pérez-Pérez 1990, Lalueza, Pérez-Pérez 1993, Lalueza *et al.* 1993, 1996, Pérez-Pérez *et al.* 1999, 2003, Jarošová *et al.* 2006). All statistics were calculated with SPSS 14.0 Inc., and STATISTICA 7.0 StatSoft Inc. (2004) package. The significance of all statistics was evaluated at $p \leq 0.05$ level.

RESULTS AND DISCUSSION

Dolní Věstonice microwear pattern

In total, a number of 5,094 striations within the sample of 62 individuals from Dolní Věstonice – Na Pískách and 3,043 striations within the sample of 36 individuals from Dolní Věstonice – Vysoká zahrada were evaluated. No deviations from the normal distribution of all variables were observed (Kolmogorov–Smirnov normality test, $p>0.05$). Mean values, medians, minimums, maximums and standard deviation values are shown in *Table 1a, b*. The density of microstriations (NT) in modern human hunter-gatherer groups ranges between 32.0 and 74.8 (Lalueza *et al.* 1996), whereas the Dolní Věstonice sample reaches yet higher values (Dolní Věstonice – Na Pískách: NT=82.2 with median in 78.5; and Dolní Věstonice – Vysoká zahrada: NT=84.5 with median in 83.5) (*Figure 4a*). This result may indicate highly abrasive diet in Dolní Věstonice sample, based mainly on plant food. By comparing the average striations length (XT), both populations from Dolní

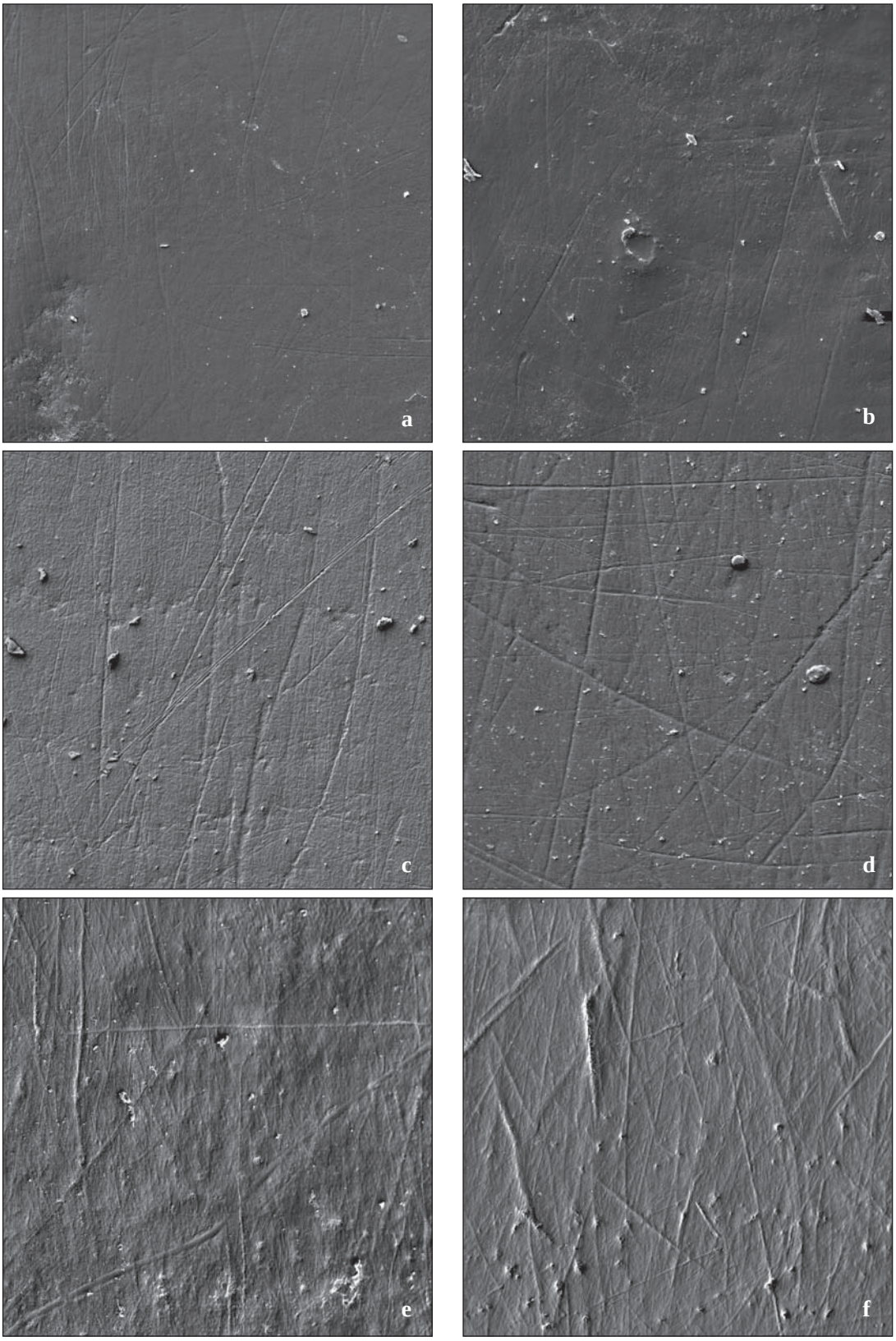


FIGURE 3. SEM images of selected individuals studied from Dolní Věstonice, Czech Republic. Each square enhanced with Adobe Photoshop v. 5.0. and surface analysed covers 0.56 mm^2 of buccal enamel surface. Occlusal surface faces the top of micrograph. Micrograph of adult (20–39 yrs) female No. 15b from Dolní Věstonice – Vysoká zahrada (a); micrograph of adult (20–29 yrs) male No. 586a/56 from Dolní Věstonice – Na Pískách (b); micrograph of adult (20–29 yrs) male No. 37b from Dolní Věstonice – Vysoká zahrada (c); micrograph of adult (50–59 yrs) male No. 32/52-II from Dolní Věstonice – Na Pískách (d); micrograph of adult (20–29 yrs) female No. 542/55 from Dolní Věstonice – Na Pískách (e); micrograph of adult (30–39 yrs) female No. 360/55 from Dolní Věstonice – Na Pískách (f).

TABLE 1. Descriptive statistics of all 15 variables in 62 individuals from Dolní Věstonice – Na Pískach (a) and in 36 individuals from Dolní Věstonice – Vysoká zahrada (b).

(a)

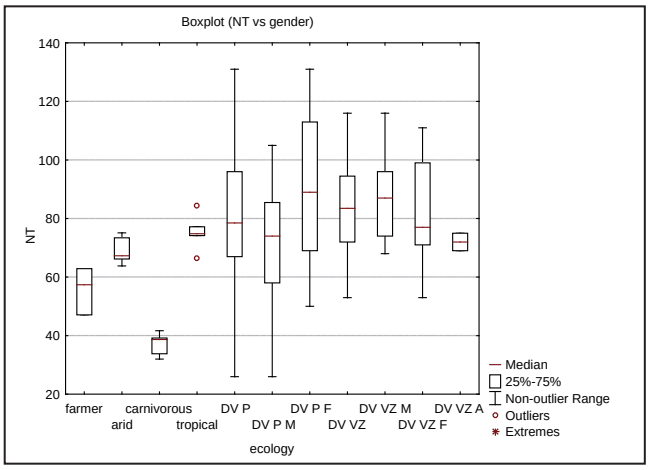
	Valid N	Mean	Median	Minimum	Maximum	Std. dev.
NH	62	14.9194	13.0000	2.0000	37.0000	7.9986
XH	62	144.0895	142.6644	31.7651	291.4802	60.1672
STDH	62	119.2615	112.5601	2.4636	280.0322	65.6454
NV	62	30.9677	31.0000	6.0000	67.0000	12.8011
XV	62	188.9159	189.2054	70.9646	377.8162	47.3158
STDV	62	131.7498	131.8034	34.5487	268.8155	39.0170
NMD	62	19.7097	19.5000	2.0000	48.0000	12.1755
XMD	62	147.6876	144.3739	59.6986	279.2198	44.9377
STDMD	62	115.4568	110.5378	21.2176	243.1460	53.5713
NDM	62	16.5645	16.0000	2.0000	49.0000	12.3682
XDM	62	133.4248	123.5260	21.1572	365.4312	56.7122
STDM	62	94.2721	84.3368	4.4119	246.2538	50.8777
NT	62	82.1613	78.5000	26.0000	131.0000	22.3586
XT	62	159.6972	158.3180	79.6299	256.9721	32.2573
STDNT	62	128.9898	125.7138	57.2122	195.5601	29.4929

(b)

	Valid N	Mean	Median	Minimum	Maximum	Std. dev.
NH	36	15.6111	15.0000	2.0000	33.0000	7.3922
XH	36	151.9185	141.5417	53.2527	279.4382	49.2638
STDH	36	121.3722	120.6656	8.8337	207.5665	50.0177
NV	36	30.3889	31.5000	7.0000	43.0000	8.7873
XV	36	199.0474	198.0284	101.4299	290.9562	48.9351
STDV	36	145.0590	155.4449	60.1868	210.3880	38.6077
NMD	36	21.2778	19.0000	2.0000	59.0000	13.0966
XMD	36	149.8824	148.2760	72.0020	298.1058	50.7451
STDMD	36	105.5805	107.4218	20.0893	216.0046	49.9392
NDM	36	17.2500	19.0000	2.0000	43.0000	9.6817
XDM	36	137.8328	132.5181	70.1873	297.2315	49.8579
STDM	36	106.8333	97.3819	14.8187	272.2593	56.1107
NT	36	84.5278	83.5000	53.0000	116.0000	15.5462
XT	36	166.1706	164.4845	107.2162	229.5744	32.1547
STDNT	36	136.0102	143.0036	74.9163	200.1053	32.1704

Věstonice approach mix-diet hunter-gatherer populations from tropical forest and arid environments (*Figure 4b*).

Non-parametrics Kruskal–Wallis ANOVA for 15 variables gave statistically significant sex-related differences within Dolní Věstonice – Na Pískách population in number of vertical striations (NV: p=0.0122) and in density of microstriations (p=0.0116). Females from the 9th century exhibit increased number of microwear pattern than males (*Figure 4a*) without difference in their average length (*Figure 4b*). Moreover, lower values of vertical striations in males partly overlap with the values reported for carnivorous hunter-gatherers (*Figure 4c*). In conclusion, sexual dimorphism in dietary strategy, with predominance in vegetal food intake by females and increased meat intake by males, might be hypothesized. The total number of striations increases with age in both samples (*Figure 5a*) and the average length of all striations increases within the younger, and decreases within elders (*Figure 5b*), as it has been proved in previous studies (Pérez-Pérez *et al.* 1994). Similarly, age-related differences were found in a number of horizontal striations (NH: p=0.0102) in Dolní Věstonice – Na Pískách sample (*Figure 5c*). Individuals within the age category over 50-year-old show increased number of horizontal striations and this group is fully overlapped with Hindu farmers, whose food intake is fully vegetarian. Only the age group of 35–50-year-old from Dolní Věstonice – Na Pískách come close to minimal number of horizontal striations (NH) of carnivorous hunters. Thus, increased amount of meat intake is possible to infer by this group. Because of established sex and age differences within the early medieval sample from Dolní Věstonice – Na Pískách it is possible to infer social stratification in the 9th century AD, historically known as the Great Moravian epoch.



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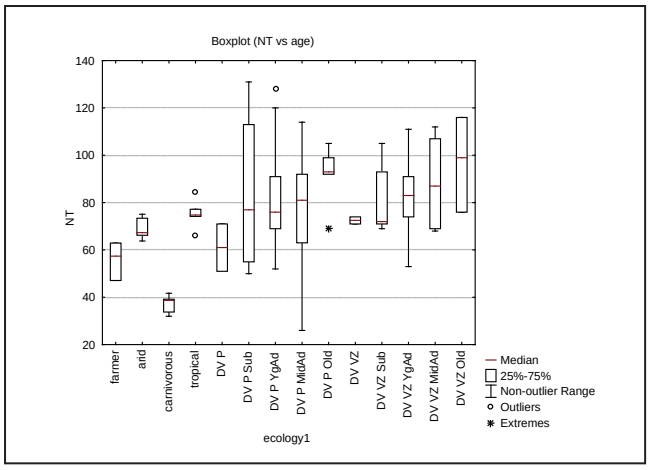

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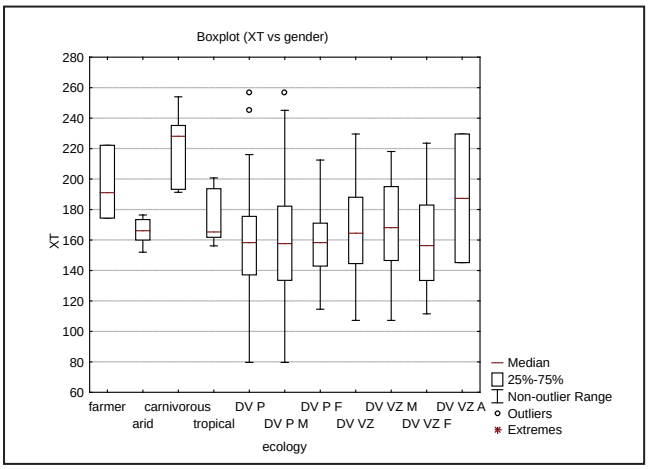

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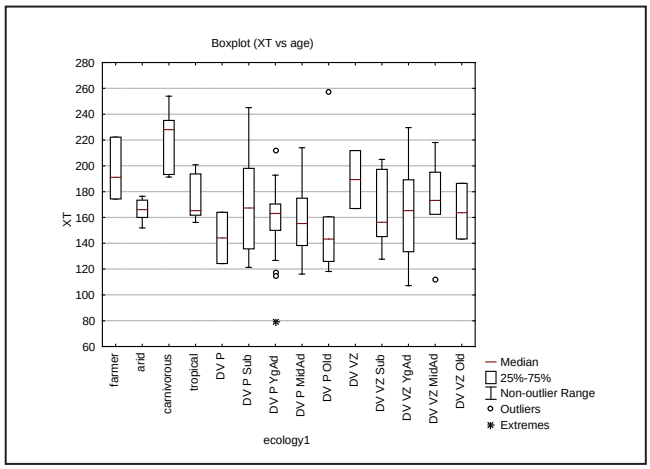

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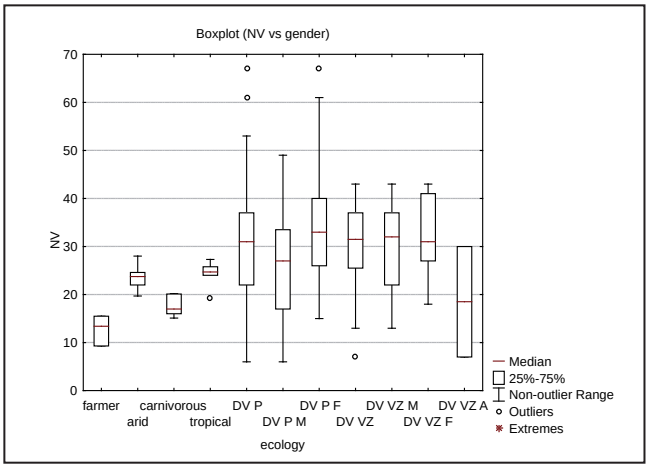

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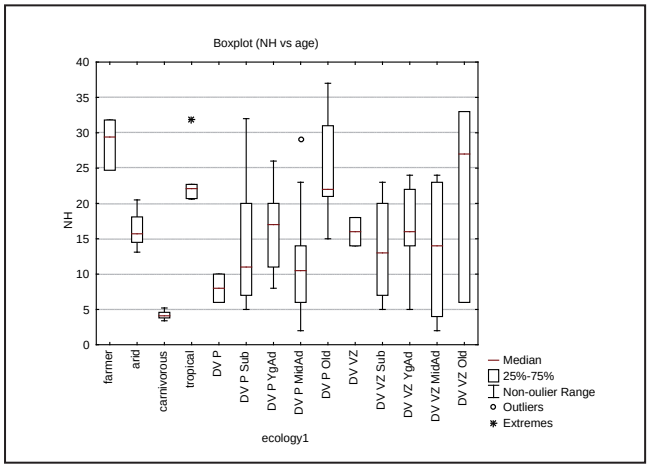

(c)

FIGURE 4. Boxplot showing the density of microstriations (NT) (a), the length of microstriations (XT) (b), and the number of vertical microstriations (NV) (c) observed in the teeth of arid, tropical, vegetarian and carnivorous populations in comparison with the whole analysed sample (DV Písky), males (DV P M) and females (DV P F) from the human population Dolní Věstonice – Na Pískách and analysed sample (DV VZ), males (DV VZ M) females (DV VZ F) and undetermined individuals (DV VZ A) from the human population Dolní Věstonice – Vysoká zahrada.

FIGURE 5. Boxplot showing the density of microstriations (NT) (a), the length of microstriations (XT) (b), and the number of horizontal microstriations (NH) (c) observed in the teeth of arid, tropical, vegetarian and carnivorous populations in comparison with the human populations from Dolní Věstonice – Na Pískách (DV P) and Vysoká zahrada (DV VZ); Sub = 15–19 yrs, YgAd = 20–35 yrs, MidAd = 35–50 yrs, Old = 50+yrs.

TABLE 2. Analysis of variance of the 15 variables studied in human populations. Seven of the fifteen variables in Dolní Věstonice – Na Pískách and nine of the fifteen variables in Dolní Věstonice – Vysoká zahrada show significant between-group differences at a 0.05 level of significance (marked with a star).

	Dolní Věstonice – Na Pískách		**Dolní Věstonice – Vysoká zahrada**	
	F	Sig.	F	Sig.
NH	8.422	0.000*	10.963	0.000*
XH	1.971	0.107	2.437	0.059
SDH	1.417	0.236	2.647	0.044*
NV	4.187	0.004*	7.981	0.000*
XV	2.675	0.038*	2.417	0.060
SDV	1.274	0.288	3.067	0.024*
NMD	4.193	0.004*	4.639	0.003*
XMD	1.313	0.273	1.107	0.363
SDMD	2.079	0.092	1.248	0.302
NDM	1.295	0.279	2.585	0.048*
XDM	3.238	0.016*	3.632	0.011*
SDDM	0.544	0.704	0.674	0.613
NT	9.11	0.000*	21.322	0.000*
XT	7.615	0.000*	6.128	0.000*
SDNT	1.101	0.362	1.667	0.172

TABLE 3. Multiple comparisons: Bonferroni post hoc test showing significant between-group differences. (* The mean difference is significant at the 0.05 level; ** the mean difference is significant at the 0.01 level.) Only the variables and groups where differences have been detected are presented (DV P = Dolní Věstonice – Na Pískách, DV VZ = Dolní Věstonice – Vysoká zahrada).

		Variable									
	Groups	**NH**	**SDH**	**NV**	**XV**	**SDV**	**NMD**	**NDM**	**XDM**	**NT**	**XT**
DV Na Pískách	vegetarian vs carnivorous	**									
	vegetarian vs DV P	*									
	arid vs carnivorous	*									*
	arid vs DV P										
	carnivorous vs tropical	**								*	
	carnivorous vs DV P	**		*	*		*		**	**	**
	tropical vs DV P										
DV Vysoká zahrada	vegetarian vs carnivorous	**									
	vegetarian vs DV VZ	*		**						**	
	arid vs carnivorous	*								**	**
	arid vs DVVZ										
	carnivorous vs tropical	**								**	

The situation with microwear pattern of Dolní Věstonice – Vysoká zahrada was different. Non-parametrics Kruskal–Wallis ANOVA for 15 variables gave statistically significant sex-related differences within Dolní Věstonice – Vysoká zahrada population in XMD and standard deviation STDDM variables, but it is impossible to clearly interpret them by present-day state of research. No other differences in this population were found, except slightly lower density (NT) and shorter average length (XT) of striations in females. Thus, it may be concluded that composition of diet in males and females in the 12th century was almost identical. There are two more individuals (without determined sex) whose microwear pattern density correlate with that of arid populations, but the average microwear length is variable. Both total number of striations and the average length of all striations increases with age in the adult sample and decreases within elders (50+ yrs) (*Figure 5a, b*). Despite these variances, no statistical age differences were proved using non-parametrics Kruskal–Wallis ANOVA. From this point of view it is possible to infer uniformity of dietary habits in the population from Dolní Věstonice – Vysoká zahrada.

Using one-way ANOVA, seven of fifteen variables in Dolní Věstonice – Na Pískách and nine of fifteen variables of the buccal microwear patterns in Dolní Věstonice – Vysoká zahrada differed significantly among groups (*Table 2*). The Bonferroni post hoc test within ANOVA (*Table 3*) shows that both populations from Dolní Věstonice through their dietary habits are the most similar to the tropical and arid populations, whereas carnivorous vs.

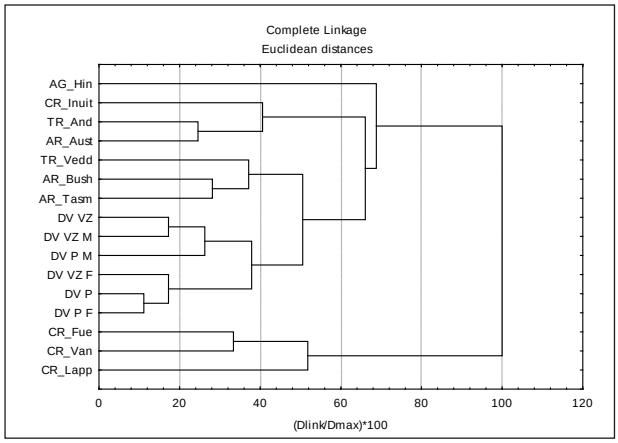

FIGURE 6. Joining Tree-clustering, final configuration of recently studied populations in comparison with Dolní Věstonice (DV P = Dolní Věstonice – Na Pískách, DV VZ = Dolní Věstonice – Vysoká zahrada; M = males, F = females; AG_Hin = Hindu (vegetarian agriculturalist), populations from tropical areas: TR_And = Andamanese, TR_Vedd = Veddahs, populations from arid areas AR_Bush = Bushmen, AR_Tasm = Tasmanians, AR_Aus = Australian aborigines, carnivorous populations: CR_Fue = Fueguians, CR_Inuit = Inuit, CR_Van = Vancouver islanders, CR_Lapp = Lapps).

Dolní Věstonice present the most distinct group of all (the population Na Pískách differs from carnivorous in seven variables and population from Vysoká zahrada in six variables out of fifteen). By comparing the vegetarian group to Na Pískách population and Vysoká zahrada population, it is obvious that the 9th century Old-Slavonic population was more depending on vegetal / cereal food than the later dated population from Vysoká zahrada. Thus, generally high meat intake in diet was excluded, and mixed diet with predominance of cereal / vegetal food confirmed in Dolní Věstonice – Na Pískách.

To illustrate further populations' affinities based on buccal microwear pattern, a joining tree-clustering (Euclidean distances, complete linkage) of 15 variables has been performed and *Figure 6* shows the cladogram obtained. When clustering closer groups indicating likenesses in abrasiveness and composition of eaten food, then the Dolní Věstonice groups show on the one side similarities with arid groups of Tasmanians and Bushmen and tropical Veddahs; on the other side great dissimilarities with carnivorous populations. An extensive research of the Veddahs has shown that this population is more inclined to gather than to hunt because of its insecure success (Lee, DeVore 1968). Studies made on Bushmen (Lee 1973, Lee, DeVore 1976) concluded that vegetable matter constitutes generally about 60–80% of the total consumed food (Hart 1978). Moreover, this outcome supports an intense agriculturalist subsistence pattern, based mainly on cereal consumption, as reported previously (Poulík 1948–1950) and as confirmed recently via trace elements analyses (Prokeš 2006, pers. comm., unpublished report). As shown in *Figure 6,* there is also obvious similarity between female and male diets within the whole Dolní Věstonice sample. Females of both populations make cluster with Dolní Věstonice – Na Pískách sample where predominance of vegetal / cereal food was inferred, white both male populations make cluster with Dolní Věstonice – Vysoká zahrada, where slightly greater income of meat food was found out.

Slavonic livelihood

The Slavonic archaeology reached very valuable results in investigation of agricultural production. The main role in Slavonic agriculture belongs to vegetable production, whereas the main source of animal husbandry rises from breeding of domestic animals besides occasional fishing and hunting.

Historically the most valuable material is to be found in settlement sites (mostly kitchen refuse), but there were neither animal bones findings nor grain remains finds in Dolní Věstonice medieval site. The only animal bone remains found in Dolní Věstonice site were those from grave inventory. That is why we had to lean upon the written sources or findings from other connected medieval settlements in examining what the Slavs had supposedly eaten in medieval times.

Plants. In searching information concerning agriculture of early Slavonic states there are two sources: the rests of plants in archaeological finds and mentions in written sources, concerning the kinds of plants and ways of their use. Grain cultivation was of basic significance in early Slavonic agriculture. In Bohemia wheat prevails, cultivated on a large scale and richly used in the consumption, whereas in other Slavonic countries main significance was given to millet and to rye. In the early Middle Ages rye was cultivated only as a secondary plant besides wheat, but at the end of that epoch (i.e. the 12th–13th centuries) rye drove out wheat from its position of the main bread source, which was a common and general source of known food mentioned in written sources besides legumes and cabbage. Millet, on the other hand, which is supposed to be the most common sort of grain in Slavonic countries, was probably cultivated on a smaller scale in Bohemia, and in the early Middle Ages markedly less than the other crops. Barley, as proved by archaeological finds, was largely cultivated, but is almost never mentioned in written sources. It was probably mainly used as fodder, and only partly as food for common people (e.g. beer and cakes). The cultivation of oat was closely connected with horse-breeding (Krzemienska 1963).

Animals. Analogies from other related medieval settlements proved mostly pigs and cattle breeding. In early medieval times, their ratio varied from settlement to settlement. In south Moravian 9th century settlements, prevalence of pigs has been assessed (Kratochvíl 1969a). Hunting was quite rare in that period – bones of wild animals represented approximately only 2% of all discovered animal bones. The main source of meat food was the breeding of domestic animals (Kratochvíl 1969b). Also fluvial fishing was sporadically proved in Slavonic populations (Beranová

1980). In the period between the 11th and 13th centuries, cattle breeding gradually prevailed over pigs breeding. Unlike the previous epoch, also the ratio of sheep and goat meat consumption increased (Bláha 2002).

As already mentioned, we had at our disposal only animal bones recovered from graves. This source of information concerning Dolní Věstonice site has a certain value too, but the choice of animal meat was probably influenced not only by economical, but also by religious and ritual reasons. In the 9th century Dolní Věstonice – Na Pískách burial site only 19 bones or fragments of animal remains were found. The most common animal bones found in Dolní Věstonice – Na Pískách graves were those of beef cattle, pigs, hares, dogs, and one almost complete skeleton of a horse. From these, horses and dogs are broadly supposed not to be eaten by Slavs; they were probably buried with their owners as companions (Beranová 1966). In the Dolní Věstonice – Vysoká zahrada cemetery around the church the situation was different. One hundred bones or fragments of animal bones were found in graves. The most common finds were bones of pigs, then beef cattle, and on the third place bones of sheep or goats. Bones of poultry were present only in a small number of pieces. Bones of hare, bear and fox are evidences for hunting and wild animals eating in the Dolní Věstonice – Vysoká zahrada settlement. Thus, only the latter bone collection of the two sites can be considered as a proof of animal husbandry in the 12th century.

Diet in Dolní Věstonice

Highly abrasive diet in both Dolní Věstonice samples has confirmed the dependence on mainly plant food, i.e. probably wheat, cultivated largely together with rye during the early Middle Ages. In the later 12th century it was probably rye that was cultivated in Dolní Věstonice – Vysoká zahrada as the main crop for bread. This finding can unfortunately neither be confirmed nor declined, because present-day state of research of buccal microwear pattern does not allow it. This matter might be considered as a topic for further research of phytoliths.

Sex-related differences within Dolní Věstonice – Na Pískách were found out in dietary strategy, with predominance in vegetal food intake by females and possibly increased meat intake by males. Because of proved domestic animal breading of pigs in the 9th century, it is possible that male diet consisted of increased amount of pork in comparison with female diet. Age-related differences in Dolní Věstonice – Na Pískách sample could be related to social stratification that results in different meat ratios within this population. Dental microwear pattern proved uniform diet strategies in the later 12th century that reflect no more social differences. During that period eating of beef cattle together with hunting was proved, thus it is possible to infer relative abundance of meat income; unlike the previous period, meat was eaten by both males and females within Dolní Věstonice – Vysoká zahrada population.

CONCLUSION

The analysis of buccal microwear pattern, carried out on early medieval specimens from Dolní Věstonice – Na Pískách site (9th century AD) indicates plant foods with large amounts of silica phytoliths. The diet of the Dolní Věstonice population was probably highly dependent on cereal resources, since meat consumption was low. In the subsequent period partial increase in meat food was assessed, without any differences according to sex and age categories. The microwear pattern observed is in agreement with the expected results and contributes to the knowledge of buccal microwear variability for agricultural populations. This research will allow future detailed analyses of early agricultural populations and provide datasets for future comparisons.

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