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DIETARY INFERENCES USING BUCCAL MICROWEAR ANALYSIS ON THE LBK POPULATION FROM VEDROVICE, CZECH REPUBLIC

ABSTRACT: Microscopic analyses of tooth enamel have been linked to the composition of the ingested aliments and feeding behaviour in bioarchaeological populations. Dietary trends can be reconstructed by quantifying enamel microwear patterns and assuming a correlation between ingested diet and microwear patterns on the enamel surface of teeth.
A study of buccal dental microwear patterns was carried out on 18 individuals from the Vedrovice site, Znojmo district, Czech Republic, dated to Neolithic period, specifically the Linearbandkeramik (LBK) phase of the cemetery. For each individual negative replicas of the buccal surface were obtained using polyvinylsiloxane Affinis Regular Body (Coltène®). Bicomponent polyuretane resin Feroca Ferropur PR-55 was applied to make positive moulds. Only molars or premolars that showed clear microwear patterns were analyzed using scanning electron microscopy. Finally, SigmaScan Pro 5.0, image analysis software, was used to quantify microwear patterns for length, orientation and number of all observed striations in a 0.56 mm^2 square surface area. Obtained results were compared with published datasets acquired from studying various modern hunter-gatherers, pastoralists, and agriculturalists with different dietary habits (Lalueza et al. *1996).*
The analysis yielded a distinct microwear pattern for the Vedrovice sample. The density and the length of microstriations showed inter-group sex and age related variability, which presumably resulted from a different amount of vegetal/cereal intake. If a close relationship between phytoliths and tooth striations can eventually be demonstrated, a high number of striations might be indicative of the presence of plant foods in diets. Moreover, observed differences in the higher amount of abrasive particles in the diet might have originated from food preparation technology associated with early agriculturalist techniques, i.e. grinding of seeds with some ancient stone mills. In spite of these additional influences, it is possible to conclude that diet in Neolithic Vedrovice sample was mostly vegetarian in its character and consists mainly of some grain-based components, whereas meat was eaten only sporadically. By comparing sex-related differences within the Vedrovice population it is possible to conclude higher vegetal intake by females in comparison to the male population.

KEY WORDS: Microwear – Diet – SEM – Vedrovice – Czech Republic

INTRODUCTION

Dental microwear analyses have been abundantly performed in skeletal collections of various time periods, both on occlusal and buccal surfaces of teeth. 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 1990, 2004, Pérez-Pérez *et al.* 1994, Lalueza *et al.* 1996, etc.) because of proved 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) result in higher scratch densities and increasingly horizontally oriented vestibular microwear pattern in agricultural population (Lalueza *et al.* 1996). Embedment and classification of phytoliths has been proved in previous research made by Lalueza-Fox and his colleagues (1994). In addition, buccal microwear is independent from individuals' analyzed tooth as the intergroup variability seems to be significantly higher than the intragroup ones 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). Thus, in present research we chose to perform the buccal tooth striation pattern to study dental microwear variability within the Vedrovice sample.

MATERIAL AND METHODS

Vedrovice site

The archeological site is located near Moravský Krumlov, Znojmo district in South Moravia (Czech Republic) and it had been excavated from the mid-1970s for one decade by V. Ondruš (Podborský *et al.* 2002). There was a Neolithic burial site "Široká u lesa" discovered in the area of present-day Vedrovice village, dated to the LBK phase of the cemetery (Podborský 2002). This outstanding skeletal sample represents one of the largest archaeological Neolithic populations in the area of Middle Danube basin (85 individuals with more than 1,400 permanent teeth).

Only 55 adult individuals from all 85 present at the Vedrovice site were considered for buccal microwear analysis because of the presence of molars or premolars. This osteological material was unfortunately damaged by various macroscopic and microscopic taphonomic processes affecting both dental enamel and surfaces of bones. That is why it was possible to study only partial number of teeth for microwear analysis, i.e. those with well-preserved enamel surface. All data on individual's sex and age-at-death were adapted from previously carried out estimations made by Malcolm Lillie (Lillie 2008). Thus, the final analyzed tooth sample from the Vedrovice cemetery consisted of 13 (72.2%) adult females and 5 (27.8%) adult males (*Table 1*) with well-preserved enamel surfaces.

Comparative modern human samples

The buccal microwear has been studied in modern hunter-gatherers, pastoralists, and agriculturalists that have arisen from different ecological conditions and food gaining from different regions all over the world. In regard to ecological criteria that, as shown, correspond with the geographical latitude underneath which these people have been living, these populations might be divided into four broad groups: (1) agriculturalists (Hindus), (2) mixed-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) mixed-diet hunter-gatherer populations from arid and mesothermal environments, including Bushmen, Australian aborigines, and Tasmanians (Lalueza, Pérez-Pérez 1993, Lalueza *et al.* 1996).

TABLE 1. List of eigthteen studied adult individuals and moulds from the Neolithic Vedrovice cemetery, Czech Republic.

Grave No.	Inv. No.	Sex	Age	Tooth analysed
22/75	2286	F	35–45 yrs	M2UR
23/75	2287	M	18–20 yrs	M3LL
38/76	2302	F?	30–35 yrs	Pm4LL
42/77	2301	F	20–30 (25–30) yrs	M1LL
45/77	2305	F	35–40 yrs	M2UL
46/77	2306	M	20–25 yrs	M1LL
57/78	2991	M	40–50 yrs	M2LL
62/78	2994	F	30–40 yrs	M1UL
67/78	2998	F	35–45 yrs	M2LL
69/78	3000	M	20–30 (20–25) yrs	M2UL
70/79	3001	F?	45–50 yrs	M2UR
72/79	3003	F?	30–40 yrs	Pm3UR
76/79	3007	M	20–30 yrs	Pm4LR
80/79	3011	F	35–45 yrs	M1UL
81a/79	3012	F	20–30 yrs	M2LL
91/80	11364–11403	F	18–21 yrs	M3LR
100/81	11565–11600	F	20–30 yrs	M3LL
101/81	11601–11634	F	45–55 yrs	M1LL

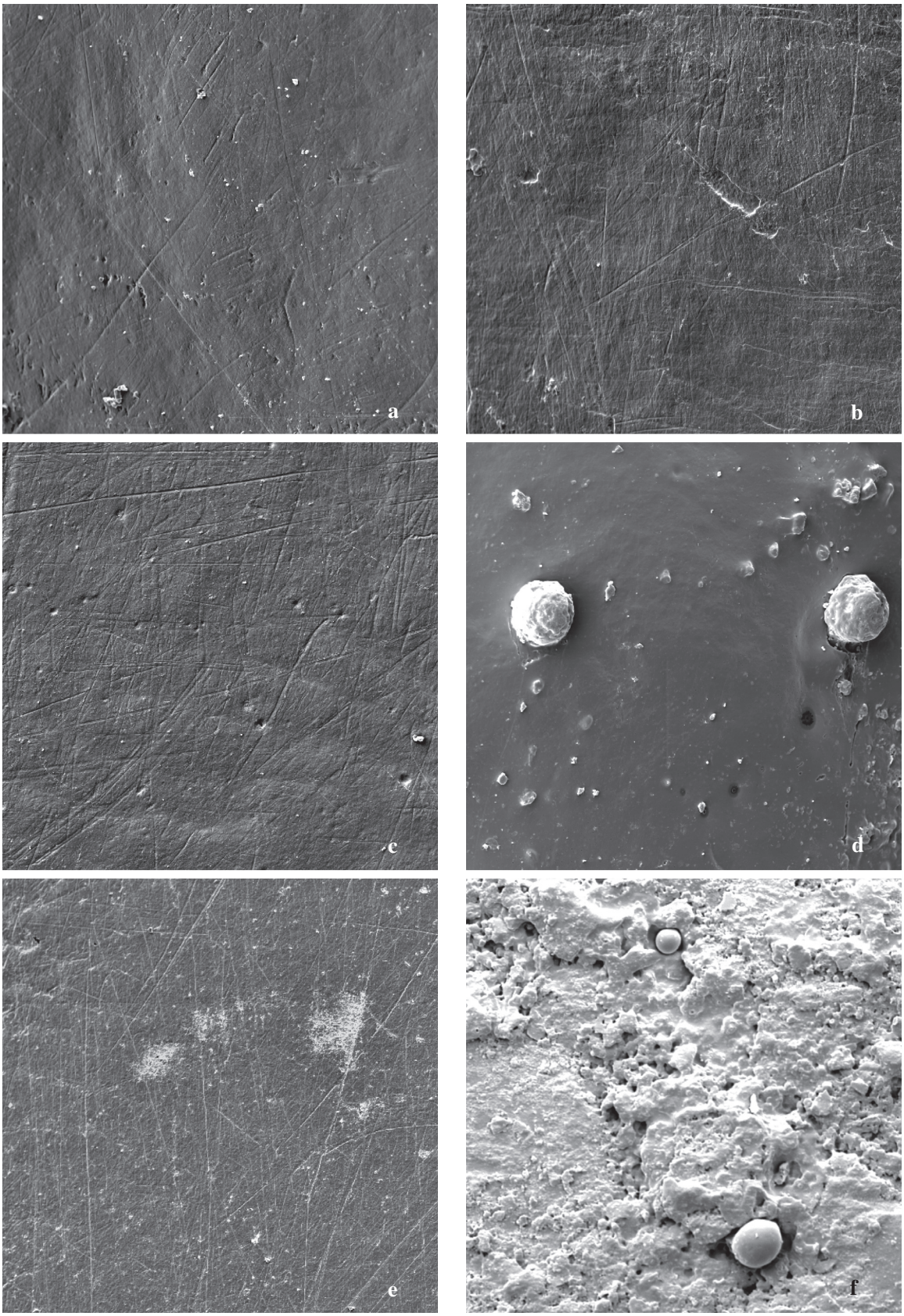


FIGURE 1. SEM images of selected individuals from Vedrovice, Czech Republic. Each square enhanced with Adobe Photoshop v.5.0. and surface analyzed covers 0.56 mm^2 of buccal enamel surface. Occlusal surface faces the top of micrograph. (a) Adult male (40–50 yrs), No. 57/78, tooth M3LL; (b) Young adult female (18–21 yrs), No. 91/80, tooth M2LL; (c) Adult female (20–30 yrs), No. 100/81, tooth M2LL; (d) Old female (50+ yrs), No. 21/75, tooth M1UR no microwear striations present; (e) Young male (25–30 yrs), No. 59/78, tooth Pm4LR, post-mortem wear caused by non-specific type of erosive agent; (f) Young male (25–30 yrs), No. 19/75, tooth M2LR, post-mortem enamel damage.

Data collection

Teeth moulding. 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 coated with a 400 Å gold layer using SCD Balzers Unions 040 and proceeded to SEM imaging.

SEM imaging. SEM images were obtained with Scanning Electron Microscope Tescan Vega TS 5136XM at the Masaryk University, Brno. 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 cut out (Jarošová 2007). Finally, because of frequent damaged enamel surface that can be attributed to post-mortem taphonomic wear, not related to dietary habits (Martínez, Pérez-Pérez 2004), only 18 enamel surfaces of teeth (single tooth per individual) were suitable for subsequent image analysis (*Figure 1a–f*).

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 was calculated with SPSS 14.0 Inc., and STATISTICA 7.0 StatSoft Inc. (2004) package. The significance of all statistics was evaluated at the $p \leq 0.05$ level.

RESULTS AND DISCUSSION

Vedrovice microwear pattern

In total, 1,547 striations within the sample of 18 individuals from Vedrovice were evaluated. No deviations from the normal distribution of all variables was observed (Kolmogorov-Smirnov normality test, $p>0.05$). Mean values, medians, minimums, maximums and standard deviation values are shown in *Table 2*. The density of microstriations (NT) in modern human hunter-gatherer groups ranges between 32.0 and 74.8 (Lalueza *et al.* 1996), whereas the Vedrovice sample reaches slightly higher values (NT=85.9 with median in 86.0) (*Figure 3a*). As it has been suggested in previous studies, plant phytoliths are supposed as a main factor producing tooth striations. If a close relationship between phytoliths and tooth striations can eventually be demonstrated, a high number of striations might be indicative of the presence of plant foods in diets (Pérez-Pérez *et al.* 1994). This increased number of all striations ranges within the Vedrovice population between 59 and 132: on one side six individuals (23/75, 42/77, 45/77, 62/78, 67/78, 76/79) fell into hunter-gatherers' values, thus

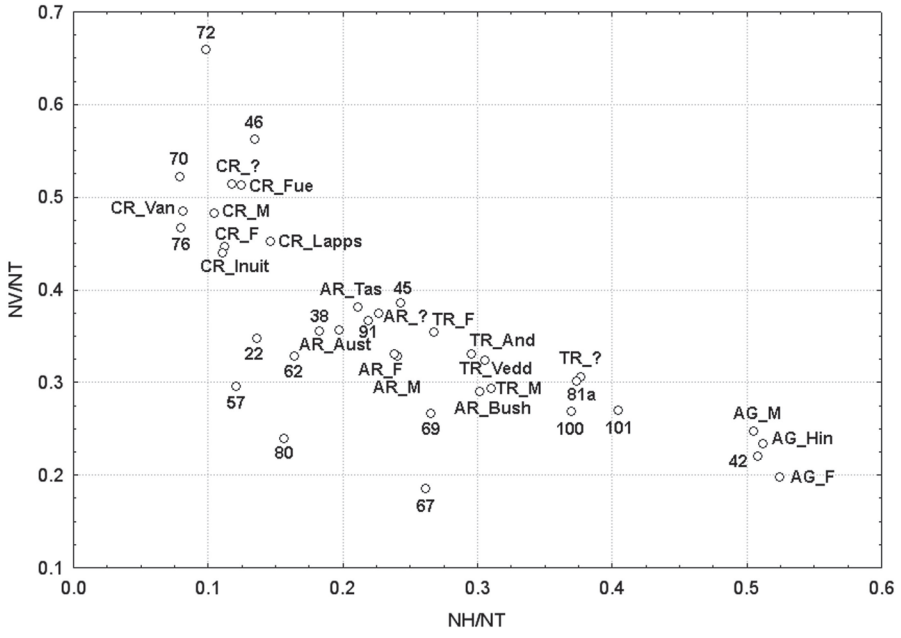
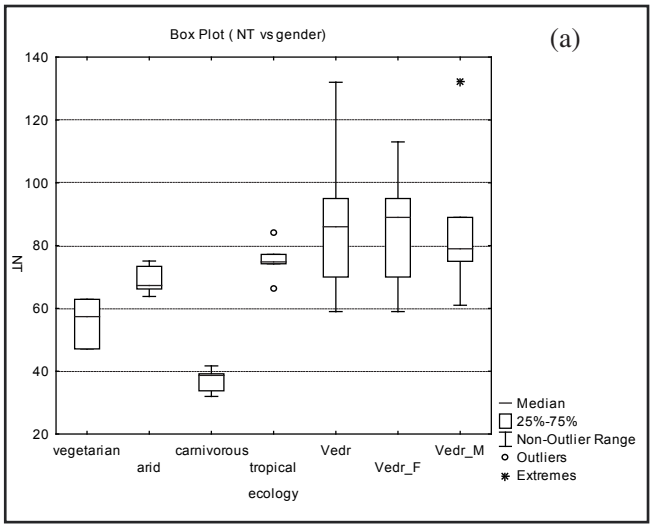
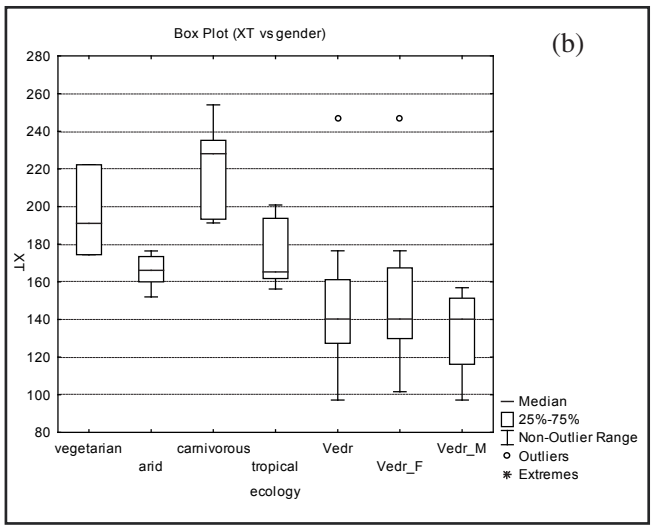


FIGURE 2. Scatterplot of NH/NT index with respect to NV/NT index for all individuals from Vedrovice in comparison to studied samples: AG_Hin = Hindu (vegetarian agriculturalists), populations from tropical areas: TR_And = Andamanese, TR_Vedd = Veddahs, populations from arid areas, AR_Bush = Bushmen, AR_Tasm = Tasmanians, AR_Aus = Australian aborigines, carnivorous populations: CR_Fue = Fueguians, CR_Inuit = Inuits, CR_Van = Vancouver islanders, CR_Lapp = Lapps.





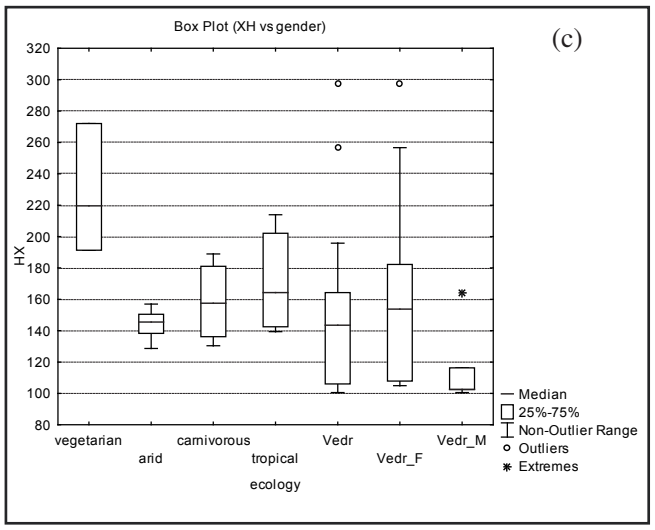
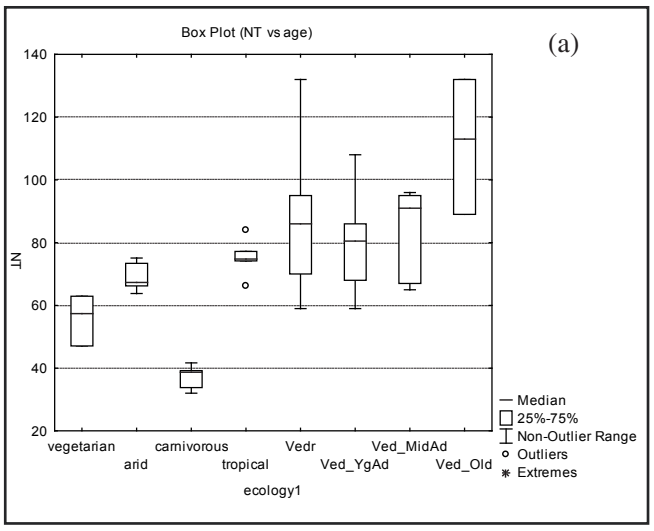


FIGURE 3. Boxplot showing the density of microstriations (NT) (a), and the length of microstriations (XT) (b) and length of horizontal striations (c) observed in the teeth of arid, tropical, vegetarian and carnivorous populations in comparison with the human population from Vedrovice (Vedr), females from Vedrovice (Vedr_F) and male population (Vedr_M). The central line in boxes indicates sample median, the boxes include 25 to 75 percentiles and the whiskers represent minimum and maximum values observed.

by them it is possible to assume relatively soft diet; on the other side there are seven individuals (69/78, 91/80, 81a/79, 101/81, 46/77, 72/79, 38/76), who have increased number of striations in comparison to the values of hunter-gatherer groups, and by whom it is possible to infer slightly abrasive food. By these two groups it is possible to infer soft or slightly abrasive food, based likely on plant sources. Finally, beside these two groups, in five individuals (22/75, 57/78, 70/79, 80/79, 100/81) it is possible to note remarkable abrasiveness of food or some additional influences. This increased number of striations might be caused not only by silica phytoliths of cereal components, but also by other abrasive materials related with food preparation technology associated with early agriculturalist techniques, i.e. grinding of seeds with some ancient stone mills (Pérez-Pérez *et al.* 1994). Other influences in food



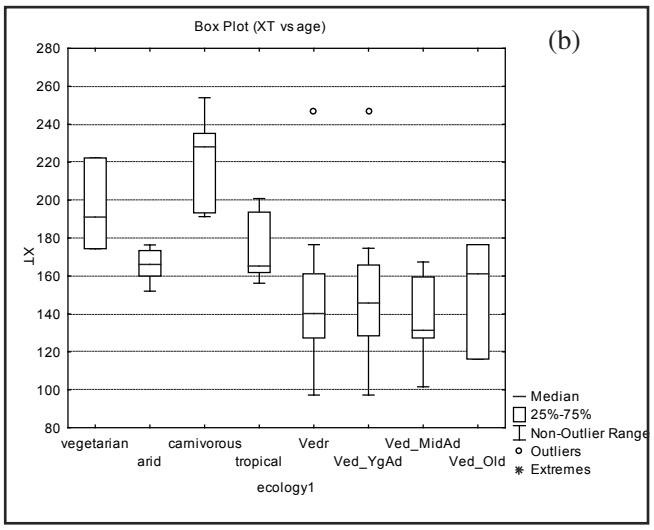


FIGURE 4. Boxplot showing the density of microstriations (NT) (a), and the length of microstriations (XT) (b) and length of horizontal striations (c) observed in the teeth of arid, tropical, vegetarian and carnivorous populations in comparison with the human population from Vedrovice (Vedr) and their age groups (Ved_YgAd: 18–30 yrs, Ved_MidAd: 30–45 yrs, Ved_Old: 45+yrs). The central line in boxes indicates sample median, the boxes include 25 to 75 percentiles and the whiskers represent minimum and maximum values observed.

TABLE 2. Descriptive statistics of all 15 variables in 18 individuals from Vedrovice, Czech Republic.

	Valid N	Mean	Median	Minimum	Maximum	Std. Dev.
NH	18	19.1667	17.0000	6.0000	40.0000	9.7574
XH	18	150.1863	143.5452	100.5705	297.8073	55.6359
STDH	18	126.0477	105.2205	52.4276	220.6767	51.7320
NV	18	29.9444	28.0000	4.0000	60.0000	14.9881
XV	18	160.0692	158.5438	111.5713	236.4386	33.6394
STDV	18	123.6598	123.5157	73.2496	195.0690	31.0916
NMD	18	26.1667	28.0000	7.0000	56.0000	13.5831
XMD	18	119.2044	108.2263	69.6586	178.8341	33.0287
STDMD	18	91.0426	87.7588	39.3129	151.5772	33.4236
NDM	18	10.6667	7.0000	2.0000	41.0000	10.0528
XDM	18	130.4403	118.3843	55.6233	263.3462	58.2187
STDM	18	94.6281	86.7808	31.0619	196.9363	47.9411
NT	18	85.9444	86.0000	59.0000	132.0000	19.1110
XT	18	146.4210	140.2167	97.2348	247.1369	34.1446
STDNT	18	123.9865	118.5446	78.5575	199.3675	29.7524

TABLE 3. Calculated indices for Vedrovice sample (NH = number of horizontal striations, NV = number of vertical striations, NT = total number of all striations).

	NH/NV	NH/NT	NV/NT
22/75	0.3939	0.1368	0.3474
23/75	6.7500	0.4426	0.0656
38/76	0.5152	0.1828	0.3548
42/77	2.3077	0.5085	0.2203
45/77	0.6296	0.2429	0.3857
46/77	0.2400	0.1348	0.5618
57/78	0.4103	0.1212	0.2955
62/78	0.5000	0.1642	0.3284
67/78	1.4167	0.2615	0.1846
69/78	1.0000	0.2658	0.2658
70/79	0.1525	0.0796	0.5221
72/79	0.1500	0.0989	0.6593
76/79	0.1714	0.0800	0.4667
80/79	0.6522	0.1563	0.2396
81a/79	1.2400	0.3735	0.3012
91/80	0.6000	0.2195	0.3659
100/81	1.3793	0.3704	0.2685
101/81	1.5000	0.4045	0.2697

processing as dust, sand or ashes should be also taken into account. However, some of these numerous striations might be also attributed to post-mortem taphonomic processes (Martínez, Pérez-Pérez 2004). By comparing the average striations length (XT) (*Figure 3b*), one-half of individuals (38/76, 67/78, 69/78, 70/79, 76/79, 81a/79, 100/81, 101/81) from Vedrovice approach mixed diet of hunter-gatherer populations from both tropical forest and arid environments with values ranging between 152 to 254 μm. Remaining individuals from the Vedrovice sample had lower values of average length of all striations that ranged between 97 and 140 μm. On one side all these results may indicate abrasive mixed diet in the Vedrovice sample based mainly on plant food; on the other side non-specific additional influences in dental microwear pattern within the Vedrovice sample are not possible to exclude as well.

Vertical striations are more frequent than horizontal ones in carnivorous groups. In the vegetarian group of Hindu population, the percentage of horizontal striations is greater than of vertical striations. In addition, the Hindus' horizontal striations are longer than those of any other group. Not so the vertical ones that tend to be longer in the carnivorous groups. The standard deviations of the lengths (STD) do not give any additional information to the analysis (Lalueza *et al.* 1993). *Table 3* shows the indices NH/NV, NH/NT and NV/NT obtained for all 18 Vedrovice individuals (Note: Increased values of NH/NV index in No. 23/75 overlapped values of comparative populations; in this microwear pattern increased number of horizontal striations might be caused by post-mortem wear or some manipulative techniques used. That is why this individual was excluded from further analysis). On one side these indices show higher values of NV/NT index and low values of NH/NT in four individuals (46/77, 70/79, 72/79, and 76/79) that tend towards more vertical striations such as in a carnivorous group (*Figure 2*), i.e. two from four analysed males (23/75 excluded) and two from thirteen analysed females. On the other side lower values of NV/NT index and high values of NH/NT in female 42/77 show similarity to Hindu vegetarians (*Figure 2*), which refer to predominantly plant food in this Neolithic woman from Vedrovice. Remaining individuals from Vedrovice show variability range within groups of the hunter-gatherers with mixed dietary habits (Veddahs and Andamanese from tropical environments and Bushmen, Tasmanians, and Australians from arid areas). In spite of these findings, conclusions based only on these indices are too simplified and do not wholly explain eaten food. Other variables such

TABLE 4. Analysis of variance of the 15 variables studied in human populations. Nine of fifteen variables show significant inter-group differences at a 0.05 level of significance (marked with asterisk).

	F	Sig.
NH	8.901	0.0**
XH	2.356	0.073
SDH	3.038	0.03*
NV	2.759	0.043*
XV	10.544	0.0**
SDV	1.685	0.176
NMD	8.120	0.0**
XMD	6.620	0.0**
SDMD	0.751	0.564
NDM	2.392	0.07
XDM	3.591	0.015*
SDDM	0.866	0.494
NT	16.386	0.0**
XT	10.139	0.0**
SDNT	1.120	0.363

as length of striations and their density are necessary to be taken in account by inferring dietary habits.

Non-parametrics Kruskal-Wallis ANOVA for 15 variables gave statistically significant sex-related differences within the Vedrovice population in length of horizontal striations (XH: p=0.0546). Females from LBK phase of this cemetery exhibit an increased length of horizontal striations of microwear pattern (mean values of XH=162.9 μm; median: 153.8 μm; with range 104.9 to 297.8 μm) in comparison to males (mean XH=117.2 μm; median: 102.6 μm; with range 100.6 to 164.3 μm). Moreover, higher values of XH in females partly overlap with the values reported for vegetarian Hindu farmers (*Figure 3c*), so that sexual dimorphism in dietary strategy with predominance of vegetal food intake in females in comparison to male population might be hypothesized. No other statistical differences were found within male and female samples. Density of microstriations (NT) was 85.5 in females and 87.2 in males, whereas females exhibit an increased average length (151.8 μm) in comparison to male population (XT=132.4 μm) (*Figure 3a, b*). As it has been proved in previous studies (Pérez-Pérez *et al.* 1994), the total number of striations increases with age (*Figure 4a*). Non-parametrics Kruskal-Wallis ANOVA for 15 variables gave no statistically significant age related differences within the adult population from Vedrovice. The average length of all striations should increase in younger groups, and decrease in elders (Pérez-Pérez *et al.* 1994), but this finding has not been confirmed within the Vedrovice sample (*Figure 4b*). Within this Neolithic sample the group over 45 yrs reached higher values of XT, whereas age group between 30–45 yrs had the lowest XT values at all. Adults under 30 years ranged between values of these two groups.

Using one-way ANOVA nine of fifteen variables of the buccal microwear patterns in the Vedrovice sample differed significantly among groups (*Table 4*). The Bonferroni post hoc test within ANOVA (*Table 5*) shows that the Vedrovice population through its dietary habits is most similar to the tropical and arid populations, whereas carnivorous vs. Vedrovice present the most distinct group of all. Thus generally, high meat intake in diet was excluded and mixed diet with predominance of cereal/vegetal meals in Vedrovice sample was confirmed.

To illustrate further populations' affinities based on buccal microwear pattern, a joining tree-clustering (Euclidean distances, complete linkage) of 15 variables

TABLE 5. 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 groups where differences have been detected are presented.

	Vegetarian vs carnivorous	Vegetarian vs Vedrovice	Arid vs carnivorous	Arid vs Vedrovice	Carnivorous vs tropical	Carnivorous vs Vedrovice	Tropical vs Vedrovice
NH	**		*		**	**	
XH							
SDH						*	
NV							
XV	**		*		*	**	
SDV							
NMD		*		*		**	*
XMD						**	
SDMD							
NDM							
XDM						**	
SDDM							
NT		*	**		**	**	
XT			**			**	
SDNT							

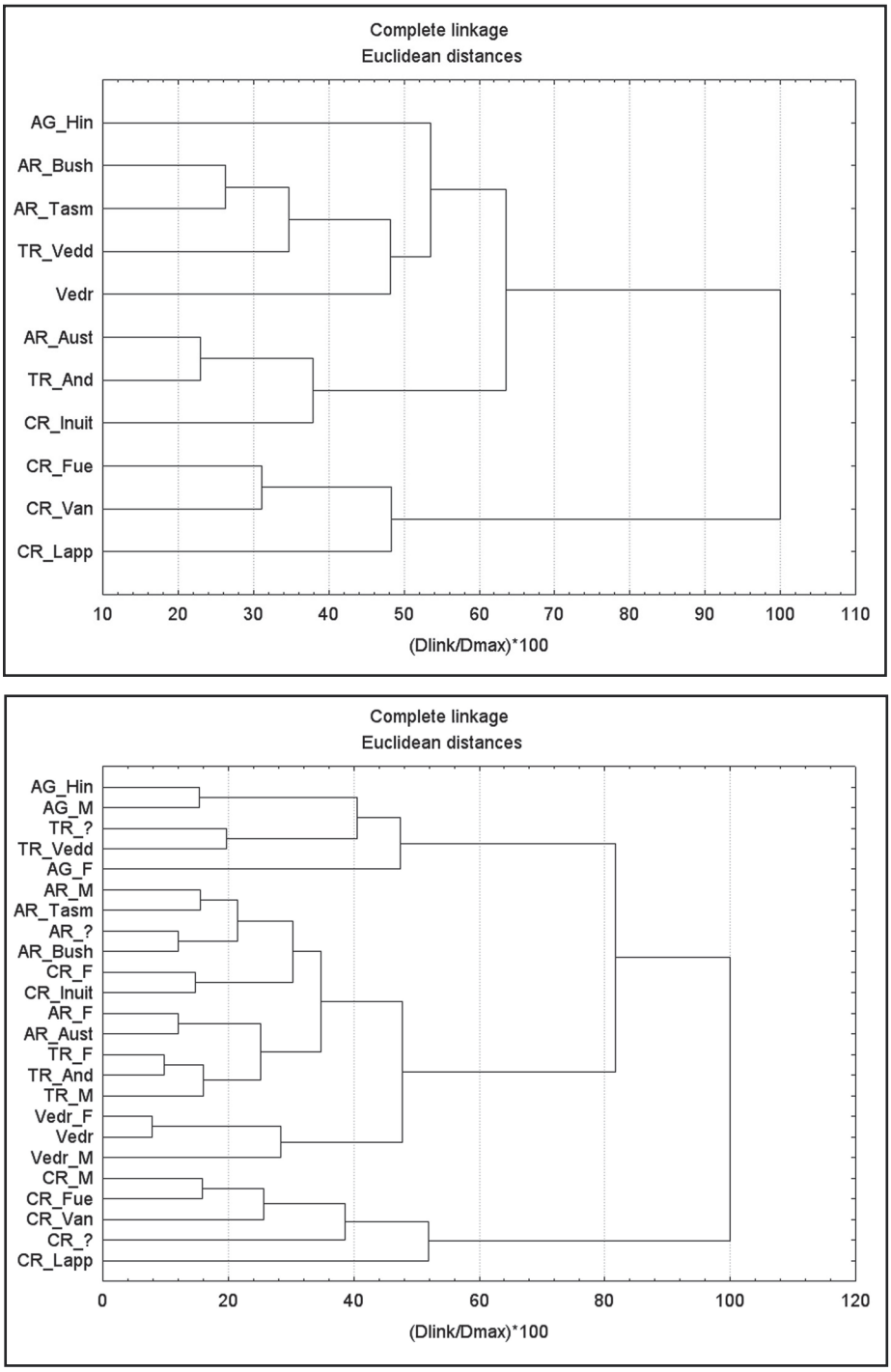


FIGURE 5. Joining tree-clustering (Euclidean distances, complete linkage) – final configuration of recent studied populations in comparison with Vedrovice (a) and female and male population within studied groups. Symbols for studied samples: AG_Hin = Hindus (vegetarian agriculturalists), populations 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 = Inuits, CR_Van = Vancouver islanders, CR_Lapp = Lapps.

has been performed and *Figure 5* shows the cladogram obtained. When a closer clustering of groups would indicate likenesses in abrasiveness and composition of eaten food, then the Vedrovice group shows on one side similarities with the arid group of Tasmanians and Bushmen, tropical Veddahs and vegetarian Hindu agriculturalists; on the other side great dissimilarities with carnivorous populations (*Figure 5a, b, Table 6*). An extensive research of 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 the supposed early agriculturalist subsistence pattern, based mainly on cereal consumption as confirmed recently via trace elements analyses and stable isotope results (Richards 2007, Smrčka 2008).

Early food-producing

Detailed analysis of the Neolithic plant and animal remains from Vedrovice does not exist, but there are a

TABLE 6. Means and standard deviations of joining tree-clustering according to groups and sex. Symbols for studied samples follow *Figure 5*.

	Mean	Std. Dev.
AG_Hin	98.0200	68.29185
AG_F	105.1600	82.18897
AG_M	94.1800	61.79818
AR_M	97.0867	56.35983
AR_F	92.5933	57.61808
AR_?	98.7333	64.03799
AR_Bush	102.9333	64.79020
AR_Tasm	96.6267	59.30458
AR_Aust	89.0200	54.35600
CR_F	91.6333	70.07356
CR_M	110.5467	85.11164
CR_?	128.7000	97.12815
CR_Fue	110.1067	85.52176
CR_Inuit	90.3933	67.56248
CR_Van	117.0267	90.94234
CR_Lapp	106.9667	83.93140
TR_F	90.7800	56.01744
TR_M	89.9933	57.23195
TR_?	114.5400	70.65103
TR_And	85.9800	53.19638
TR_Vedd	108.2067	68.76362
Vedr_F	97.9602	53.31308
Vedr_M	90.3216	46.66683
Vedr	95.8383	50.92810

few localities within Central Europe, where this research was undertaken and from which it is possible to assume subsistence methods associated with the onset of early agricultural practices. The domestication of plants and animals begun probably in the Mesolithic peoples, and resulted in the establishment of permanent villages based on cultivation of a narrow range of cereals, both wild and domesticated, which included einkorn wheat, millet and spelt, raising of cattle, sheep, goats, and pigs, and using of pottery. In other words, this relatively increased periodical starch and protein income resulted in dietary changes and overall impact on early social development – increased population density, decreased population mobility, and increased close proximity to domesticated animals. On the other side, these relative benefits caused difficulties in the increase of various diseases.

Diet in Vedrovice

Soft or slightly abrasive mixed food, based likely on plant sources, was found out within the Vedrovice sample. This confirms dependence mainly on vegetal/plant food with certain amount of silica phytoliths, i.e. probably some kind of cereals that began to be cultivated during the early agricultural period. In five individuals one could detect higher abrasiveness of food or some additional influences related with food preparation technology associated with early agriculturalist techniques. Other influences in food processing as erosive agents should be also taken into account.

Sex-related differences within Vedrovice were detected in dietary strategy related to a predominance of vegetal food intake by females in comparison to the male diet. Age-related variability in dental microwear pattern was detected as well, but without statistical significance. During the Neolithic period, eating of meat was inferred only in several individuals within the Vedrovice sample, but it was not possible to estimate the sort of consumed meat; we can only assume presence of meat that was eaten by both males and females. In all, it is possible to conclude that diet in the Neolithic Vedrovice sample was mostly vegetarian in its character and consisted mainly of some grain-based components, whereas meat was eaten only sporadically.

Additional indirect information concerning diet can be deduced from average adult stature, median lifespan (yrs), infant mortality, investigation of health, diseases, and death circumstances of skeletons present within the Vedrovice sample, and by comparing these data to other Neolithic samples (i.e. from the Balkans, Ukraine, etc.) and most of all to the earliest Palaeolithic and Mesolithic periods, when nomadic hunter-gatherer subsistence techniques such as hunting, fishing, and food-gathering were main sources of food.

CONCLUSION

The analysis of buccal microwear pattern, carried out on Neolithic individuals from the Vedrovice cemetery, indicates plant foods of some cereal-based components with the presence of silica phytoliths. In most cases soft or slightly abrasive food was detected. Furthermore, in females a tendency to predominance of plant/cereal intake could be proved. In several individuals also meat consumption was inferred, but these findings are in minority. The microwear pattern observed is in accordance with the expected results, and contributes to the knowledge of buccal microwear pattern for early agricultural populations.

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