

Anthropological analysis of Celtic graves from Brežice and Dobova (Slovenia)

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The discovery of ancient cultures in the Krško field began with intense excavations of Late Iron Age tumuli at the end of 19th century (Velike Malence, Libna, Sajevice). Individual objects from the La Tène period, i.e. of Celtic provenience, were discovered at hillforts like Stari Grad above Podbočje and Dunaj above Krško, but also among the graves from Velike Malence. The post-World War II period saw a distinct rise in archaeological excavations with the founding of the Museum of the Posavje Region in Brežice in 1947. A year later, in 1948, the museum received the first Celtic graves from Brežice at the 'Sejmišče' location and other neighbouring sites: Dobova, Veliko Mraševo, Žadovinek near Krško, and the most recent Čateški grič, researched during a three-year campaign from 2000 to 2003.

The Dobova plain with its numerous archaeological sites encircles a gravel terrace between the rivers Sava and Sotla, with the area of Brežice being the point of narrowest passage from the pre-Alpine region to the Pannonian plain. The settlement continuity is demonstrated by a vast necropolis from the Late Bronze Age, a Celtic cemetery, Roman period housing remains with cremated and inhumation graves, and old Slavic inhumation burials.

The first archaeological finds (bronze items from the Dobova area) appeared in 1950 during construction work on the railway embankment Dobova – Kumrovec and gravel-digging in the Dobova plain.

Although the cemetery was already partly damaged, Francè Stare lead the excavations uncovering

more than 420 graves with cremated human remains from the Late Bronze Age (Urnfield culture), while several old Slavic inhumation graves were found at the location 'Na gomilicah' during a ten-year period, from 1951 to 1961 (F. Stare 1974). Numerous graves with cremated human remains from the Roman period were researched by Peter Petru in 1961 in the vicinity of the abovementioned Urnfield culture necropolis, while a well, part of a Roman settlement, was discovered during gravel-digging in 1975. Francè Stare excavated some test trenches in the adjacent Sela and discovered some skeletal graves with grave goods from the Early Middle Age.

The first graves of the Celtic necropolis were discovered in 1962 and 1966 in the field called 'Kosovka', property of Jože Bosina and Jože Vogrinc, during the construction of outbuildings, i.e. during the digging of gravel at the northern edge of Dobova near the road towards the village Veliki Obrež, less than a kilometer from the cemeteries 'Na Gomilicah' and Sela.

Of the seven unearthened graves two were subsequently deposited in the Museum of the Posavje Region. Due to the precious grave goods, the exceptional preservation of their iron items and ornaments, they are both considered exceptional in the inventory of the Celtic material culture in Slovenia. Stanko Škaler also reported on random Celtic findings in 1968 – La Tène period spearheads from Anton Blažinič's gravel pit in Rigonce and a La Tène period long sword found in the gravel pit on plot 804 c.p. Veliki Obrež.

During 1979 and 1980 systematic excavations by Mitja Guštin for the Museum of the Posavje Region were carried out in the field 'Kosovka', in the vicinity of Jože Bosina's house. 25 graves with cremated human remains were found on this site, all dated to the 3rd and the 2nd centuries BC. Some warrior graves with swords and several female graves were published, while a monograph publication of the graves is still in preparation.

Oval or round grave pits found only 0.3 m under the surface were buried in the gravel foundation. Warrior graves with equipment were buried between 50 and 140 cm deep; weapons, especially swords, were purposely bent and damaged, with traces of fire. Grave goods from female and child graves were more modest and their grave pits shallower (30-70 cm). The cremated remains of deceased persons were placed at the bottom of the pits (maybe in a sack), with pieces of jewellery (fibulae, bracelets, rings), accessories (fibulae, belt rings, razors, knives), arms and ceramic vessels appearing as grave goods.

The research revealed a double grave of a male and female person (grave 5), and a triple burial of a woman, man and child (grave 10). During the excavation it was noticed that specific objects were laid or wrapped in textile, the traces of which could still be seen on the surface of some objects. The grave goods often included a set of three vessels made of fine grey fired clay; frequent findings are biconic vessels with wide orifice, as well as biconic pots and cups. Grave goods also included animal remains, mostly represented by the right forefoot and the right lower jaw of a domestic pig (*Sus scrofa domestica*, L.) and by the bones of a hen (*Gallus gallus*, L.).

Male graves no. 1, 2, 6 and 10 belong to the Lt C1 period. Lt C2 period graves are the grave of a male person no. 23, the grave of a female person no. 26, and the double grave 5. The Lt D1 period and the termination of burials are represented by the female graves no. 15 and 22.

The Celtic cemetery at the 'Sejmišče' location in Brežice lies at the bottom of two gravel terraces above the left bank of the river Sava, not far from its confluence with the river Krka. Traces of Bronze Age and Early Iron Age settlement were documented in the

vicinity, presuming a continuous colonisation with a settlement corresponding to the Celtic necropolis at the former bedn of the river Sava.

The first grave with cremated human remains was unearthed during the construction of a veterinary station in 1948, and another during the main plumbing renovation in 1954. Due to the scheduled earthworks on the site, the Museum of the Posavje Region carried out extensive archaeological rescue excavations, directed by Mitja Guštin, in the summer of 1981 and the spring of 1982 when 60 new graves were found. New excavations took place in 1997 (directed by Alenka Jovanović) with 11 new graves revealed, and in the spring of 2011 with 30 more graves.

Graves no. 1, 2, 6, 49 and 55 were published, Alenka Jovanović elaborated the scientific discoveries until the year 1997 in an exhibition catalogue (Jovanović A. 2007) and in her masters thesis entitled *The Celts in the Posavje Region* (Jovanović A. 2006).

The oval or round grave pits were mostly buried in the river gravel, very exceptionally in the thick humus layer which was 0.7 m thick in certain parts because of the embankment.

The iron parts from a two-wheeled warrior cart were an exceptional discovery at the site (Guštin, 1984b). Personal equipment and elements of the cart were bent and placed at the bottom of the grave pit, together with the charred bones of an adult male person and animal bone fragments. Their mixing indicates that the deceased - the driver was probably burnt while on the cart.

This paper compares the anthropological findings from two Iron Age sites, i.e. Brežice-Sejmišče and Dobova - Kosovka, partially also amending the old analyses with new results and information. New methods include the microscopic determination of age at death and sex. Only a complete anthropological and demographic analysis, together with analyses of animal remains appearing as grave goods, enables us to understand and explore the living conditions, customs and events during this period.

Methods

Morphometrical and morphological analyses of cremated human remains were undertaken by a procedure that is partially applicable to analyses of inhumation

burials (Bass, 2004; Ferenbacher et al., 1980; Scheuer et al., 2000) for the material from Brežice - Sejmišče.

Temperature range for each grave specimen was determined (Schmidt 2008; Walker et al. 2008) according to the specific colour expressed by Munsell designation (2000) for both sides.

Estimation of sex and age at the time of death for a person was completed by modified microscopic method by Kerley (1965; 1968) and for the majority of graves by using the regression formula. All calcified samples, i.e. specimens burnt at temperatures exceeding 900°C were excluded from the selection of the most suitable fragments of femoral diaphyses. The further selection of samples suitable for microscopic preparation includes the measurements of long bone thickness (Kleppinger, 2006; Schmidt, 2008). Femoral bone specimens were then sectioned on a precision cut-off machine 'Minitom' (Struers, Denmark) and polished on Labopol-1 (Struers) before being fixed on a microscope slide. By involving microscopic analysis and using electron microscopy in research it was possible to determinate the sex for 30 samples.

Macroscopic methods for animal samples provide identification of anatomical elements and determination of species, genus or family (Schmidt 1972; Driesch 1976; Cohen et al., 1986; Hillson 1992; France 2008). In the case of very fragmented burnt animal samples microscopic analysis was applied (Kerley 1965; 2006; Hincak et al. 2007).

All microscopic slides were unstained. Light microscopic analysis is performed under magnifications given by protocol (Olympus, CX41RF). Photomicrographs were made by digital camera (Olympus 5050-Zoom). All histological slides were prepared from human femoral or humeral bone fragments, or fragments of animal long bones from the samples.

Pathological conditions on the bones were identified and described with diagnosis (Ortner et al. 1985; Aufderheide et al. 1998; Mann et al. 2005).

A high portion of the graves from Brežice-Sejmišče can be attributed as Celtic in origin. A demographic analysis was undertaken after the anthropological analyses (Acsadi et al. 1970; Swanson 2004).

Results

The Celtic necropolis in Brežice-Sejmišče

The cremated bones recovered from 68 cremation graves from Brežice-Sejmišče were examined for identifiable bone fragments. The complete filling of the grave pits (100 % specimen) was processed under flotation procedure and each specimen was marked. After measuring the total weight of specimens and each burnt specimen separately, human samples were separated from animal ones for each grave. Sex and age at death for each person were estimated by macroscopic determination of human osteological remains. The results mostly depend on the degree of sample preservation and procedure for determining human remains (Ferembach et al. 1980).

The average mass of burnt human remains is between 300 and 400 g.

In cases of heavier fragmentation or calcified samples due to high temperatures, it was not possible to determine age at death of a person more precisely, besides determining the anatomical elements and estimating the sex for each grave sample.

Together with human cremated remains the burnt animal remains from the same site were identified. The majority of animal bone fragments was already analyzed in 1998 (Dirjec 1998; Malez 1986), but almost all the cremated human remains also contained fragments of burnt animal bones. Moreover, the unburnt animal remains from graves 42, 43, 45 and 46 were also analysed. The total mass of burnt animal bones weighed approximately 600 g.

The Celtic necropolis in Brežice-Sejmišče comprised 62 persons from 60 graves: 58 individual and two double graves. It was possible to determine the remains of 27 female and 27 male persons, as well as 5 children, mostly with the use of the microscopic method of analysing sex and age at death (**fig. 1**). The juvenile group (15-19 years) has three undetermined persons.

Grave 44 was determined as a grave, but instead of human remains it only contained the remains of a young pig (*Sus scrofa sp.*). Graves 70 and 23 only contained few fragments of burnt human bones, while the other burnt anatomical elements belonged to a younger pig.

The human material from all graves was completely cremated. The colour of burnt bones varied from grey, white yellowish, to white, and white with a pink undertone. A higher degree of burning was detected for particular anatomical elements or skeletal areas, e.g. parts of the cranium, facial bones, temporal bone, but others also showed complete burning. Fragment preservation was medium to moderate medium; therefore, it was hard to deal with bone fracture biomechanics and distinguish fractures on common skeletal areas due to high temperature performance from fractures of other etymology.

Specimen undertones were recorded by Munsell classification. It describes undertones of the analysed specimen from grey or brown to the pure white colour (Munsell: GLEY 2 4/5PB, 2.5YR 4/1, 2.5YR 3/1). Frequently the colour of burnt bones from this site is light grey to white (Munsell: 2.5YR5/1, 2.5YR6/1, 10YR8/2, 2.5Y7/1, 5Y6/1, 5Y7/1), for very high temperature white colour with an almost pink hue (Munsell: 2.5YR7/1, 2.5YR8/1).

The majority of human bone fragments shows characteristic 'burning' deformations, indicating that the body was still fleshed when placed on the pyre.

Due to sample fragmentation it was only possible to identify the basic characteristics of some anatomical elements and to use morphometrical analysis for determination of sex at death, but also to calculate the body height from the diameter of the femoral (*caput femoris*) and humeral head (*caput humeris*). Body height was calculated for two females. Body height ranged from 150-154 cm (grave 34) and belongs to a group of short statures, while the woman from grave 68 with

body height range from 160-164 cm belongs to a high stature. Body stature of males was presented with four samples. Body height for a male person from grave 10 was calculated by measuring the diameter for both femoral and humeral heads. This person had a short stature within a range from 161-165cm. Male persons from graves 21, 29 and 45 had a medium stature within a range from 166-170 cm.

Dental material was poorly represented and dental remains include mostly enamel and root fragments.

Pathological changes were detectable on the skeletal remains of four persons. Three of them had the presence of depressions on the vertebral bodies (*corpus vertebrae*) that could be seen by the naked eye. In a female from grave 15 such lesions exist in both superior and inferior endplates of vertebral bodies between the last thoracic and last lumbar vertebra (T₁₁-L₅). Vertebral bodies of male persons affected with depression markings are not so numerous. A specific lesion could be seen on the first lumbar vertebra (L₁) of the skeleton in grave 21, while the person from grave 47 presented the same specific lesion on the 11th thoracic vertebra (T₁₁). Diagnosis is Schmorl's node.

The vertebral column of a male person from grave 25 demonstrates small rounded protrusions at two adjacent bodies of lumbar vertebra (L₄-L₅). The diagnosis of such moderately raised irregularities along the margins of the body is vertebral osteophytes (*osteophytosis vertebrae*).

After examining the skull from grave 21 it was possible to see fine pitting - bone porosity on the upper surface of the orbits. The person was affected with *cribra orbitalia*, cribriotic type (2nd degree).

	Sex	Indefinable		Females		Males		Total	
	Age	N	%	N	%	N	%	N	%
Infans	0-14								0
Juvenilis	15-19	3	5	7	12	4	7	14	25
Adultus I	20-29			10	18	7	12	17	30
Adultus II	30-39			9	16	11	19	20	35
Maturus I	40-49			1	2	4	7	5	9
Maturus II	50-59					1	2	1	2
Senilis	60+								0
Undecided									0
Total		3	5	27	47	27	47	57	100

Figure 1
The distribution of the population according to age and sex categories of site Brežice-Sejmišče.

With the better preserved bone samples from graves it was possible to analyse the physical activity of individual persons. For female persons it is possible to claim that the majority of main muscle attachments were well developed. Moreover, it is possible to describe a female person with strong development of muscle attachments at the upper part of body, while attachments of legs muscles were also strongly developed. Male persons could be divided into *hypermasculinum* and *masculinum* group by the development degree of muscle attachments. Both groups show balanced development of bilateral muscle attachments, mostly major muscle attachments on hands, arms and legs.

Demography

To reconstruct the structure of the population buried in the necropolis at Brežice – Sejmišče the two parameters were used: sex and age of persons.

Figure 1 provides the distribution of the population according to age and sex, with values for all age groups from *infans* to *maturus II* phase. The *infans I* group, which comprises the age range from birth to 7 years, includes the remains of five children (8 %).

The juvenile group follows with age range from 14-19 years. It was hard to identify sex for all specimens in this group. However, it was possible to determine sex for 11 of 14 samples, seven female and four male persons (23 %).

The age ranges of the older groups could be divided into shorter, five-year spans. Within the early phase

of *adultus I* (20-25 years) it was possible to identify the remains of five females and three males. Three samples, remains of one female and two male persons were identified in the wider range, *adultus I* (20-29 years). All specimens of *adultus I* phase comprised 26 % of total specimen. The next most numerous group is *adultus II* (30-40 years) with 32 % of frequency. The early phase of this group (30-35 years) comprises seven females and three males. In the later phase of the same group (35-40 years) remains of four male persons were identified.

Maturus I group (40-50 years) includes remains of four persons, a female and three male persons (6.4 %). A female and male person were identified as part of the earlier phase (40-45 years), while remains of two male persons belonged to the later phase of the *maturus I* group (45-50 years). Finally, only one sample, the remains of a male person, was identified in the *maturus II* group (50-60 years) with 4.6 %.

The mortality of adults was also analysed according to decades of age at death (**fig. 2**). Characteristic for female samples is that the highest mortality rate is in *adultus I* phase (18 %), between 20 and 30 years. In the earlier *juvenilis* phase (15-19) the predominance of female samples is also self-evident (12 %). The later phase *adultus II* demonstrates an apparent remission in the prevalence of female samples (16 %), which decreases significantly to 2 % in the next *maturus I* phase (40-50 years).

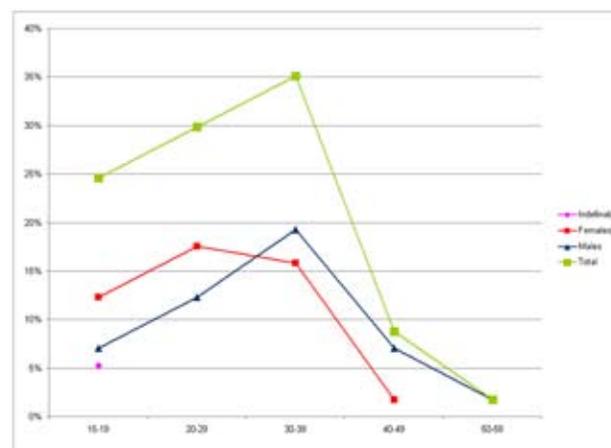
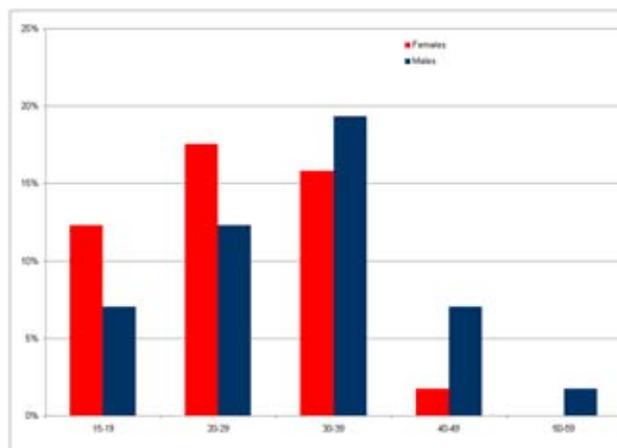


Figure 2
Distribution of deads by age categories of site Brežice-Sejmišče.

Age	D_x	d_x	l_x	q_x	L_x	T_x	e_x
15-19	14	24,56	100	0,246	877,19	1833,33	18,33
20-29	17	29,82	75,44	0,395	605,26	956,14	12,67
30-39	20	35,09	46,61	0,769	280,70	350,88	7,69
40-49	5	8,77	10,53	0,833	61,40	70,18	6,67
50-59	1	1,75	1,75	1,000	8,77	8,77	5,00
	57	75,44					

Legend: D_x -the number of persons died at age x , d_x -number of deaths in percentage, l_x -survivors, q_x -probability of death, L_x -total number of year (all individuals) between x and $(x+n)$, T_x - total number of years for population, e_x -life expectancy.

Figure 3
Life tables of site Brežice-Sejmišče.

The highest rate of male mortality extends through the age phase of *adultus II* (30-40 years) with 19 %. During the earlier phases from *juvenilis* (15-20 years) to *adultus I* phase (20-30 years) the prevalence of male samples rises, from 7 % and 12 % to the peak in *adultus II* phase. Later phases show a remarkable decrease, in *maturus I* phase to 7 % (40-50 years), and in *maturus II* phase the prevalence of male samples falls to barely 2 % (50-60 years). For three specimens in the *juvenilis* group (15-19 years) sex determination was not identifiable.

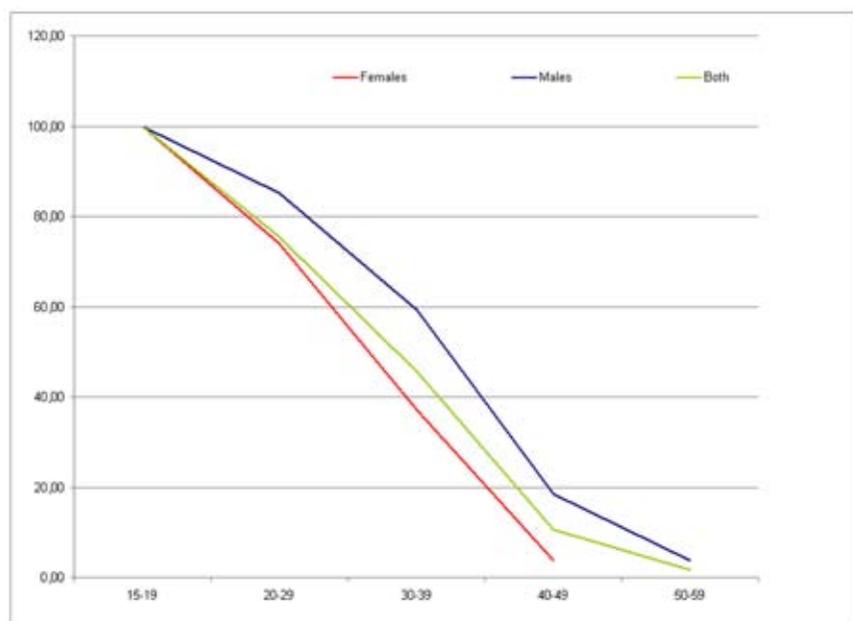


Figure 4
Survivors (l_x) of site Brežice-Sejmišče.

Beside the distribution table of the population, a life table and separate life tables for males and females were made. Life tables comprise several elements represented in the legend (fig. 3). The fundamental values are l_x - survivors, q_x - probability of death and e_x - life expectancy, explained separately in graphs.

Children were not taken into account because of their unrealistic number, just five in the phase *infans I* (0-7 years), therefore, the results were applied only for adults.

Curves of survivors for both sexes show a significant divergence (fig. 4). For female survivors the curve slopes mildly during juvenile (14-19) group, but in the next one, *adultus I* (20-29) females have a slightly higher percentage for every age period than males. *Adultus II* phase (30-39 years) is a breaking point for female survivors after which the curve acquires a uniform, very steep trend until the *maturus I* phase (40-50 years).

Male survivors have better results and a better survivorship rate than females (fig. 4). It is possible to fractionate a curve into several phases. In the *juvenilis* (15-19 years) and *adultus I* groups (20-29 years) the curve is gentler than in other phases. The curve of *adultus II* (30-40 years) and *maturus I* (40-50 years) groups are mostly oblique with a swift decline. The extended curve to *maturus II* group is more flattened out.

The curves for both female and male samples shows slight changes within values for male and female samples.

Values representing probability of death (fig. 5) are in logic relation to the percentage of survivors (l_x). A higher value for probability of death means smaller

values of survivors (l_x). The curve for female and male samples shows a higher possibility of death in *adultus I* (20-29 years) and *adultus II* groups (30-39 years).

Average life expectancy values for males are slightly higher than for females in all groups (fig. 6). Females in *juvenilis* age group (14-19 years) were expected to live, on average, for only 16 years, while a male in the same age group lived for 21.5 years more. Values of e_x for both sexes drew closer in the *adultus II* (30-39 years) and *maturus I* groups (40-49 years).

Animal remains as grave goods

Unburnt animal remains were present as grave goods in four graves.

Double grave 46A and 46B with a burial of a male and a female person included the remains of a wild boar (*Sus scrofa ferus, L.*). Remains include bones of the right front leg and left hind leg. Fragments of the skull are not numerous, fragments of the basolateral part of the occipital area (*os occipitale*), fragments of the right upper jaw (*mandibula*), and both left and right lower jaw (*mandibula*). The animal specimen was about one year old, with a body mass range of 30-35 kg, while body height of withers reached approximately 50 cm.

Grave 45 of a male person also included remains of a wild boar (*Sus scrofa ferus, L.*) and bird (*Aves*), more particularly a hen (*Gallus gallus, L.*), beside human remains; more precisely the bones of the left leg and part of left wing. Remains of the wild boar (*Sus scrofa ferus, L.*) comprised fragments of the left hind leg and fragments of the left front leg. Other samples were a severely damaged vertebral fragment and a fragment of the right part of the lower jaw (*mandibula*). From represented samples it was not possible to determine the sex of the animal. The age at death of the animal did not exceed six months, while the body mass reached approximately 15 kg.

Grave 42 of a young female person comprised unburnt remains of a wild boar (*Sus scrofa ferus, L.*) and a bird, in type of a hen (*Gallus gallus, L.*). Wild boar remains include bone fragments of a hind leg, femoral bone (*femur*) of both left and right side with part of right calcaneus bone (*calcaneus*). Bone samples of a right front leg are better preserved. From represented

samples it was not possible to determine the sex of the animal. The age at death was in range between six to eight months; body mass approximately 40-50 kg, while body height of withers reached 30-40 cm.

Cremated animal bone remains display similar colours as the human remains from the same site. Most fragments represented here were analysed by microscopic method of analysis (fig. 2). Figure 7 presents the abundance of cremated animal remains determined on site. With 41 % of total bone remains pigs (*Sus scrofa sp.*) were the predominant animal on site. Due to heavier fragmentation, 30 % of samples were not detectible. These are followed by bone fragments of cattle (*Bos sp.*) with 14 % and remains of small ruminants, i.e. sheep, goat or roe deer (*Ovis aries, L.*, *Capra hircus, L.*, *Capreolus capreolus, L.*) with 11 %. The smallest is the group of bird remains with only 4 %.

In nine graves very specific finds of wild boar (*Sus scrofa ferus, L.*) male individuals were found - small fragments of mandibular canines of adult animals were mixed with other burnt animal bones (graves: 3, 4, 12, 15, 21, 30, 39, 46, 47). Exceptional was the find of two premolar teeth from a dog (*Canis familiaris, L.*) in male graves 3, 21 and 39.

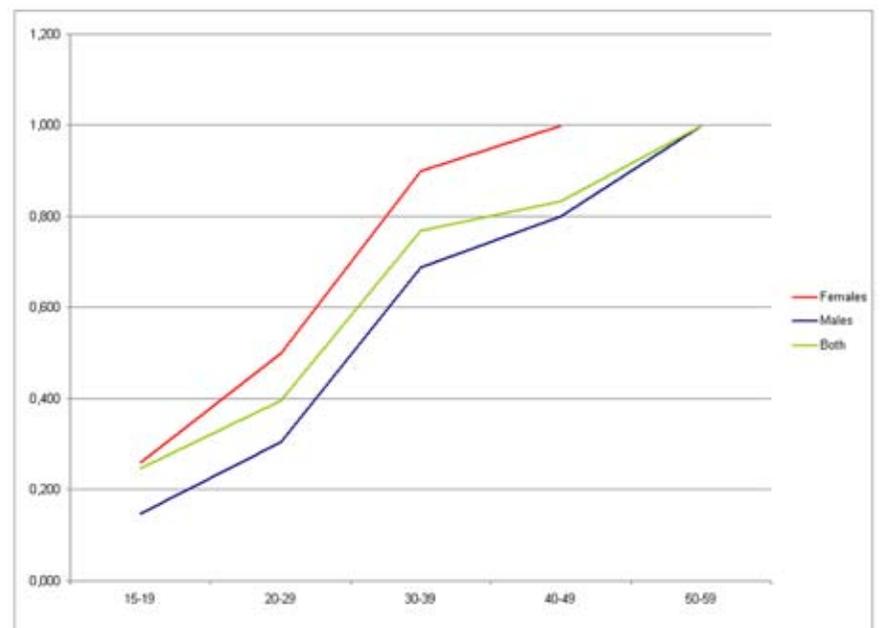


Figure 5
Probability of death (q_x) of site Brežice-Sejmišče.

The Celtic necropolis in Dobova - Kosovka

Burnt human bones from the Dobova - Kosovka site were analysed by Marija Štefančič (1982). The analysis had given the best possible results for the macroscopic method of research, together with calculations of stature. We used additional microscopic methods for determination of age span at the time of the death, so samples of femoral and humeral diaphyses from nine graves and one additional sample were processed.

The animal remains appearing as grave goods had previously been investigated by Ivan Turk (1978), but contemporary advanced methods were used during this analysis in order to determine age and speciation more precisely.

Nine grave samples and one isolated sample (N73) were analysed by microscopic method for age determination.

The material was in good condition, especially the samples for microscopic analysis. A high degree of specimen preservation was crucial; in two cases it included fragments of humeral diaphyses, while for other grave samples, diaphyseal fragments of humeral bone were used. A specific situation emerged during analyses of the triple grave 10. The material from part

of grave 10 marked as 'pod skledo' (*under the bowl*) was predominantly from a child, but four long bone fragments were from an adult person aged 30-39 years (**fig. 8**). Due to the heavy fragmentation, it was not possible to detect whether these fragments belonged to the female or male person from grave 10. Human remains from six graves were not preserved enough for microscopic analysis, or the remains were from anatomical elements unsuitable for this type of analysis. Material from grave 16 was well preserved and pointed to an individual under 20 years of age, but it was not possible to affiliate the individual to any of the higher precision groups of *infans I*, *infans II* or *juvenilis*.

For the majority of samples presented in **figure 8** it was possible to carry out sex determination with new methods (graves 10a, 10b, 18, 24, 27, 28). Samples from graves 4, 5a, 16 and 19 were determined with high probability.

Grave 7 was determined as a grave, but instead of human remains it contained solely remains of a young pig. More precisely, it comprised fragments of the tibial bone (*tibia*) with non-ossified epiphyseal parts, together with distal parts of the femoral bone (*femur*). At the time of death the animal was not older than six months.

The colour of burnt bones varies according to anatomical element and its position on the funeral pyre, but also from the stature and body mass of the deceased person. Human material from every grave was burned completely. As for human material from graves from Brežice it is also possible to detect the degree of burning by observing the colour of anatomical elements, or more precisely, the skeletal areas. Epiphyseal parts of long bones, together with vertebral bodies, pelvic and palmar areas of the fist are often coloured darker than other areas (Munsell: 10R2.5/2, GLEY 2 4/5PB, 2.5YR 4/1, 2.5YR 3/1). Frequently, the colour of burnt bones from this site is light grey, brownish to white (Munsell: 2.5YR5/1, 2.5YR6/1, 7.5YR6/1, 7.5YR 7/1, 10YR8/2, 2.5Y7/1, 5Y6/1, 5Y7/1). If the sample was exposed to very high temperature, the colour of the sample will reach white colour with an almost pink undertone (Munsell: 2.5YR7/1, 2.5YR8/1).

Pathological changes were detected on the body of the second lumbar vertebra (*corpus vertebrae*)

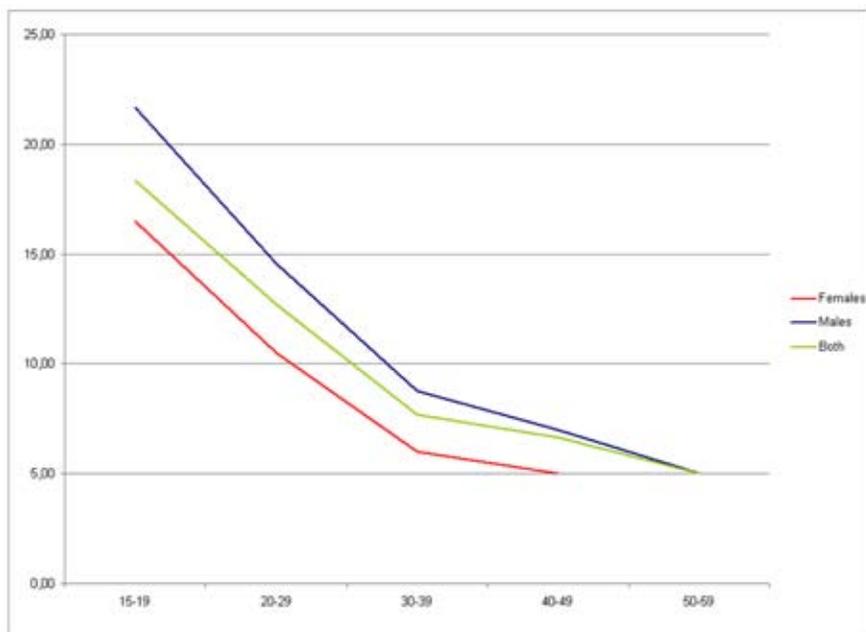


Figure 6
Life expectancy (e_x) of site Brežice-Sejmišče.

of a female aged 30-39 years (grave 10a). Changes represent intraspongious herniation without crossing of the *annulus fibrosus*. Such pathological condition refers to Schmorl's disc herniation, or intraspongious vertebral herniation.

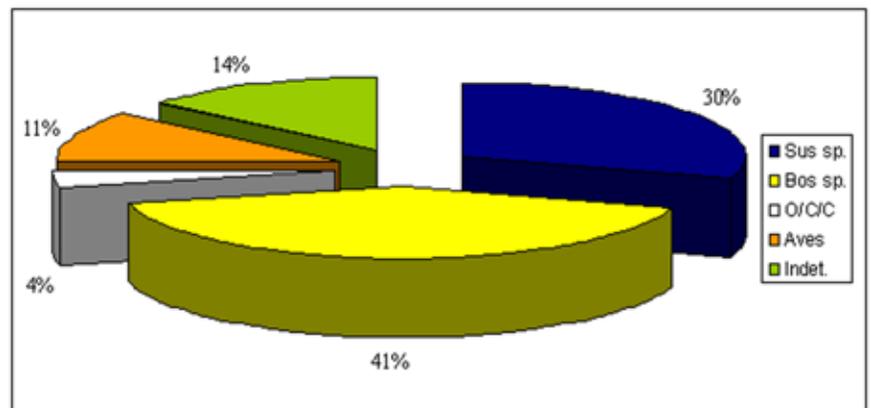
Animal remains as grave goods

Unburnt animal remains pertain to a pig (*Sus scrofa* sp.) in more than 99 % of fragments. Fragments of other animal species are rare. Goat (*Capra hircus*, L.) and domestic cattle (*Bos taurus*, L.) were documented with fragments of a horn (*cornua*) and a frontal bone (*os frontale*). Bones of birds (*Aves*) were more common and were present in five graves (10, 5a, 20, 21, 26, 28), mostly with fragments of the tibio-tarsus, distal parts of the humeral bone and carpo-metacarpus, in some samples also coracoid and scapular bone.

Special attention was given to unburnt bones of a pig (*Sus scrofa* sp.), which are present in fifteen graves (5b, 9, 10, 12, 15, 16, 19, 20, 21, 22, 23, 25, 26, 27, 28). Ages at death of these pigs were in range from three months to two and a half years, but a mean value of age at death was between a year and two years. Fragments of a very young pig were detected in graves 10 (3-6 months), 21 (6-8 months) and 28 (8 months to a

Grave No.	Age (yrs)	Sex
4	20-29	M?
5a	20-24	M?
10a	30-39	F
10b	35-39	M
10 (under bowl)	30-39*	Onfans
16	under 20	M?
18	35-39	F
19	40-44	M?
24	40-49	M
27	20-24	F
28	30-39	F
N37	30-39	?

Figure 8
The results of microscopic analysis of samples of site Dobova-Kosovka.



Legend: Sus sp.- pig, Bos sp.-cattle, O/C/C- sheep, capra, roe deer (*Ovis aries*, L., *Capra hircus*, L., *Capreolus capreolus*, L.), Indet.-indeterminate

Figure 7

Percentual abundance of species analysed from cremated animal remains from the site Brežice-Sejmišče.

year). Age that reached or slightly exceeded one year was detected for graves 5b (about a year), 15 (about a year), 16 (about 1.5 years), 19 (1-1.5 years), and 26 (about 1.5 years). The lowest quantity of remains was from pigs in the age range between 1.5 and 2.5 years from graves 9 (about 2 years), 20 (2-2.5 years), 22 (1.5-2 years), and 23 (1.5-2 years). Differentiation of domestic from wild species of pig was possible for several specimens. Domestic pig (*Sus scrofa domestica*, L.) was identified in graves 19, 23, 27 and 28. Remains of wild boar (*Sus scrofa ferus* L.) were documented in graves 16, 21, 22, and 26. It was possible to determine the sex for only one specimen of wild boar (*Sus scrofa ferus*, L.) from mandibular fragments from grave 20. The calculated body mass of an individual pig varied from about 30 kg (for piglets up to 6 months) to 50-60 kg for young pigs in age range from 1.5-2 years.

Several anatomical elements of pig skeletons are frequently found in graves

In four graves bone fragments of the right part of the skull were identified, with a cut through the median plane of the cranial vault. Anatomic elements that comprise such findings are fragments of frontal bone (*os frontale*), parietal bone (*os parietale*), first cervical vertebra (*atlas*), zygomatic bone (*os zygomaticum*), occiput occipital bone (*os occipitale*), together with

parts of the lower (*mandibula*) and upper jaw (*maxilla*) with dentition. In several graves (23, 19, 27) only the jaw fragments were better preserved, while skull bones were not frequent and of which only a tiny fragment remained. In our case the most represented anatomical parts were the front legs, both left (two samples) and right ones (four samples): humeral (*humerus*), ulnar (*ulna*) and radial bone (*radius*). Bones of the right hind leg were less frequent, as some (femoral bone (*femur*) and tibial bone (*tibia*)) were enclosed in just one grave (21). Cutting marks were present on three fragments of costal body (*corpus costae*).

The only grave that included fragments of partially burnt animal bones is grave 23. Eight parts of partially burnt bones originate from long bone diaphyses of small ruminants, i.e. goat, sheep or roe deer (*Capra hircus*, *L.*, *Ovis aries*, *L.*, *Capreolus capreolus*, *L.*). On three specimens the burning is black in colour (Munsell: 2.5YR2.5/1), while the rest of the outer bone layer (*substantia compacta*) is unaffected. The remaining five samples were black (Munsell: 2.5YR2.5/1) to light grey in colour (Munsell: GLEY2 5/5PB, GLEY2 6/ 5PB) on the outer bone layer, while the inner bone layer remained unchanged due to the short duration of burning at high temperature.

Animal bones were cremated at the same time as human bones

All the specimens were very fragmented and it was rarely possible to find and macroscopically identify species from bigger bone parts. Calculated specimen mass of burnt animal bones hardly reached 100 g per grave. A distinct type of fracture pattern on the cremated bones points to fracture development under high temperature. Due to the position of fracture patterns it is possible to claim that animal remains put in the funeral pyre were burnt with a flesh on bones. Bone fragments vary in colour from grey (Munsell: GLEY2 5/5PB), light grey (Munsell: GLEY2 6/5PB, GLEY2 7/5PB), to almost white (Munsell: 2.5Y 8/1).

Discussion and conclusion

A comparison of osteological results from the sites Brežice-Sejmišče and Dobova-Kosovka in Slovenia cannot be based solely on anthropological analyses. Be-

cause of insignificant numbers of graves from Dobova-Kosovka it was not possible to make a comparison for both sites on a demographic level.

Moreover, it has to be mentioned that a major group for the specimens from Dobova-Kosovka, according to quantity (**fig. 9**) was a group that comprised the remains of persons with undetermined age at death. The *infans* group encompasses age range from birth to 14 years of age. In demographic analysis this data has to be excluded because the representation of child samples is too low in number. According to some authors their representation should be significantly higher, i.e. it should amount to half of the deceased adult persons on the site (Štefančič 1995). For material from Brežice - Sejmišče *juvenilis* and both *adultus* groups show increasing intervals in number of deceased persons. The acme is in *adultus I* (20-29 years) for females and in *adultus II* phase (30-39 years) for males. Although **Figure 9** for Dobova-Kosovka does not distinguish persons according to sex, it is possible to determine the peak of mortality during later phases *adultus II* (30-39 years) and *maturus I* (40-49 years). During analysis of both sites the interval *maturus II* (50-59 years) was described with rapid decline in number of deceased persons. An analysis of the demographic trends for the material from Brežice - Sejmišče does not confirm the existence of extreme events in the life of that population. All curves show continuity, without excesses.

For analysed samples from Dobova-Kosovka sex determination was also included (**fig. 9**), but the values confirmed earlier results (Štefančič 1982).

Burning temperature that affects bones varies from 250–300°C for some animal specimens (Munsell: N2.75/0, 2.5YR3/2, 7.5YR4/2), 400°C (Munsell: 7.5YR8/3, 10YR2,4/1), 400–600°C (Munsell: 10YR7/2, n6.75.8/0, 10YR5/3, N9/0), 700–800°C (Munsell: N9.5/0), and even 900°C. A very small percentage of specimens from both sites belongs to remains burnt at temperatures that indicate lower burning temperatures compared with the rest of the material from both sites. Graves were of male persons, and very well preserved. The effect of a lower temperature is well visible on the skeletal elements during the burning process, but for parts that were last affected by fire.

Analysis of stature (height) in persons from Brežice-Sejmišče was compared with analysed height stature from Dobova-Kosovka (Štefančič 1982). From Brežice-Sejmišče height stature for two females and three males were calculated. The two female persons were of short stature range (150-154 cm, grave 34) and high stature (160-164 cm, grave 68) each. For the three male persons (graves 21, 29 and 45) a medium stature within a range from 166-170 cm was calculated. The male person from grave 10 had a short stature within a range from 161-165 cm. The analysis of body height from Dobova - Kosovka had given results for four graves (Štefančič 1982). For three male persons the body stature was short (grave 23, 161-165 cm), medium (grave 10b, 166-171 cm) and high (grave 6, 171-175 cm). Female stature was medium (grave 10a, 155-159 cm). The analysis of stature represents just a sample, basic information, because there were too few samples for comparison.

It is possible to describe major physical activities of a person's everyday life in the village by studying muscular attachment to the bone. For material from both sites, there are no significant differences in the development of left and right hand, except those caused by usage of the dominant hand. Harmony and proportion in the muscular development of the legs indicates moderate physical activity.

According to the degree of burning at different anatomical elements it is possible to conclude that the persons were laid down on the funeral pyre on their back, with the face facing up. It is very hard to describe more precisely the placement on the pyre, because of the pugilistic posture that the body will acquire due to the burning effect. It is possible to assume that the bone was first burned in areas of minimal protection that are much exposed, while pugilistic posture was a result of temperature affecting the better protected areas with significant tissue depth (Schmidt 2008). Moreover, every anatomical element, every area of the skeleton has a specific burning and destruction path. Some spots or areas of the body will be immediately affected by fire in the initial stage, together with the development of early fractures, while other parts will represent second or final areas of burning on bone. From distinct fracture patterns it is possible to assume

that whole body parts were placed on the pyre, not just bone remains after consuming the meat.

Pathological changes on human remains of both sites are not numerous, mostly because of the burning effects on fragmentation and changes to the bones. The determined pathological changes from both sites are very common for all archaeological populations. Analysis of pathological changes of human remains from Dobova-Kosovka was determined by Štefančič (1982). In two cases these changes were represented with lesions that could be markers of occupational stress (MOS).

Schmorl's node was present on remains of five persons, three from Brežice-Sejmišče, as described above, and two cases from Dobova-Kosovka, analysed prior to this research (Štefančič 1982). For such pathological lesions it is possible that stress factors like flexion and lateral bending of the vertebral column, especially from lifting heavy objects could be crucial (Kelley 1982, Kelley and Angel 1983; Campillo 1988; Iscan et al. 1989; Capasso 1991; Tehranzadeh et al. 2000). The vertebral remains of young people from archaeological sites indicate a heavy and continuous work activity (Bolm-Audorf 1992; Jayson et al. 1992; Mann et al. 2006).

Osteophytic development or *osteophytosis vertebrae* was determined on remains of two persons from Brežice-Sejmišče, as described above, and on one

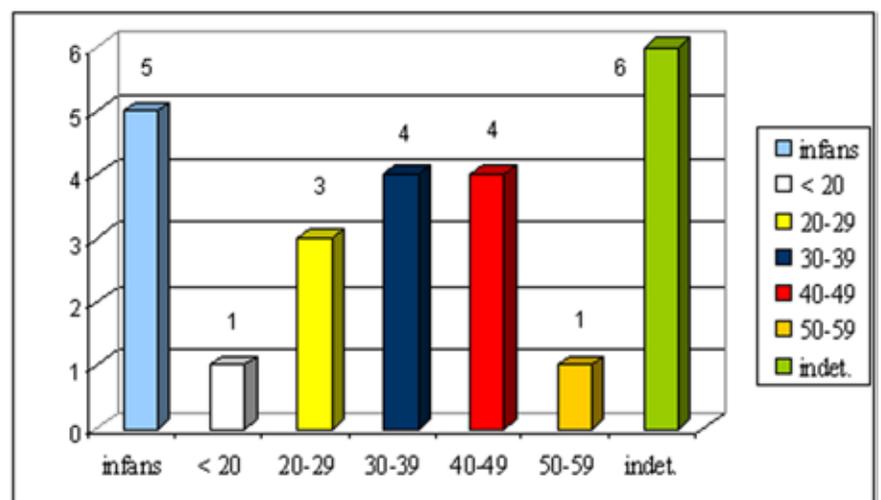


Figure 9
Distribution of deads by age categories
of site Dobova-Kosovka.

vertebra from an adult person from Dobova - Kosovka (Štefančič 1982). Such growths of new bone which arise round the margins of the joint are common on human vertebral remains of archaeological populations (Ortner et al. 1985; McCarthy et al. 1993). In some cases such conditions could be associated with a severe disease, i.e. DISH (*diffuse idiopathic skeletal hyperostosis*) or *Forrestier's disease* (McCarthy et al. 1993). Burnt human remains are not preserved enough to claim to what extent the osteophytes represent a disease in the skeleton in this precise case. If they are only marginal, they are a normal sign of aging (hip, spine, etc.); they are common on any skeleton over the age of 50 (McCarthy et al. 1993). More frequently it could be a sign of osteoarthritic bone change, especially as a result of inadequate life conditions. But for the majority of cases stress to the vertebral part and extension against loading could be the cause of development (Bridges et al. 1994; Mann et al. 2008).

Lesions on the upper surface of orbits refer to a pathological condition called *cribra orbitalia* (*Ursa orbitale*). This pathological condition was identified on the skull of a person from grave 21, Brežice-Sejmišče (fig. 4). Its frequency in archaeological populations is usually much higher, but it depends on a number of factors, e.g. iron deficiency anaemia (perhaps related to malnutrition), scurvy, chronic gastrointestinal bleeding, *ancylostomiasis* and epidemic diseases (Møller-Christiansen et al. 1963; Ortner et al. 1985; Hirata 1988; Aufderheide et al. 1998; Mann et al., 2005; Walker et al. 2009). According to some authors this condition will probably develop during childhood and could be connected to several causes, from malnutrition to anaemia (Ortner 1986; Schultz 2001).

Differences in morphological characteristics between human remains from graves for both sites were not confirmed. However, there is some difference in animal grave goods content analysed on both sites.

Unburnt animal remains as grave goods from both sites manifest significant similarities. In both cases grave goods constitute the unburnt remains of young pigs represented with complete saggital cut (on crania), and remains of front and hind legs. Bird remains (*Aves*) are also represented, but in small numbers. It is not possible to relate the sex of a person to the appearance of certain

anatomical elements as grave goods. Nevertheless, it is important to indicate that bird remains are often or more often related to female graves, but not exclusively. With two samples as unburnt grave goods, remains of cattle (*Bos taurus*, L.) and goat (*Capra hircus*, L.) appeared at the Dobova-Kosovka site. It is interesting to compare analyses from both sites with one from the French site Les Arenes in Levroux (Horard-Herbin 1997). In the case of pig remains as grave goods a higher frequency had the lower jaw (*mandibula*), shoulder blade (*scapula*) and upper arm (*humerus*), while fragments of skull bones, remains of front and hind leg elements, and finally, remains of hip bones (*os coxae*) also occurred (Horard-Herbin 1997).

Based on pig skull remains from several graves (Dobova-Kosovka 19, 23, 26, 28) it is possible to note the median cross-section which would correspond to the shearing of body and head in two approximately equal parts. A recent practice is to hang a dead animal from its hind legs on an appropriate type of frame. In this position the body usually hangs on the calcanean tendon (*tendo calcaneus communis*) which is attached to the *tuber calcis* of the hock. After evisceration a cut would start at the level of the last caudal vertebral bones, down along the vertebral column through all vertebral bodies and ending with the cutting of the first vertebral body (*atlas*). The cut then goes much further to the tip of the cranium (rostrum or muzzle). After that almost equal parts of the head (cranium) are separated from the body and the first cervical vertebra (*atlas*). Cuttings that appeared on the surface of 7 % of bones represent a butcher's technique of further fragmentation to body parts.

An analysis of burnt grave goods gives a much broader picture, especially for Brežice-Sejmišče, because the burnt animal remains from Dobova-Kosovka were not so numerous. The analysis of burnt animal remains from graves on the Brežice-Sejmišče site has to be completed with more details. Findings of burnt remains of a young pig, goat or cattle obviously represent a standard, because this type of remains occurred in 70 % of all analysed graves. There were also rare findings in nine graves, i.e. graves 3, 4, 12, 15, 21, 30, 39, 46, and 47. Finding a lower canine fragment of an adult male wild boar (*Sus scrofa ferus*, L.) in both male and female graves with rich personal belongings as a

grave good, regardless of person's age was obviously specific to that site. Specific findings were also three premolar teeth (*dens premolares*) of a dog (*Canis familiaris*, L.), which were mixed with cremated human remains and unearthed in three male graves. All graves had very rich personal belongings as grave goods (3, 21 and 39).

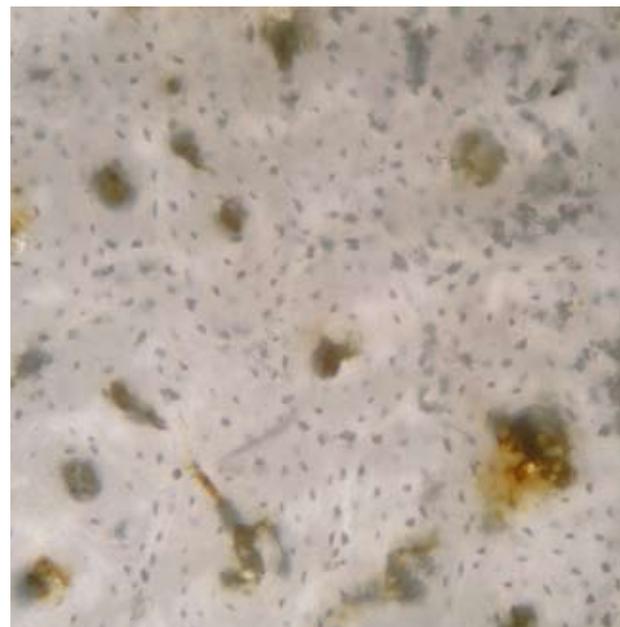
Burnt bird remains (*Aves*) from Brežice-Sejmišče were analysed by Malez (1986), while Janez Dirjec (1989) analysed the material from Dobova-Kosovka (1982). However, together with human remains it was possible to detect just few fragmented long bone diaphyses.

Macroscopic and morphometric methods of analysis that are recognized by the scientific community and are in everyday use today, cannot determine the sex of an individual (for example remains of legs and crania of a young pig). For better results advanced microscopic and molecular methods of analysis should be used. Methods of DNA identification would be especially applicable for unburnt animal remains. For example, a DNA analysis of young pig remains, bone fragments of the front and hind legs, fragments of the skull and jaw could offer determination of the sex for each specimen. Moreover, including that type of sophisticated analysis it could be possible to determine speciation, as well as distinguish fragments of the wild from the domesticated breed (pig versus boar).

The Celtic necropolis in Brežice, which, after the newest excavation in 2011, comprises more than 110 graves, represents one of the most eminent cemeteries of the **Middle La Tène period** in the southeastern **pre-Alpine** area. Together with graves from Dobova-Kosovka, Žadovinek near Krško and Veliko Mraševo ob Krki it provides us with good evidence of dense Celtic agricultural settlement in the Brežice plain region after the colonisation of Celtic families in the 3rd century BC. They remained there on their farms and fields for about two centuries and afterwards moved, because of the Roman presence in Gallia Ciasalpina, to the better protected hillforts, occupied already during the Early Iron Age, e.g. Dunaj above Krško, Libna, Stari Grad nad Podbočjem and Velike Malence. The toponym Dunaj – dunum (like Verdun near Novo mesto) still today reminds us of the Celtic settlers from this region who were part of the larger community of *Taurisci* (see Guštin p. 119-130 in this book).

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Figures 10, 11
Brežice-Sejmišče, 10 photomicrograph of a femoral bone section, male person aged 30–34 yrs. at death, grave 9 (magn. 20x10); 11 photomicrograph of a femoral bone section, cattle (*Bos* sp.), grave 47 (magn. 20x10)



Figure 12
Brežice-Sejmišče, *osteophytosis vertebrae* (L4, fourth lumbar vertebra), grave 25.



Figure 14
Dobova-Kosovka, distal third of right humeral bone, wild boar (*Sus scrofa ferus*, L.) 1.5-2 yrs., grave 22.



Figure 13
Brežice-Sejmišče, cribra orbitalia (fragment of frontal bone - orbitae), grave 21.



Figure 15
Dobova-Kosovka, left side of lower jaw (*mandibula*), domestic pig (*Sus scrofa domestica*, L.), 1-1.5 yrs., grave 19.