

# Anthropological Analysis of Neolithic and Early Bronze Age Skeletons – A Classical and Molecular Approach (East Slavonia, Croatia)

Zdravka Hincak<sup>1</sup>, Irena Drmić-Hofman<sup>2</sup> and Damir Mihelić<sup>3</sup>

<sup>1</sup> Institute for Mediterranean Heritage, Science and Research Center of Koper, University of Primorska, Koper, Slovenia

<sup>2</sup> Department of Pathology, University Hospital »Split«, Split, Croatia

<sup>3</sup> Department of Anatomy, Histology and Embryology, Faculty of Veterinary Medicine, University of Zagreb, Zagreb, Croatia

## ABSTRACT

*Theories about the first Indo-European migration are numerous. Significant contribution in attempt to resolve these theories is given by analysing skeletal material from two biggest prehistoric archaeological sites from N-E Croatia. Eight skeletons of Starčevo culture from sites »Nama« and »Hotel« at Vinkovci (6100–5500 BC) and seven skeletons of Vučedol culture from the site Vineyard Streim at Vučedol near Vukovar (3000–2500 BC) were analysed. Methods of classical anthropological analysis tried to distinguish the differences among members of both populations, while the methods of molecular genetics were used in defining possible genetic structure of both ancient populations. Established differences speak on the behalf of the theory of Maria Gimbutas about the first Indo-European migration with a cattle breeding population from the east around 3500 BC.*

**Key words:** *Indo-European migration, Starčevo culture, Vučedol culture, anthropological analysis, molecular genetic analysis, East Croatia*

## Introduction

The prehistoric populations from Central and South Eastern parts of Europe are very heterogeneous. This article is dealing with a question of the oldest migration of Indo-Europeans and could be a contribution in resolving an old dilemma represented in two famous theories about the roots and time of indoeuropesation. Is the south, the area of Asia Minor, its cradle from where the first farmers started the migration cca 8000 BC and brought it to Europe<sup>1</sup> or was it from the east with the cattle-breeding population much later, cca 3500 BC<sup>2</sup>? The skeletal material, crucial in giving the answer about the first appearance of the Indo-Europeans, originates from the biggest prehistoric archaeological sites in Croatia: »Nama« and »Hotel« at Vinkovci with the Neolithic, agricultural population of Starčevo culture (6100–5500 BC) and »Vineyard Streim« at Vučedol (Vukovar, N-E Croatia) with the Early Bronze, cattle breeding population of Vučedol culture (3000–2500 BC). The archaeological site Vučedol with its numerous changes visible in the material remains and customs (human burials, ritual burials

of sacrificed animals and the oldest European calendar<sup>3</sup>) clearly indicates that these crucial changes in the population of Europe started 3500 BC and originate from the Early Bronze Age (Baden, Kostolac and Vučedol cultures). Anthropological researches of Vučedol culture from site Vučedol were not numerous, and only classical anthropological methods were used<sup>4,5,6</sup>. Recent analysis of skeleton from Vučedol culture are also not numerous, so classical and molecular approach with statistic data for small specimens cannot give us the right image for both populations, but for certain individuals within each population can, with a very high preciseness.

## Material and Methods

Analysed human skeletal remains originate from two archaeological sites in East Slavonia. Skeletons of Vučedol culture come from the site »Vineyard Streim« at Vučedol near Vukovar, while Starčevo culture skeletons

originate from two sites »Nama« and »Hotel« in Vinkovci. Skeletons from thirteen graves were included in the research, eight from Starčevo and five from Vučedol culture. Two skeletons, one of Starčevo, and one of Vučedol culture came from archaeological site »Hotel« in Vinkovci. Cranium Q is special finding from »Vineyard Streim« without a real grave pit.

Five skeletons from site »Nama« from Vinkovci were excavated near the edge of dug out positioned in semicircle during campaign in 1977 (graves 7,8,11,12,13). Skeletons from graves 6 and 15 were individual, as well as the skeleton of grave 1 site »Hotel« in Vinkovci. Graves of Vučedol culture were excavated during campaigns in 1985, 1986, 1987, and 1990 on the site »Vineyard Streim« at Vučedol. Skeleton from the grave 2 is the only one from the site »Hotel« in Vinkovci. Graves are individual, except grave 3. Cranium Q originates from the site »Vinograd Streim«-Vučedol. Skeletons are stored in Vinkovci (skeletons of Starčevo culture) and Vukovar (skeletons of Vučedol culture) municipal museums. Two basic methods, classical anthropological methods and methods of molecular genetics, were used.

Sex is determined by scoring of skeletal development of twenty-nine sexual signs and is expressed by degree of sexualization for each adult person (Table 1)<sup>7,8</sup>. Some postcranial elements of skeleton were used in secondary method of sex assignment analysis: analysis of talar joint by Steele method<sup>9</sup> and metacarpal bone analysis (ossa metacarpalia) by Falsetti method<sup>10</sup> and results obtained are compared using Scheuer and Elking tables<sup>11</sup>. Age at the time of death is estimated for each skeleton within a range of five or ten years<sup>7,12</sup>. Age estimation for the youngest skeletons is based on the time of milk dentition eruption<sup>13,14</sup> and the length of long bone diaphysis<sup>15,8</sup>. Juvenilis phase was determined with both decidue tooth formation and eruption<sup>10,11</sup> and the time of epiphyseal union of long bones<sup>15</sup>. Age estimation from adultus to senilis phase is analysed by gradation of skeletal elements degeneration: sternal rib changes<sup>16,17</sup>, pubic aging by the method of Brooks and Suchey<sup>18</sup>, changes of iliac auricular surface (facies auricularis ossis ilii) by Lovejoy et al.<sup>19</sup> with Hamann Todd collection samples comparison and the vertebral body changes<sup>20</sup>. Complexed method<sup>7,8</sup> defines age estimation for five adult skeletons (graves 12,13/A,15 and 2). In analysis a cranial suture closing is used as a second method<sup>14,21,22</sup>.

Basic cranial and postcranial anthropological measures were taken by standard anthropological instruments. Twenty-five cranial measures include twelve neurocranial measures, thirteen splanchnocranial measures and six indices by Martin<sup>14</sup> (Table 2). Postcranial skeletal measures comprise sixty-one basic measures and twenty-four indices<sup>14</sup>. Stature estimation was reconstructed using the length comparison of femoral or humeral bone with comparing metrical data from Manouvrier's table<sup>22</sup> and calculation from regression formulas by Pearson<sup>23</sup>.

DNA was extracted from femoral bone of five skeletons (Starčevo culture) and from Vučedol culture two skeletons.

DNA was extracted by organic phenol/chloroform/isoamyl alcohol extraction, followed by isopropanol precipitation, according to slightly modified method, described earlier<sup>24</sup>. Each sample was extracted twice, in a two separate tubes. DNA amplifications were performed on Gene Amp PCR System 9700 (Applied Biosystems), using the AmpFISTR Identifiler kit (Applied Biosystems). Amplification conditions were: initial denaturation at 94 °C, 10min, followed by 35 cycles of 94 °C, 45 sec, 59 °C, 45 sec, 72 °C, 45 sec, and final extension at 72 °C, 10 min. DNA typing was performed using the capillary electrophoresis instrument, ABI Prism 310 (PE Applied Biosystems, USA), GeneScan and Genotyper softwares were used for automatic genotype assignment.

## Results

Eight skeletons of Starčevo culture were analysed. Five of them were remains of female persons, one in juvenilis phase (grave 3/B), three in adultus I (graves 1, 6 and 11) and one in matusus I age phase (grave 12/A) (Table 1). Sex was assigned as femininum for three persons (graves 6, 12/A and 1) and in one case as hyperfemininum (grave 11) (Table 1).

None of above mentioned female skeletons has cranial bones sufficiently preserved for cranial indexes calculation. Skeleton from grave 11 has a long type of cranium (176 mm). Beside the remains of a male person (A) in the grave 13 it is possible to identify another one, female person (B) by frontal bone (os frontale) from adultus I phase (20–30 years). This specimen is poorly preserved but it is possible to assume narrow type of a face with a help of frontotemporale-frontotemporale value (ft-ft) (Table 2).

Four skeletons of male persons were identified: two in juvenilis (grave 7 and 8), one in adultus II (grave 13/A) and one in matusus I phase (grave 15). Sex was determined as hypermasculinum in two cases (grave 15 and 13/A) (Table 1).

The most common cranial shape is pentagonal, then ovoid and rhomboid, while all occiput regions shows shape of a house. According to breadth-length index (8/1) one mesocrania (grave 13/A) and one dolichocrania type (grave 15) were found (Table 1). Height-length index (17/1, 20/1) is calculated for two crania (graves 15 and 13/A) as orthocrania type, while breadth-height index (17/8, 20/8) for both is defined as metriocrania type (Table 1). Skeleton from the grave 13/A has completely preserved cranium which is very long, high and medium broad. The face is broad and high. Upper facial index is lepten (high), orbital index is determined as mesoconh (medium height), and nasal index describes medium broad nose type or mesen. Poorly preserved crania from graves 7 and 15 provide only basic cranial data because of massive damages in the facial area. Both crania are narrow, and their length is in range from long (grave 15) to medium long (grave 7). Cranium from grave 15 has strongly expressed superciliary arch (arcus supraciliaris) (Table 2).

**TABLE 1**  
STARČEVO AND VUČEDOL ANTHROPOLOGICAL SERIES, DETERMINATION OF SEX AND AGE AT DEATH

Starčevo culture, graves	Archeological site	Sex	Degree of sexualization	Age at death (years)
1	»Hotel«, Vinkovci	female	-0.11	21–24
6	»Nama« Vinkovci	female	-0.5	20–24
7	»Nama« Vinkovci	male	+0.62	17–19
8	»Nama« Vinkovci	male?	-	14–16
11	»Nama« Vinkovci	female	-1.55	25–29
12A	»Nama« Vinkovci	female	-0.93	40–44
12B	»Nama« Vinkovci	?	-	15–18
13A	»Nama« Vinkovci	male	+1.32	35–39
13B	»Nama« Vinkovci	female	-1.72	20–30
15	»Nama« Vinkovci	male	+1.06	40–44

  

Vučedol culture, graves	Archeological site	Sex	Degree of sexualization	Age at death (years)
2	»Hotel«, Vinkovci	female	-0.87	25–29
4, pit 26	»Vineyard Streim«, Vučedol	female	-0.8	20–24
5, pit 83	»Vineyard Streim«, Vučedol	female?	-	12±6 months
3, pit 9, person A	»Vineyard Streim«, Vučedol	male?	-	9–10
3, pit 9, person B	»Vineyard Streim«, Vučedol	female	-1.09	17–19
Cranium Q	»Vineyard Streim«, Vučedol	male	+0.13	+60
2, pit 10	»Vineyard Streim«, Vučedol	female	-1.04	45–50

**TABLE 2**  
STARČEVO AND VUČEDOL CULTURE: BASIC CRANIAL MEASUREMENTS (mm) AND INDEXES

		Martin numbers																
Starčevo culture	Sex	1	8	17	20	45	48	54	55	66	8/1	17/1	20/1	17/8	20/8	48/45	52/51	54/55
Vinkovci »Nama«, grave 13/a	M	193	150	143	121	139	78	30	57	109	77.7	74.0	62.69	95.3	80.6	56.0	78.0	53.0
Vinkovci »Nama«, grave 15	M	189	140	-	121	-	-	27	44	110	74.0	-	64.0	-	86.0	-	81.0	61.0
Vinkovci »Nama«, grave 7	M	176	141	-	-	-	-	-	-	87	79.6	-	-	-	-	-	-	-
Vinkovci »Nama«, grave 11	F	176	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

  

		Martin numbers																
Vučedol culture	Sex	1	8	17	20	45	48	54	55	66	8/1	17/1	20/1	17/8	20/8	48/45	52/51	54/55
Vučedol cranium Q	M	182	151	128	120	-	67	26	49	99	82.96	70.30	65.9	84.77	79.47	-	-	53.0
Vučedol grave 3, pit 9, person A	M	178	133	129	115	105	54	19	40	86	74.71	72.47	64.6	96.99	86.47	51.0	88.0	48.0
Vučedol grave 2, pit 10	F	187	128	128	115	-	-	-	-	-	68.80	68.80	61.8	100.0	89.8	-	-	-
Vinkovci »Hotel«, grave 2	F	190	143	-	-	-	-	-	-	-	75.26	-	-	-	-	-	-	-
Vučedol grave 4, pit 26	F	172	141	143	114	-	57	-	-	-	81.9	-	66.27	80.8	-	-	-	-

F – female, M – male, 1 – maximum cranial length, 8 – maximum cranial breadth, 17 – basion bregma height, 20 – auriculo-bregmatic height, 45 – bizygomatic breadth, 48 – upper facial height, 54 – nasal breadth, 55 – nasal height, 66 – bigonial width, 8/1 – height-breadth index, 17/1 – basion height-length index, 20/1 – auricular height-length index, 17/8 – basion height-breadth index, 20/8 – auricular height-breadth index, 48/45 – upper facial index, 52/51 – orbital index, 54/55 – nasal index

**TABLE 3**  
STATURE ESTIMATION FROM LONG BONE LENGTH

Grave, archeological site	Sex	Long bone	Measure (mm) (Martin numbers)	Stature estimation (mm)			
				Manouvrier	Pearson	Mean value	
1, »Hotel«	F	Femur dex.	1=425	2=423	157	156	156
7, »Nama«	M	Femur dex.	1=445	2=438	166	165	165
11, »Nama«	F	Femur sin.	1=380	2=376	146	146	147
12A, »Nama«	F	Humerus sin.	1=275	2=273	159	158	147
13A, »Nama«	M	Humerus dex.	1=329	2=318	166	166	163.5
15, »Nama«	M	Femur dex.	1=459	2=457	168	168	166.6
2, »Hotel«	F	Femur sin.	1=413	2=410	155	153	154.1
4, »V, Streim«	F	Femur dex.	1=426	2=424	157	155	156.5
3B, »V, Streim«	F	Femur dex.	1=422	2=419	157	155	155.5
2, »V, Streim«	F	Femur sin.	1=413	2=410	155	153	154

F – female, M – male, 1 – maximum cranial length, 2 – maximum cranial breadth

Stature was estimated for three female and three male persons. Metric values for female persons are in the range from 147 to 156 cm including groups of short and medium statures (graves 12/A, 1, 11) (Table 3). Values for males are in the range between 163,5–166,6cm, and are classified as medium stature (grave 7, 15, 13/A) (Table 3).

Seven skeletons of Vučedol culture were analysed. Two of them were masculine, cranium Q with very low degree of sexualization (+0.13) and skeleton of a child from grave 3/A (Table 1). For male skulls breadth-length index encompass brachyrania (cranium Q) and mesocrania (grave 3/A) type, height-length index is orthocrania to hypsocrania type and breadth-height index is mesocrania type for both crania (Table 2). Cranium Q is medium long, medium broad and medium height, while the one from the grave 3/A has medium long, narrow and medium height cranial values (Table 2). The best preserved Vučedol cranium is from grave 3/A. Face is narrow and short. Upper facial index is medium high mesen, orbital index is classified as high hypsiconh while the nose is medium broad or mesorrhina type of nasal index (Table 2).

There are five female skeletons in the group. Sex is determined as hiperfemininum for two skeletons (grave 3/B and grave 2) and for the remaining two as femininum (graves 4 and 2 »Hotel«). Female skeleton from grave 5 (14 years±12 months) is from infans II age group. Stature is estimated as medium within a range from 155 to 156.5 cm for adult persons (graves 4, 2 and 2 »Hotel«) (Table 3). Cranial measurements were taken for three cases (graves 2 »Hotel«, 2 and 4). Breadth-length index is determined as hyperdolichocrania (grave 2), mesocrania (grave 2 –»Hotel«), and brachyrania (grave 4) (Table 2). Height-length index is within range from chamaecrania-orthocrania (grave 2) to hypsocrania type (grave 4) (Table 2). For mentioned crania breadth-height index is classified as acrocrania type. Two most common types, established by shape in norma verticalis stand are

pentagoides (graves 5 and 2–»Hotel«) and ovoides (graves 4 and 2), while the norma occipitalis stand gives a shape of the house for all specimens. Cranial length varies from very long (grave 2– »Hotel«, grave 2), to medium long (grave 4) while breadths are in the range from narrow (grave 2) to medium broad (graves 2 »Hotel« and 4) (Table 2). Cranial height assign them to high (grave 4) and medium high crania (grave 2) (Table 2). Female persons had medium stature ranging between 154–156,5 cm which is determined from long bone measurements from three graves (graves 3/B, 2 pit 10, 2 »Hotel« Vinkovci) (Table 3).

DNA was extracted for fifteen samples and the results were obtained for 5 samples: person B from grave 13, site »Nama« Vinkovci, person from grave 1, site »Hotel« Vinkovci and two samples of left and right femur from grave 6, belonging to Starčevo culture. From Vučedol group of the samples, DNA was extracted from two skeletons, person A from cave 9 and person B from grave 2 from »Hotel« Vinkovci site.

The results of capillary electrophoresis were obtained after STR analysis of genomic DNA and are shown in Table 4.

## Discussion

Comparison of anthropometrical values for both Starčevo and Vučedol groups shows certain diversity, but neither shows homogeneity inside its own group. Mean values of stature estimation were calculated by Manouvrier and Pearson. Due to the lack of preserved osteological fragments from both sex, comparison of stature estimation were possible for osteological remains of female persons from both cultures. Stature estimation for female persons from Starčevo culture was in range from 147 to 156 mm, two persons were short and only one of medium stature. Stature of analysed remains of female persons from Vučedol culture is somewhat higher, and is in range

from 154–156.5mm or in the group of a person with medium stature. Due to poor cranial preservation it was only possible to measure three basic cranial measurements for two male samples from Starčevo culture. Comparison of basic measurements (length-1, breadth-8 and height-17) shows a range from medium to very long, narrow to medium broad and high crania for both samples (graves 13/A, 15) (Table 1). Values of three basic indexes classify both crania in range dolichocrania to mesocrania (8/1), orthocrania (17/1, 20/1) and metriocrania (17/8, 20/8) (Table 2). Given values fit in general anthropological measure span for Starčevo culture skeletons, but the number of analysed specimens was too small for any further conclusions. Specimens of crania from Vučedol culture are more numerous, so it is possible to compare four of them, two male and two female crania. Female specimens are in broad range from medium to very long, narrow to medium broad and from medium height to height crania. Calculation of breadth-length indexes (8/1) for female samples demonstrate broad range from hyperdolichocrania (grave 2), mesocrania (grave 2, »Hotel«) to brachyocrania type (grave 4) (Table 2). Breadth-length (8/1) index for male persons varies from dolichocrania (grave 3/A) to brachyocrania type (cranium Q), and demonstrate the same broad range as for the female ones (Table 2). For another two indexes ranges were smaller. Values of length/height index were determined as orthocrania for both male (grave 3/A, cranium Q) and chamaecrania for female person (grave 2, pit 10) (Table 2). Values of breadth/height index (17/8, 20/1) are in a broad range from tapeinocrania for both female and male person (grave 4, cranium Q), to metriocrania for male (grave 3/A) and acrocrania for female person (grave 2, pit 10) (Table 2). Results from cranial analysis and a broad span of values could be, at the first moment a problem, because appearance of a new steppe population must leave an anthropological evidence. It is important to accent that Vučedol culture period lasts for 500 years, and precise datation for each grave is not possible to gain. Theoretically, it would be possible that the group of dolichocrania types with narrow face would be older than characteristic Bronze Age brachycranial type with medium broad face inside the span of Vučedol culture. Earlier anthropological analysis of skeleton from Vučedol culture and from the site Vučedol as a main characteristic describes older, dolichocranial type with narrow face<sup>5</sup>.

In this study, five bone samples from Starčevo culture and two samples belonging Vučedol culture were analysed. Each sample was analysed individually, and the genetic data within and between these groups of samples were compared. Additionally, the data obtained from three Starčevo bone samples were compared with contemporary Oriental Jews and Arab population data<sup>25</sup>, including Saudi-Arabic and Oman population<sup>26</sup>. Vučedol samples data were compared with Russian<sup>27</sup>, Greek and Kurdish population data<sup>28</sup>. According to the obtained results, the difference between Starčevo and Vučedol group was observed. In certain loci there were slight similarities, but differences in the following loci were observed:

TABLE 4  
RESULTS FOR PCR ANALYSIS OF TESTED LOCI FOR BOTH CULTURES: ALLELES ARE MARKED WITH NUMBERS THAT CORRESPOND WITH A NUMBER OF REPETITIVE SEQUENCES

Loci/ sample	D8S1179	D21S11	D7S820	CSF1PO	D3S1358	TH01	D13S317	D16S539	D2S1338	D19S433	vWa	TPOX	D18S51	D5S818	FGA	Ameloge- nin/sex
1	12,13	27,28.2	10,10	-	14,20	8	-	-	-	19 (20)?	-	-	-	-	14;16	-
2	14	27.2,29	4,5	10,10	15,18	6,8	12,15	-	-	-	-	-	-	-	-	-
3	11,12	30.2,34	9,11.2	10,11	14,16	8,9	13,13	10.2,12.2	17,24	14,16	15,17	9,10	14.2,19	9,11	19;23	x,x
4	13,14	28,31	8,10	10,10	15,16 (?)	6,9.3	9,13	11.2,14	16,20	12,15	16,16	9,10	16,17	12,13	24;25	x,x (?)
5	14,14	24,24	10,10	10,10	15;15	4,6 (4)	8 (8.2?)	-	-	-	-	-	-	-	-	-
6	16,16	28,30	4,9	4 (?),5	13,16	4,10	12,12	11.2,12.2 (?)	19,19	15,15	21,21	9,9	16,16	-	-	x,x

1. grave 13/ B, 2. grave 3/A pit 9, 3. grave 6, 4. grave 6, 5. grave 1, Vinkovci »Hotel«, 6. grave 2, Vinkovci »Hotel«  
Short tandem repeat (STR) markers are polymorphic DNA loci that contain a repeated nucleotide sequence, from two to seven nucleotide in length. Alleles are marked with numbers that correspond with a number of repetitive units (full numbers, e.g. 12) or with number of repetitive sequence with additional two base pairs (intermediate alleles, e.g. 27.2).

D8S1179, D7S820 and vWA. The shorter allele variants were observed to be more common in Starčevo culture samples, implying that this could be the older population. Comparison of the data indicates certain similarities between oriental group of samples and Starčevo sample group studied here. The results obtained for loci D21S11, D7S820, TPOX, D5S818 and FGA showed rare allele variants, but detected in contemporary population<sup>25</sup>. Given results from Vučedol sample group indicate similarities with Iranian, Kurdish and Greek population in D8S1179 locus. Rare allele variant is obtained from D7S820 (alleles 4 and 5), TH01 (allele 4), and vWA (allele 21) loci. It should be kept in mind, that only 5 bone samples from Starčevo culture and 2 samples belonging Vučedol culture have been analysed, each with highly degraded DNA and the amplification failed in some loci.

## Conclusions

Analysed skeletons could partially be divided in two groups each presenting a different culture depending on time of their emergence, Starčevo and Vučedol culture. Classical anthropological analysis describes two different groups in the context of population. The biggest problem was a lack of statistically competent number of specimens that could truly validate the analysis.

Results of molecular genetics were compared to results of modern populations. Selection of these modern populations was first done for Starčevo culture. From earlier historical and archaeological researches it is clear that oriental populations were, in a certain way, excluded

from the direct influence of Indo-European migration. The real Indo-European selection is one of Central Russian and Greek populations. Comparison of modern and ancient DNA data was partially successful. In some loci of Starčevo and Vučedol culture certain alleles more frequent than in modern populations were noted. Data for modern Kurdish population shows slightly closer values in some loci with data of Russian and Greek population than with data for oriental ones.

Initial genetic studies of Starčevo and Vučedol culture were just an attempt to elucidate possible genetic structure of the ancient populations from region of today's (contemporary) Croatia. Certain limits must be put, due to restricted number of yielded DNA samples, as well as due to ancient and damaged DNA samples. To complete the results of this study it is necessary to reveal more genetic data on analysed samples, establish possible relationships between the samples, as well as to analyse mitochondrial DNA (maternal lineage) and eventually Y chromosome (paternal lineage).

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*Z. Hincak*

*Vukovarska 6, 10430 Samobor, Croatia*

*e-mail: zdhincak@inet.hr*

## **ANTROPOLOŠKA ANALIZA NEOLITIČKIH I RANOBRONČANODOBNIH KOSTURA – KLASIČNI I MOLEKULARNI PRISTUP (ISTOČNA SLAVONIJA, HRVATSKA)**

### **S A Ž E T A K**

Teorije o dolasku prvih Indoeuropljana su brojne. Važan doprinos njihovom razrješenju daju analize skeletnog materijala s dva najveća prapovijesna nalazišta sjeveroistočne Hrvatske. Analizirano je osam kostura starčevačke kulture s neolitičkih nalazišta »Nama« i »Hotel« u Vinkovcima (6100–5500 pr.n.e.) i sedam kostura s ranobrončanodobnog nalazišta »Vinograd Streim« na Vučedolu pokraj Vukovara (3000–2500 pr.n.e.). Metodama klasične antropološke analize pokušalo se razlučiti koliko se pripadnici obje populacije razlikuju, dok se metodama molekularne genetike pokušala utvrditi moguća genetička struktura pripadnika obje populacije. Utvrđene razlike daju određenu prednost teoriji Marije Gimbutas o dolasku prvih Indoeuropljana približno 3500 godina pr.n.e. sa stočarskom populacijom s istoka.