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Project title: Revealing Bucharest's past: an integrative study of ancient DNA and osteoarchaeological data of late medieval population.

Project abstract:

This project will undertake an extensive comparative study of the history of Bucharest viewed from the perspective of cross-population changes in genetic structure, health, quality of life, adaptation to the external stress factors and lifestyle evolution based on the analysis of the skeletons discovered in the recently excavated *Piata Universitatii* archaeological site, one of the biggest medieval cemeteries from Romania. The project will integrate archaeological and historical data with the precise anthropological and genetic results that can bring more objectivity to historical anthropology in a promising way to investigate and validate over four centuries of local history. The field of ancient DNA experience a new era after new technologies and methodological approaches became available and large-scale population genetic studies are now possible. When population history reconstruction is based strictly on the analysis of contemporary human DNA material rather than ancient DNA samples, significant information regarding replacement, admixture and local minor migration events could be lost. Ancient population studies may yield interesting results in cases where are indications from archaeology and history that a population demographic modification like depopulation or replacement has taken place and shaped the gene pools of contemporary populations. The impact of lethal epidemics, wars, religious and cultural changes in historical periods would significantly reduce the genetic diversity via bottleneck effect and fundamentally affected the development of populations. Interpreting potential genetic signature and osteoarchaeological data left by the effects of such phenomena on population is important because may aid in the reconstruction of the real historical events which affected the Bucharest region during centuries.

Research teams:

- Institute of Anthropology: Andrei Soficaru, Mihai Constantinescu, Mihaela Culea, Luminița Andreica, Claudia Radu, Elena Gavrilă, Dragoș Ungureanu.
- Laboratory of Genetics: Florina Raicu, Relu Cocoș, Laurențiu Camil Bohîlțea, Sorina Schipor, Livia Creț, Silvia Elena Popescu.

Objectives:

The project's goal is to establish the health profile, the size of the populations, the bio-cultural adaptation to the stress factors and the genetic profile of 150 out of 900 skeletons and correlate all data with historical and archaeological information. Bioarchaeological data will help us evaluate social, cultural and economic changes that affected the population of Bucharest from the 16th to the 19th century. The study of ancient human populations from different centuries will rely on comparisons of the frequency of the various sequence haplotypes or haplogroups studied by a complex analysis based on Y-SNP, Y-STR and mtDNA markers with contemporary population genetics data. We will analyze both stable and fast-mutating polymorphisms, which respond differently to different demographic events at different time scales. The late medieval genetic composition of the local population of the Bucharest region could reveal strikingly different frequencies induced by short-term

historical Balkan processes (population replacement, admixture and minor migrations events due to lethal epidemics, wars, religious and cultural incidents) that are partly described in historical chronicles, archeological and anthropological sources.

Reports for 2012-2014, project number PNII-ID-PCCE-2011-2-0013

INSTITUTE OF ANTHROPOLOGY RESEARCH TEAM

2012

Objectives	Activities	Results
1. Cleaning and packing of the human remains from University Square	1.1. Anthropological analysis of skeletons from comparison samples	Anthropological evaluation of 200 skeletons from University Square. Database creation and fill up with information of samples from Europe

- There were washed and stored the human bones from 494 graves.
- To establish the standard anthropological protocol for this sample it was anthropological analyzed 221 skeletons (by sex 74 females, 76 males, 71 indeterminate; by ages 165 are and 56 non-adults).
- The anthropological protocol has following inputs: stage of preservation and representation, sex determination, age estimation, dental pathology, postcranial pathology, injuries; the measurements (according to the Martin's system) are applicable on clavicle, scapula, humerus, radius, ulna, coxal bones, sacrum, femur, tibia, fibula and calcaneum.
- The grave 1-3 was discovered at 35 meters from cemetery; the archaeologists found three adult skeletons in a unusual position; from anthropological point of view they are males and all of them displayed multiple lesion made by sharp or blunt objects; it is very possible that could be victims of a military encounter;
- Sex determination is mainly establish using the visual traits of the skull and it is very important for anthropological analysis; for that reason a study was conducted in the Rainer Osteological Collection and 390 skull were recorded; with SAS software a number of discriminant function were obtained and they can be used for the skulls from University Square; the skulls were selected by criteria of identity, age between 18 and 80 years, and very well preservation; there were scored: glabella, orbital margin, mastoid process, nuchal line, mental eminence.
- Additionally were analyzed for further comparisons the human remains from: Valul lui Traian (283 skeletons), Valul lui Traian – Sit 10 (23 skeletons), Poiana (94 skeletons);
- A number of 814 skeletons from Spain (published data) were input in a database with samples for comparisons.

2013

Objectives	Activities	Results
1. Anthropological analysis of 900 skeletons	1.1. Recording of stage of preservation and representation, sex and age, metrics, pathology, injuries	Discriminant functions for sex determination based on the visual traits of skull
	1.2. Calculation of number and distribution of the lesions	Violent cause of death cases in the University Square cemetery

- There were analyzed 624 skeletons from 568 de grave; by sex 149 were females, 236 males an 239 indeterminable; by ages 491 are adults and 133 non-adults; for dental pathology 6177 positions of permanent teeth and 5374 permanent erupted teeth were recorded, and from those 9% have caries, 18.13% are antemortem loose and 6.14% have abscesses; dental resorption is present in 232 de cases, dental calculus in 266 cases; dental enamel hypoplasia was recorded in 193 cases, *cribra cranii* in 259 cases and *cribra orbitalia* in 270; osteoperiostitis was found in 329 de skeletons, osteoarthritis in 222 skeletons; a number of 75 healed fractures were identified in 49 skeletons, and 121 traumatic lesions were recording in 46 skeletons.; average stature male sample is 168.06 cm (Breitinger's method) and for females of 160.96 cm (Bach's method).
- The identification and determination of pattern injuries can reveal the lie style and healing procedures during late medieval period; the fractures were identified in 34 male skeletons, opt females and seven indeterminable; it were affected 75 bones and by sides 53% of cases are on the right one and 45% on the left; by localization 27 are on the upper limbs, 24 on the lower limbs, and other on various area; 67 of cases were healed, which means a treatment and help from the family; despite of this, 30 cases present important deformation of bones, partial alignment in 18 cases and pseudo-arthritis in eight cases.
- From a study regarding the variation of *foramen magnum* in 300 skulls (males and females) from Rainer Osteological Collection was obtained some discriminant functions with 70% of correct assignment.
- The correlation of osteoarchaeological analysis with historical information prove that grave 1-3 is dated during the rules of Michael the Brave (1593-1601), a period of military actions in this area. The anthropological analysis concludes that antemortem lesions, the markers of occupational stress, stature, and asymmetry indicate a military training of these three individuals. The pattern of perimortem trauma is different from the execution of people from that period, and their incidence is bigger than University Square male sample. These three skeletons are very possible to belong to some mercenaries hired in the local army or soldiers from Ottoman army. If they were killed by the Turks they had to be buried in the nearby Christian cemetery; but they were entombed by assailants because they didn't had any personal items, inside the grave were found an iron arrow point and a musket projectile.
- A database with historical information was created. About 281 texts were inputted and arranged by these criteria: food, calamities, demography, epidemics, standard of living, wars, and life style.
- For the database with information from same period cemeteries were updated with 270 graves from 10 necropolises: USA, Croatia, France, England, Portugal, Nederland, Sweden, Italy, Germany, Slovakia, Sudan, Greece, Hungary and Turkey.
- During the evaluation of pathology from the University Square were found ten possible syphilis cases. By sex, six are males, one female and three indeterminable; by age eight are adults and two non-adults; at this stage of study was establish the distribution, morphology and location of lesion so as to by apply the differential diagnostic.

Papers:

1. A. Soficaru, M. Constantinescu, M. Culea, C. Ionică, *Discriminant Functions for Sexing Skulls applied in the Rainer Osteological Collection (Bucharest, Romania)*, HOMO – Journal of Comparative Human Biology (in peer-review).
2. D. Marcu-Istrate, M. Constantinescu, A. Soficaru, *The medieval cemetery from Sibiu/Hermannstadt*, Faustus Verlag, Tübinger Beiträge 6, Tübingen, 2014 (in press).
3. M. Constantinescu, E. Gavrilă, S. Greer, A. Soficaru, D. Ungureanu, *Fighting to the death: skeletal trauma in a mass grave (16th-17th century) from Bucharest, Romania*, International Journal of Osteoarchaeology (in peer-review).
4. Mihai Constantinescu, *Analiza antropologică a unui schelet din prima epocă e fierului de la Saharna (Rep. Moldova)*, Studii de Preistorie 10, 2013, p. 211-219.
5. M. Constantinescu, A. Soficaru, S. Ailincăi, *Materiale osteologice umane din situl de la Enisala-Palanca*, Congresul International Lower Danube Prehistory 50 years of excavation at Babadag, Tulcea, 21.09.2012.
6. S. Ailincăi, F. Mihail, L. Carozza, M. Constantinescu, A. Soficaru, F. Topoleanu, C. Micu, *Un mormânt tumular de la începutul epocii bronzului cercetat la Rahman, com. Casimcea, jud. Tulcea*, Comunicare la Sesiunea Internațională „Pontica”, Constanța, 11.10.2012.
7. W. Kelsey, T. A. Crist, A. D. Soficaru, *Tracking Hunnic cultural influences through cranial deformation*, the 82th annual meeting of American Association of Physical Anthropologists din 9-13 April 2013, Knoxville (Tennessee, USA).
8. K. J. Welch, T. Crist, L. L. Taylor, M. Faraldo, M. Constantinescu, *Set apart: Why were these men dumped in that grave?*, the 82th annual meeting of American Association of Physical Anthropologists din 9-13 April 2013, Knoxville (Tennessee, USA).
9. E. Williams, M. Constantinescu, T. A. Crist, A. D. Soficaru, *Evidence of possible interpersonal violence in a female bronze age skeleton from Romania*, the 82th annual meeting of American Association of Physical Anthropologists din 9-13 April 2013, Knoxville (Tennessee, USA).
10. J. M. Watson, M. Constantinescu, *The Bronze Age cemetery from Hăpria, Romania*, the 82th annual meeting of American Association of Physical Anthropologists din 9-13 April 2013, Knoxville (Tennessee, USA).

2014

Objectives	Activities	Results
1. Health status in the sample of University Square	1.1. Identification of infectious diseases and other pathology	Identified cases of syphilis and tuberculosis. Subjects with surgical interventions. Evaluation of metrics regarding the <i>foramen magnum</i> .
	1.2. Non-adults pathology	Stress factors during the growth. The study regarding the relation between meningeal artery and craniometrical point pterion.

- A number of seven adults (ages between 30 to 50 years; five males and two indeterminable) with bones modification due to the syphilis were identified. The osteobiographical profile and localization of lesion were corroborating by historical data; foreign travelers refer to the disease who affected many people in 17th century. The infection with syphilis was possible due to the Austrian or Russian armies who cross the area for wars with Ottoman Empire.
- For the tuberculosis cases were identified five adult males and one adolescent. The differential diagnostic was applied to identify correctly the typical lesions. The statistical yearbooks of Bucharest from 1880-1940 periods were checked to establish the incidence of the disease and percentage of mortality. Our research implies also the Rainer Osteological Collection where tuberculosis represented 28.69% causes of death; the statistics was made for age at death, profession, birth place (urban or rural) and cause of death (tuberculosis or other disease).
- A number of 10 skeletons with surgical interventions are belonged to some Russian soldiers who died in the battle of Oltenița (04.11.1853) during the Crimean War. One of them has traces of autopsy on the skull and vertebral column. To establish the historical moment it was tried the identification of regiments and was prove that the soldiers were senior officers. The cut marks from the bones were done with typical instruments and according to the surgical handbooks of that period. It is very probable that surgical innervations were made in a hospital from Bucharest (maybe Colțea) and they affected the limbs and the head.
- Stress factors during the growth were established for the non-adult samples. For enamel hypoplasia: mandibular canines = 42.86%; mandibular incisors = 29.17%; maxillary canines = 33.33%; maxillary incisors = 47.83%; for *cribra orbitalia* = 41.03% and *cribra cranii* = 35.14%. The calculation of average for the femur length for ages groups of 1-4 years, 5-9 years, 10-14 years and 15-19 years in comparisons with samples from Mikulcice, Pruskany, Cherbourg, Norroy, Sibiu, and Leiria, indicate that University Square values are lower; same average was calculated for age groups of 0-2.5 years, 2.6-6.5 years, 6.6-10.5 years, 10.6-14.5 years, 14.6-20 years and again the University Square values are lower than Sibiu, Aebelholt, Naestved, Leiria.
- A possible case of spondylo-epiphyseal dysplasia was identified in the Roman-Byzantine necropolis from Slava Rusă (Tulcea County). The skeleton belongs to a male of 35 years old and it was discovered in 2004; the radiocarbon chronology is 321±58 AD. The pathological conditions are: cranial sutures closed, the maxillary teeth are missing, both humeri are short with deformed head, left femur has the head very deformed, two ribs have healed fractures, two cervical and three thoracic vertebrae are fused.

Papers:

1. A. Soficaru, M. Constantinescu, M. Culea, C. Ionică, *Evaluation of Discriminant Functions for Sexing Skulls from Visually Assessed Traits Applied in the Rainer Osteological Collection (Bucharest, Romania)*, HOMO – Journal of Comparative Human Biology, 65, 2014, p. 464-475, DOI: 10.1016/j.jchb.2014.08.004.
2. W. Ripsher, S. Inskip, M. Constantinescu, M. Glasson, J. Sofaer, M. Gilder, S. Border, *Localisation of the pterion and its relationship with the middle meningeal artery in Romanian human skulls*, Journal of Anatomy, 224, (6), 744, 2014, doi:10.1111/joa.12175.
3. Andrei. D. Soficaru, *Anthropological Data for the Human Skeleton from Baba Cave, Pontica*, no. 46, 2013, p. 459-475.
4. A. D. Soficaru, *Anthropological data about the funeral discoveries from Slava Rusă, Tulcea County, Romania*, Peuce, S. N., XII, 2014, p. 307-340.
5. C. Radu, L. Andreica, M. Constantinescu, A. Soficaru, *Multiple Cases with Probable Treponemal Infection from Late Medieval/Early Modern Romania*, International Journal of Osteoarchaeology, 2014 (in peer review).
6. M. Constantinescu, E. Gavrilă, S. Greer, A. Soficaru, D. Ungureanu, *Fighting to the Death: Weapon Injuries in a Mass Grave (16th-17th century) from Bucharest, Romania*, International Journal of Osteoarchaeology, 2014 (in peer review).
7. M. Culea, A. Soficaru, C. Radu, L. Andreica, *Date antropologice preliminare privind osemintele umane din necropola de la Piața Universității*, Volum aniversar Constantin Brâncoveanu, 2014 (in press).
8. M. Hervella, M. Rotea, N. Izagirre, M. Constantinescu, S. Alonso, M. Ioana, C. Lazăr, F. Ridiche, A. Soficaru, M. Netea, C. de la Rua, *Ancient DNA from South-East Europe reveals different events during Early and Middle Neolithic influencing the European genetic heritage*, Plos One, 2014 (in peer review).
9. M. Culea, M. Constantinescu, *Studiul antropologic al cimitirului neolitic de la Gârlești, jud. Dolj*, Studii de Preistorie, no. 11, 2014 (in peer review).
10. E. Teleaga, P. Gherghe, F. Ridiche, M. Constantinescu, A. Bălășescu, V. Apostol, L. Ionescu, *Die mittel- und spät-La-Tène-zeitliche Nekropole in Desa*, Archäologisches Korrespondenzblatt 44, 2014 (in peer review).
11. E. Teleaga, A. D. Soficaru, A. Bălășescu, *Interdisziplinäre Studien über das Prunkgrab aus Agighiol, jud. Tulcea, Rumänien. I. Einführung sowie paläoanthropologische und zoologische Analysen*, Archeologisches Korrespondenzblatt, 44 (3), 2014 (in press).
12. E. Teleaga, *Die Scheiterhaufen aus Cugir und Tarinci. Ein Beitrag zu den Bestattungssitten der Balkanhalbinsel und des vorrömischen Dakiens um Spät-La-Tène-Zeit*. Unter Mitarbeit von A. Bălășescu, A. Soficaru und W. Schoch, Prähistorische Zeitschrift 89, 2014 (in press).