

## “LIFE AND DEATH ON THE PERIPHERY OF ROMAN CIVILISATION: A COMPLEX BIOARCHAEOLOGICAL ANALYSIS OF PANNONIAN COMMUNITIES” – INTRODUCTION TO AN MTA-BTK LENDÜLET “MOMENTUM” PROGRAMME

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*The study introduces the programme, objectives, and working methods of the interdisciplinary [MTA-BTK Lendület Bioarchaeology Research Group](#) established in late 2023. The primary aim of the five-year professional programme is to provide a comprehensive understanding of the lifestyle, health status, and temporal changes in the biological connections of local Celtic tribes and the incoming Roman and barbarian populations in northeastern Pannonia. By comparing cemeteries from various settlement types dating to the 1st–4th centuries AD, the research group aims to characterise these diverse communities from a bioarchaeological perspective.*

**Keywords:** bioarchaeology, Pannonia, archaeogenetics, anthropology, Aquincum, Celts, archaeology of Roman provinces, cemetery archaeology

### INTRODUCTION

The Roman province of Pannonia in the Carpathian Basin existed from AD 49 to 430, initially as a single administrative unit but later divided into two parts in the 2nd century AD and later into four by the late 3rd century AD. The province’s population was highly diverse: the indigenous Celtic and Illyrian tribes gradually established relations with the Roman soldiers stationed there and the craftsmen and merchants accompanying the legionary units. The indigenous population became Romanised with time, adopting customs and a material culture inspired by Italian traditions. Many locals participated in the operation of Roman military facilities, trade, and industry; later, some even held official positions or served in auxiliary units of the army in the hope of obtaining Roman citizenship.

Epigraphic sources indicate that members of the incoming military forces married and assimilated with the local population (MÓCSY 1959, SZABÓ 1963, LÓRINCZ & KELEMEN 1997), but the extent of this integration remains difficult to estimate. While the history of the central regions of the Empire is well documented, peripheral areas like Pannonia are less thoroughly covered in written sources. Epigraphic evidence provides valuable insights into the origins of military units and the local elite, but these sources, in most cases, cannot be linked directly with the individuals found in the graves (KELEMEN 1995).

Beyond the indigenous population, the study of the material remains of barbarian peoples from outside the province is also a key field of the archaeology of the ancient world. During the 4th century AD, elements of the barbarian material culture increased in graves (see, e.g., the 5th-century AD earrings with polyhedral heads in the record of the Roman settlement of Solva (in the area of today’s Esztergom; KELEMEN 2008,

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118–120). This phenomenon raises the question of how far the Romanised population accepted barbarian groups from outside the Empire, such as the Sarmatians, Marcomanni, and Quadi in the north and east, whose presence is known primarily from archaeological evidence (ISTVÁNOVITS & KULCSÁR 2001).

These groups were, at times, trade partners, at other times enemies or rebels, frequently causing crises in the province. Examples include the Marcomannic Wars (AD 166–180), the attack in the area of Solva in AD 270, and the assault at Campona (today a part of Budatétény in Budapest) in AD 322. These turbulent periods were often accompanied by epidemics, referred to in ancient records as plagues, though the exact pathogens have not yet been genetically identified. Notably, emperors such as Marcus Aurelius and Claudius II Gothicus succumbed to such epidemics in Pannonia.

A dissensus characterises interpretation concerning the predominance of indigenous or foreign elements within the Late Roman Period archaeological record (VISY 2003, VIDA *et al.* 2015). Divergent hypotheses, encompassing a broad spectrum from barbarian immigrants to the formation of a unified Late Roman civilisation (VÁGÓ & BÓNA 1976), have emerged in relation to the material culture of the 4th century AD in particular. These debates have opened a wide range of opportunities for bioarchaeological research, offering new perspectives on ancient Pannonian communities for both scholars and the broader public.

## RESEARCH QUESTIONS AND OBJECTIVES

Significant gaps remain in understanding the historical and biological processes taking place in the population of Roman Pannonia. Written sources and epigraphic evidence from the province provide limited information on ordinary people's daily lives, health, and social connections. However, Roman cemeteries and graves offer direct sources to address these questions, particularly when anthropological and genetic studies of human remains can yield new data.

The population was likely highly mixed in Roman Pannonia, especially on the Empire's eastern periphery, such as Aquincum (modern-day Óbuda in Budapest) and Solva. The presence of Roman military forces attracted numerous immigrants from various parts of the Empire, particularly Italy, Hispania, and the Near East. The local Celtic and Illyrian populations gradually underwent Romanisation. Archaeological evidence indicates significant cultural transformations, yet the relationships between military personnel and civil populations, as well as their impact on the biological composition and social structure of the population, are only partially understood, based primarily on epigraphic data.

The fundamental question is whether colonisation or migration can be detected in the province. If so, what was its extent, and how did it influence the composition of the local population? This leads to a related question: How did the interactions between migrants and locals affect the biological makeup of the population? How common were mixed marriages, and how were these influenced by the relationships between different social groups? Conversely, how did such marriages affect those relationships? One of the main goals of genetic research is to conduct population genetics and kinship analyses enabled by whole genome sequencing.

Another key issue concerns changes in the lifestyle and health of the population under Roman rule. To gain insight into the lifestyles of the populations that once lived in northeastern Pannonia, the research group systematically investigates traumatic lesions, activity-induced joint alterations, and various dental pathologies observed in skeletal remains. An especially important question is how diseases introduced by immigrants impacted the local population and to what extent they contributed to potential outbreaks. By comparing paleopathological findings with historical, archaeological, stable isotope, and genetic data, it is possible to assess how frequently certain diseases affected different social strata and identify disparities in lifestyle and diet between these groups.

Additionally, the research includes an innovative objective: the archaeozoological and genetic study of domestic animals in Roman Pannonia, particularly horses and camels. Horse-drawn chariot burials were common, especially among the local Celtic elites (MRÁV 2009). Further research is needed to determine the types of horses and their importation from various regions of the Roman Empire. Although rare, the presence of camels could also provide valuable insights into the trade and economic networks of the Roman Period.

### THE CURRENT STATE OF RESEARCH AND ARCHAEOLOGICAL SITES INCLUDED IN THE PROJECT

Numerous archaeological excavations have taken place in Lower Pannonia (Pannonia Inferior), established in AD 106, and later, in the province of Pannonia Valeria, formed in AD 296, particularly in major cities and military fortifications. However, comprehensive analyses of larger urban centres are hindered by fragmented excavation opportunities due to urban development, varying excavation methods, and gaps in archaeological documentation spanning multiple generations of scholars.

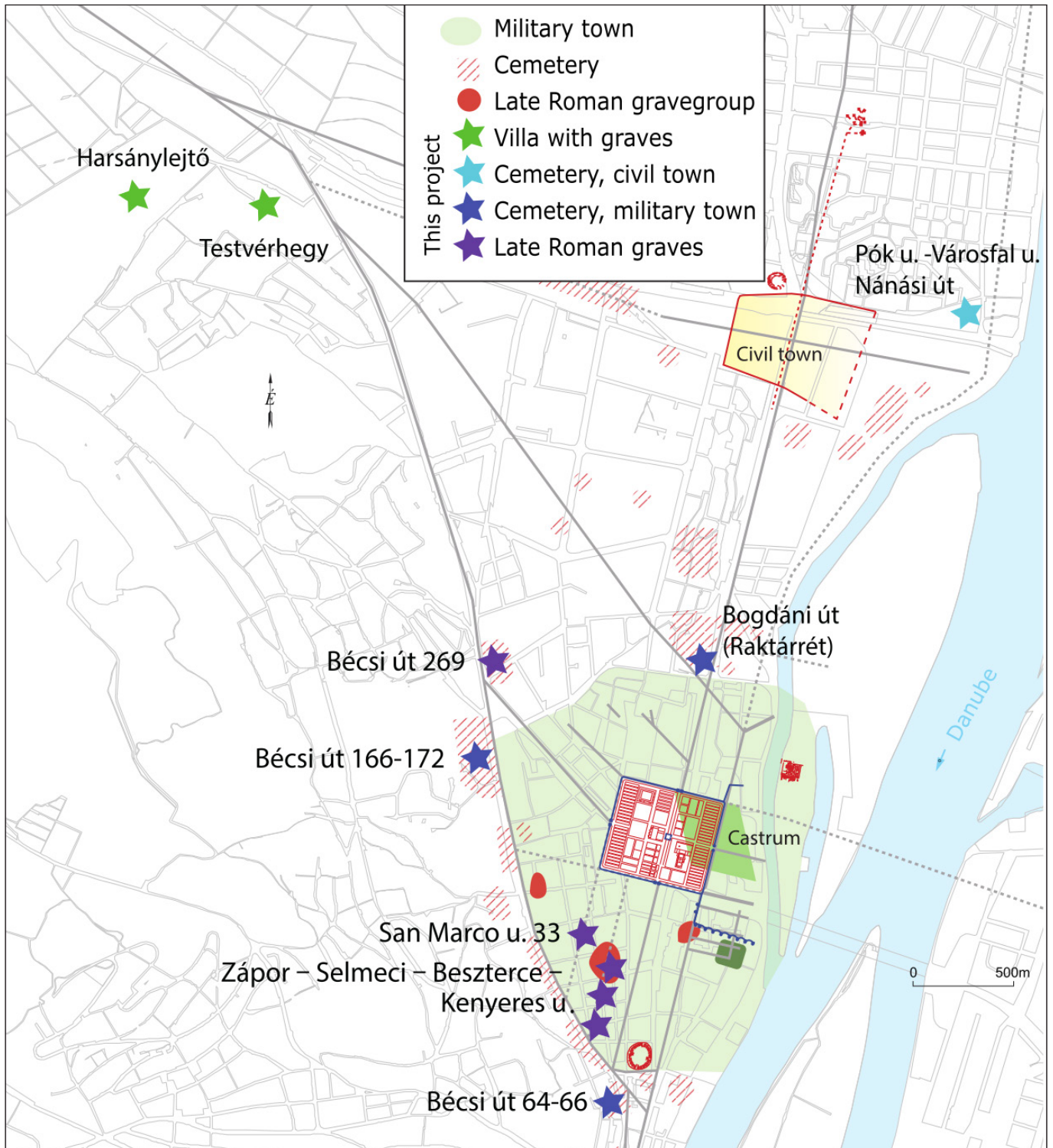


Fig. 1. Map of modern-day Óbuda (in Budapest) with the excavated areas of the Roman town of Aquincum. Stars mark the archaeological sites included in the project. Original map by Krisztián Kolozsvári (BHM, Aquincum Museum)

Aquincum is one of Pannonia's most significant Roman cities, serving as the centre of Pannonia Inferior during its heyday in the 2nd and 3rd centuries AD. A Roman military fortress and a civil settlement had been established there by the end of the 1st century AD. The ruins of the Aquincum settlement complex were identified as early as the late 18th century, and excavations have been ongoing for over two centuries. The BHM Aquincum Museum continues with these excavations to this day, and both the legionary fortress and the civil town have been recognised as important archaeological sites (*Fig. 1*). Teams from BHM have unearthed approximately 7,000–8,000 Roman graves in the area in the past decades (ZSIDI 2017), but bioarchaeological analyses have only covered insignificantly small parts of individual cemeteries so far (TOPÁL 1993; 2003), underscoring the importance of restarting bioarchaeological research from a broader perspective.

The cemeteries excavated thus far suggest that the city's population was highly heterogeneous, incorporating diverse coexisting social and ethnic groups. Particularly noteworthy are the cemeteries near the military fortress, which yielded numerous finds related to the daily life of Roman military personnel and their families. Selected grave clusters include those of groups settling within the military town after its decline. Additionally, civil cemeteries provide significant insight into the living conditions of the wealthier and poorer classes, such as through a comparative analysis of the burials from Pók Street and the *villa* unearthed on Harsánylejtő.

Solva was a key link in the Roman frontier defence system. Its remains have been known since the 18th century, but instead of systematic excavations, they have been discovered primarily during demolition and landscaping preceding constructions financed by the church (KELEMEN & MERCZI 2019). The cemeteries of the Roman *castellum* (fort) and its *vicus* (camp village) lie beneath the modern city and have only been partially uncovered in small-scale excavations in the 1990s and 2000s (KELEMEN 2008). The cemetery at Bánomi-dűlő served as a burial site for the garrison and their families, while the graves found at Kossuth Lajos Street likely belonged to the descendants of the indigenous population (KELEMEN 2008). Examining these two cemeteries allows for a detailed analysis of the interactions between the local population and the military personnel. The significance of the Bánomi-dűlő cemetery is heightened because it remained in use uninterrupted from the 4th to the mid-5th century AD. Hopefully, this site will enable the tracing of the social and cultural changes that took place in the waning days of the Roman Empire.

Páty is the third key site for human bioarchaeological research. It contains a Roman *vicus* and a cemetery of the Romanised Celtic Eraviscus tribe. The Late Roman burials of the 183 Roman graves excavated by Katalin Ottományi are being analysed as part of the [ERC HistoGenes Synergy project](#). Burial customs at Páty, particularly those associated with women, such as the use of brooches and other jewellery, reflect strong Celtic traditions (OTTOMÁNYI 2019).

Having distinct biological, environmental, and historical contexts, the three selected sites (Aquincum, Solva, and Páty) complement each other and provide a comprehensive picture of the composition of the Roman Period population of northeastern Pannonia. The study of these sites offers an opportunity to compare the lifestyles and burial practices of urban, military, and rural communities.

## METHODOLOGY

The project adopts a multidisciplinary approach to gain a comprehensive understanding of the life and death of the Pannonian population (*Fig. 2*). Archaeological evaluation focuses on grave finds, including pottery vessels and clothing accessories. Determining the function, age, and possible origin of these artefacts will be essential for analysing burial customs and the cultural affiliation of the buried individuals. Additionally, the study of the topographic setting of the graves and cemetery structures may yield important clues on the social status of the different groups.

Anthropological analyses aim at reconstructing the basic biological profiles of individuals (age at death, sex, height) and conducting detailed examinations of traumatic lesions, activity-induced joint deformations, and pathological conditions (e.g., caries and dental calculus). These analyses are performed on teeth, maxillae, and mandibles following both domestic and international methodologies (PAP *et al.* 2009; UBELAKER

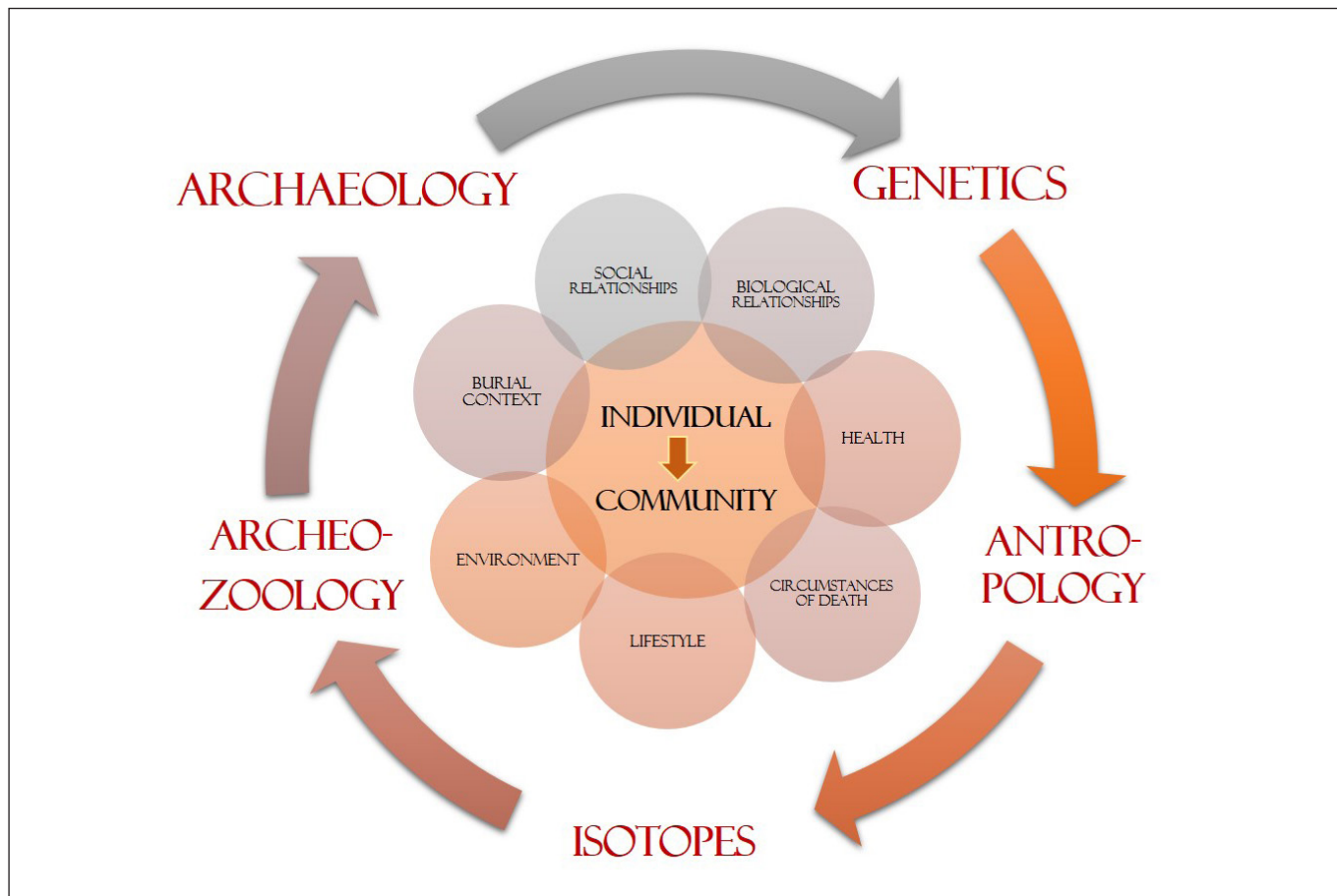


Fig. 2. Integrated disciplines in the MTA-BTK Lendület “Momentum” project and key foci of research

1989; BUIKSTRA 2019). While the analysis of traumatic lesions and joint deformities may help reconstruct the environmental impacts different individuals and groups (e.g., from different temporal and spatial contexts or social strata) had to face, the study of the dental remains is expected to yield crucial information about diet. The identification of infectious diseases and significant health issues affecting life quality and mortality (e.g., congenital anomalies or tumours) is also pivotal. These findings will be integrated with data from archaeogenetics, stable isotope analyses, and archaeological studies to draw robust conclusions.

Although detailed genetic studies on Roman populations in Europe have begun in recent years (ANTONIO *et al.* 2019; OLALDE *et al.* 2023), the genetic research planned for Pannonia is pioneering. One of the major challenges is the extraction of high-quality ancient DNA (aDNA) from bone samples. We aim to analyse DNA from approximately 300 skeletons from selected archaeological sites. By aiming for full genomic sequence coverage, we seek to provide a detailed picture of the population’s biological diversity, mobility, and admixture. Particular emphasis is placed on examining ‘identity by descent’ chromosome segments (RINGBAUER *et al.* 2024), which can reveal distant kinship connections and their networks within the ancient populations.

Stable isotope analyses aim to gather data on diet and living conditions. For example, nitrogen and carbon isotopes ( $^{13}\text{C}$  and  $^{15}\text{N}$ ) enable the reconstruction of individual diets, particularly regarding the proportion of animal protein consumed, the balance between plant and animal foods, and the types of carbohydrate sources. This method helps us understand dietary differences across social strata, age groups, and communities.

Archaeozoological research within the project focuses on animal remains associated with burials, particularly horses. Genetic analysis of horses from chariot burials provides insight into breeding practices and trade networks in Roman Pannonia. Rare camel finds are also subject to genetic studies, contributing to an understanding of trade connections and the distribution of these animals within the Empire’s borders.

## PROJECT PARTICIPANTS

The research project is realised as a collaboration of multiple institutions and experts. The Institute of Archaeogenomics at the HUN-REN Research Centre for the Humanities leads the genetic and anthropological studies, with the Institute of Archaeology from the same research centre providing advisory support for the project. Archaeological, anthropological, and archaeozoological material analysis is conducted by experts from the BHM Aquincum Museum, the Ferenczy Museum Centre, and three institutes of the Hungarian National Museum Public Collection Centre – Hungarian National Museum (HNM), the HNM Balassa Bálint Museum, and the Natural History Museum, where anthropological investigations are further supported.

Stable isotope analyses are performed by specialists from the HUN-REN ATOMKI in Debrecen and Isotoptech Ltd. The processing of genomic datasets is supported by the HUN-REN Cloud infrastructure at the Wigner Data Centre and the HUN-REN Research Centre for Astronomy and Earth Sciences.

A full list of research group members can be found on the project [website](#).

## SUMMARY

Our research aims to generate new biological and archaeological data on the composition and living conditions of the population in Roman Pannonia. By employing a multidisciplinary methodology, we hope to contribute to a deeper understanding of and greater awareness of the history of Pannonian communities, while also paving the way for new directions in archaeology and historical studies.

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