

## **Cattle-based agriculture in the Early and Middle Neolithic in the Polish lowlands – faunal and genetic characterization**

The project aims to recognize the introduction and spread of cattle-based agriculture and its further development by the Neolithic farmers of the North European Plain. In particular, it will attempt to (1) determine the places of origin of cattle and introduction of cattle-based architecture in the Early and Middle Neolithic the Polish lowlands; (2) examine the character of cattle husbandry in this period, in particular recognition of the meat and milk exploitation profile as an outcome of husbandry traits of different cattle breeds throughout the studied periods. These processes will be investigated in three major Early and Middle Neolithic cultures from the Polish lowlands: (1) the Linear Band Pottery culture in the second half of the sixth millennium BC, (2) the Late Lengyel culture in the second half of the fifth millennium BC, and (3) the Funnel Beaker Culture in the fourth millennium BC.

The project shall deploy the cutting edge research methods and techniques to effectively complete both research objectives. Migration and interbreeding of cattle will be studied with the use of targeted next-generation sequencing of specified regions in chromosome Y and mitochondrial DNA (mtDNA). Chromosome Y analysis will be focused on several known interspersed multilocus microsatellites (IMM) and single nucleotide polymorphisms. Mitochondrial DNA analysis will be focused mainly on clustering samples to well established main five mtDNA haplogroups (T1-T5), T1 sub-haplogroups (T1a – T1f) and rare haplogroups (P, Q, R). Additionally, the state-of-the-art osteology method in the form of the Logarithm Size Index (LSI) will be used to distinguish between wild and domesticated forms. A completion of the second project's objective will be achieved by the use of targeted next-generation sequencing of aDNA isolated from bovine bones from three study groups. Selection of targets will be focused on QTL (quantitative trait loci) markers and candidate genes encoding proteins potentially involved in utility trait phenotype expression. QTL and candidate genes analysis will be focused mainly on utility traits such as milk production (milk yield, milk protein and fat yields, milking speed) and meat quality (meat tenderness score, meat texture, meat flavor score, meat fat content, etc.). Furthermore, the study of dental eruption, wear and replacement stages will lead to the construction of mortality profiles. They will be examined by the correspondence analysis.

The project provides a well-grounded explanation of the origin of cattle-based agriculture and its subsequent spread in the Early and Middle Neolithic in the Polish lowlands as well as examine the impact of cattle traits, in terms of meat and milk yield, upon the profile of cattle exploitation. It will fill a major gap in the recognition of the processes in the Polish part of the North European Plain, which is devoid of these kind of studies. The project offers an innovative solution for studying these processes at the osteomorphological and genetic levels. It will weave together a highly coherent picture of the evolution of Neolithic societies in the Polish lowlands in time and space.