

Transition to agriculture in Europe: Evolutionary trends in body size and body shape

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Janusz Piontek¹ and Vaclav Vančata²

¹University of Poznań, Institute of Anthropology, Poznań, Poland;

²Department of Biology, Faculty of Education, Charles University, Prague, Czech Republic

Summary: This study presents a general processual model of skeletal adaptations in the transition to agriculture, and its detailed application, using the example of the Upper Paleolithic-Neolithic transition in Europe (Piontek 1996, 1999a, 1999b, 2001). We suppose, that natural selection operated through the differential fertility of early and late maturing individuals and so favored a new ontogenetic pathway in Neolithic agricultural populations, i.e., acceleration of ontogeny connected with early maturation. Differences in the body build of early and late maturing individuals has been verified on the basis of contemporary ontogenetic semilongitudinal data, and shows that early maturation is associated with a longer trunk and shorter lower limbs. Late maturing individuals have shorter trunk and longer lower limbs. Similar differences have been described also for the process of transition from the Upper Paleolithic to the Neolithic in Europe.

We have studied postcranial skeletal data for three groups: European Upper Paleolithic individuals, including: the Pre-Glacial Maximum group – PGM (24 males, 14 females and 5 individuals of unknown sex) and the Late Upper Paleolithic group- LUP (19 males, 13 females and 3 individuals of unknown sex); European Mesolithic individuals (9 males and 6 females); and five Neolithic populations with two types of economy: early Central European agriculturalist populations (Jena, Germany – the Linear Band Pottery Culture-LBPC-32 individuals) and early Central European pastoral populations (Złota, Poland – the Corded Ware Culture - CWC - 62 individuals, Jena, Germany – the Corded Ware Culture - 38 individuals), and agriculturalist populations (Kujavia, Poland – the Lengyel Culture – 45 individuals and Hungary – the Lengyel Culture - 84 individuals).

The selection of material and data used followed the program of reconstruction of body size and body shape of fossil *Homo sapiens* (Vančata 1991, 1996,1997). We have studied bone lengths, basic measurements of the lower and upper limb long bones, robusticity and biomechanical structure of bones. Body height was computed as a mean value of six different formulae for the femur and two for the humerus. Body mass was computed as a mean value of 25 different formulae based on the measurements of the femur and tibia.

We have found significant differences between the Upper Paleolithic and Neolithic populations in: (1) body size, body shape and limb proportions, (2) basic biomechanical limb parameters and limb robusticity, and (3) sexual dimorphism both in body size and shape, and in the proportions and biomechanical structure of limbs. The results of our study support our processual model, as there is conformity between the empirical fossil and recent data, and the theoretical assumptions of our model.

Key words: Upper Paleolithic, Mesolithic, Neolithic, Central Europe, body size, body shape, evolutionary trends.