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Refining 14C dating of bone >30,000 BP : establishing an accurate chronology for the Middle to Upper Palaeolithic transition in France
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Abstract

This thesis aims to improve the chronology of the transition from the Middle to Upper Palaeolithic in France through the radiocarbon dating of bone collagen samples. This requires accurate calibration of the radiocarbon time scale for this time interval, reliable extraction of collagen from prehistoric bones and accurate AMS radiocarbon dating.

The recent developments in radiocarbon calibration beyond 26,000 cal BP, which have resulted in the formulation of an internationally agreed calibration curve spanning back to 50,000 cal BP, are discussed in the introductory section of this thesis.

The methodological section of this thesis presents the results of experiments undertaken to establish an optimal procedure for extracting collagen from bone samples for radiocarbon dating. The main objectives of these experiments were to remove contamination from the organic bone fractions, which generally results in younger ages, and to avoid the incorporation of exogenous carbon in the laboratory through careful cleaning of the equipment. In order to achieve these aims, a suite of bone pretreatment methods were adopted and the resulting collagen extracts were sent for dating to different laboratories. The radiocarbon ages obtained from two test bones cover large ranges, which fall significantly beyond measurement error. This may be due to differences in both pretreatment methods and in the set-ups of different AMS facilities. The research undertaken for the present thesis has allowed the author to establish a protocol of laboratory procedures that produces consistent ages for bone collagen older than 30,000 cal BP

This protocol was implemented at the Max Planck Institute for Evolutionary Anthropology (MPI-EVA) and, in chapter 7 of the thesis, it is adopted to establish a chronological framework for the site of Les Cottés in France. This site has an almost uninterrupted sequence spanning from the Middle to the Upper Palaeolithic, including Mousterian, Châtelperronian and Aurignacian occupations. The AMS radiocarbon determinations obtained from bone collagen samples, pretreated according to the quality criteria developed in this thesis, accurately date not only the different human cultures which succeeded each other at Les Cottés, but also the climatic episodes and oscillations which characterized the Middle to Upper Palaeolithic transition. This case study demonstrates that AMS radiocarbon dating of mammal bone collagen can be

reliably used for establishing the chronology of sites older than 30,000 ^{14}C years BP and with well-preserved deposits.