
Direct ESR dating of *Homo antecessor* from Atapuerca Gran Dolina TD-6 (Spain): first results

Mathieu Duval*^{†1}, Rainer Grün¹, Josep M. Parés², Laura Martín-Francés³, Isidoro Campaña², Jordi Rosell⁴, Qingfeng Shao⁵, Juan Luis Arsuaga⁶, Eudald Carbonell⁴, and José María Bermúdez De Castro²

¹Australian Research Centre for Human Evolution, Griffith University (ARCHE) – Australie

²Centro Nacional de Investigación sobre la Evolución Humana (CENIEH) – Espagne

³Université de Bordeaux (PACEA) – Université de Bordeaux, Université de Bordeaux – France

⁴Institut Català de Paleocologia Humana i Evolució Social (IPHES) – Espagne

⁵Nanjing Normal University – Chine

⁶Universidad Complutense de Madrid – Espagne

Résumé

We present here the details of the first direct Electron Spin Resonance (ESR) dating study of *Homo antecessor*, the earliest known hominin species identified in Europe. The analysis of a tooth (ATD6-92) from TD6 unit of Atapuerca Gran Dolina (Spain) was carried out following a "semi non-destructive" procedure combining ESR measurements of an enamel fragment and high resolution Laser Ablation ICP-MS U-series of dental tissues. Additional magnetostratigraphic data were collected within TD6 for independent age control. Our dating results are consistent with previous studies of TD6 unit and associated fossil remains and confirm the Early Pleistocene age of *H. antecessor*. Additionally, this work illustrates the challenge of dating fossil human teeth by means of ESR. It identifies the specific pitfalls inherent to this application, in particular the systematic μ CT-scanning of human remains, or the existing uncertainty arising from the absence of the original surrounding environment, which complicates the dose rate reconstruction. Other sources of uncertainty are common to standard ESR dating applications to large mammal fossil teeth, such as the spatial distribution uranium-series isotopes in dental tissues, the variability of the water content over time, or the potential preferential creation of unstable NOCORs in the radiation-induced ESR signal. Pre-screening of fossil remains using laser ablation IPC-MS appears to be essential prior to any subsequent analysis to evaluate the suitability of the sample for combined US-ESR dating, although it does not preclude future complications in the dating process.

Mots-Clés: Quaternary Geochronology, Lower Palaeolithic, ESR dating, Atapuerca, *Homo antecessor*

*Intervenant

[†]Auteur correspondant: m.duval@griffith.edu.au