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Radiocarbon dating of the Early Natufian at el-Wad Terrace, Mount Carmel, Israel

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The Natufian culture (15-11.5 kyr BP) of the Levant played an integral role in the transition from nomadic hunter-gatherers to the establishment of sedentism and, finally, to food producing societies of the Neolithic. The Natufian sites in the Southern Levant are characterised by a lack of macrobotanical remains, including charcoal, and a poor preservation of bone collagen. A result of the scarcity of radiocarbon dateable material is that only about 30 reliable radiocarbon dates from the Natufian are available for constructing a chronology of this period, which would enable a better synchronisation of archaeological and environmental data. A key question of Natufian research is if and to what extent past climate changes influenced the lifestyle of the Natufian communities, but the prerequisite for the correlation of cultural and environmental events in time are accurate chronologies. Therefore, a chronological framework with dates from well-defined contexts and samples of good quality is essential for the investigation of the Natufian.

We present new C-14 data from the site of el-Wad Terrace, one of the major Natufian hamlets of the 'core area' of this culture. The samples (12 charcoals and 34 bones, of which 6 charcoals and 5 bones were suitable for dating) were derived from Early Natufian (15-13 kyr BP) living surfaces, dwellings and burials.

Using FTIR, we investigated the environmental factors that influenced the preservation of material for radiocarbon dating of the site, and we tested a modified pre-treatment method for poorly preserved charcoal samples. We found that the usual pre-treatment protocol for C-14 samples (W-ABA) removed more charcoal material than the method modified by Rebollo et al. (2008) which omits the first acid treatment (W-BA). This first acid step enhanced the extraction of humic substances during the subsequent base step. The modified W-BA method is a promising tool for dating poorly preserved charcoals which needs further testing with larger sample sets. The poor preservation of charcoal could be attributed to the presence of calcite and therefore an alkaline pH of sediments. The most important factor determining bone collagen preservation may have been the hydrological setting, i.e. fluctuating water levels due to oversaturation of the dense sediments after rainfall.

The strict stratigraphic and quality control on the dated material has provided a consistent chronology exhibited by samples derived from different parts of the terrace. The obtained dates are largely in agreement with their cultural affiliation. The ongoing radiocarbon dating program and the processing of additional samples from refined contexts will contribute to open issues regarding the Natufian, such as the initial phases of the culture.