Reply to Douka et al.: Critical evaluation of the Ksâr 'Akil chronologies

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Our paper (1) proposes a new chronology for Ksâr 'Akil based on 16 accelerator mass spectrometry (AMS) determinations on shells. To minimize the possibility of dating diagenetically compromised samples, we conducted amino acid racemization analyses on the intracrystalline proteins, oxygen isotope analysis, and geochemical characterization of all dated shells. Our calibrated radiocarbon ages fit well with existing Levantine chronologies, but are up to 4,000 y older than Douka et al.'s (2). Our paper explores several possibilities for this difference, whereas Douka et al. (3) provide alternative explanations. They accept our radiocarbon ages as correct but question our sample selection and Bayesian modeling. Douka et al. (3) question both the inclusion of samples from the 1940s excavations and our combined outlier analysis. Excluding the 1940s samples and running a manual outlier analysis (using 0.05 prior outlier probabilities without manual down-weighting) (4) results in age ranges of 42.7–40.9 ka cal B.P. for the Egbert fossil and 44.9–43.6 ka cal B.P. for the start of the dated Initial Upper Paleolithic (IUP; Layer XXII). Thus, Egbert's age estimation is slightly younger than in our paper (1), but the age estimations for the IUP do not change, and they support our original conclusions. The date for the Ethelruda fossil found in Layer XXV was modeled without a lower constraint, thus generating an age estimate that may be skewed backward in time. As suggested by Douka et al. (3), placing start and end boundaries for the undated IUP allows the model to constrain the lower boundary of Ethelruda's age range. We would not dispute that, but setting a lower constraint is problematic. Currently, there are no dates for the start of the IUP; thus, placing boundaries cannot be substantiated by any chronological data. Nonetheless, incorporating these boundaries in our model provides an age estimate for Ethelruda of 49.9–44.1 ka cal B.P., making it older than all European human fossils except Cavallo B [the context of which has been questioned (5)]. Douka et al. (3) also propose including dates from lower in the sequence. We rejected this option, as all available dates are of uncertain provenience and/or obtained on compromised samples (1). Stutz et al. (6) independently raised doubts on the Middle Paleolithic AMS dates by Douka et al. (2), concluding that chemical diagenesis resulted in minimum ages. Moreover, excluding both the date function for Ethelruda and the constraining boundaries, the start of the dated IUP is 44.9–43.6 ka cal B.P., both with and without the 1940s samples. This provides a minimum age estimate for the underlying undated IUP deposits containing Ethelruda at their base. In conclusion, differences in the Bayesian models used do not appear to explain the divergence between our dates and those reported by Douka et al. (2). Our data provide reliable estimates for modern humans and the IUP at Ksâr 'Akil and support our initial conclusions for an early chronology for modern humans in the Levant. This is in line with other Levantine datasets and is compatible with the Levantine corridor hypothesis.

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The authors declare no conflict of interest. 1

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