Radiocarbon, Vol 65, Nr 6, 2023, p 1366–1371 DOI:10.1017/RDC.2023.115

STABLE ISOTOPE AND RADIOCARBON DATING OF HUMAN SKELETAL REMAINS FROM ISLAMIC SETTLEMENT, KHIRBET AL-SHEIKH HUMAID, NABLUS, PALESTINE

Loay Abu Alsaud[1]* • Amer Al-Qobbaj[2]

[1]Department of Tourism and Archaeology, Faculty of Humanities and Social Sciences, An-Najah National University, Nablus, Palestine
[2]Department of History, Faculty of Humanities and Social Sciences, An-Najah National University, Nablus, Palestine

ABSTRACT. Khirbet Al-Sheikh Humaid is found 615 m above sea level in the central highlands of Palestine, northwest of the city of Nablus. During rescue excavations carried out at the site, part of a male human skull with a tooth attached was discovered. Accelerator mass spectrometry radiocarbon (AMS ^{14}C) dating and stable isotope analysis were performed on the tooth at the Hertelendi Laboratory in Debrecen, Hungary. Dating revealed the individual had lived in the time frame 900–1030 AD, which is within the Abbasid period (750–1258 AD). Dietary analysis gave information on the daily life of the inhabitants of the settlement, showing local agriculture provided a diet of legumes and vegetables.

KEYWORDS: Abbasid period, AMS dating, isotopic composition, Khirbet Al-Sheikh Humaid, Nablus.

INTRODUCTION

Khirbet Al-Sheikh Humaid is located approximately 615 m above sea level on a hill known as White Mountain rising from the village of Ijnisinya, 6 km northwest of the city of Nablus (Figure 1). In summer 2017, from 03/08 to 14/08/2017, in collaboration with the Nablus Department of Antiquities[1], the first author carried out rescue excavations at the site when a landowner, Faysal Al-Affori, made plans to build there. The rescue excavation proved worthwhile, revealing the foundations of opulent dwellings with mosaic flooring, as well as numerous related finds. Significantly, among these were the remains of a human skeleton, consisting of part of a skull with a tooth attached.

The area of the hill is approximately four hectares. Field surveys and aerial photography provided information on the most significant structures found at Khirbet Al-Sheikh Humaid. These included approximately 20 wells for drawing water, hewn into bedrock—the large number would have been due to the soft limestone composition of the rock and the lack of natural springs in the area, apart from a relatively distant one at Ain Zawata. The inhabitants of the village depended on rainwater and water collection in wells and reservoirs. In addition, on the west slope of the hill, the ruins of a small limestone mosque (measuring 6 × 6 m), and a destroyed *mihrab*, were found. It appears to have been left to deteriorate when the inhabitants abandoned the site and is in very poor condition. The researchers were not able to give the mosque a construction date, as no inscription or evidence of an architectural style specific to a certain period remained.

This particular site is important for the Palestinian community as it will provide historical and archaeological information on the ruins. The discoveries and information will provide opportunities for restoration of the archaeological site that would allow it to be opened to local

*Corresponding author. Email: loayabualsaud@najah.edu
[1]Mahmoud Al-Birawi and the students of the Department of Tourism and Archaeology at An-Najah National University: Thaer Haron, Yazid Dweikat, Abdallah Hany, Baker Al-Sholi, Yousef Othman and the worker Laith Dawod Dweikat.

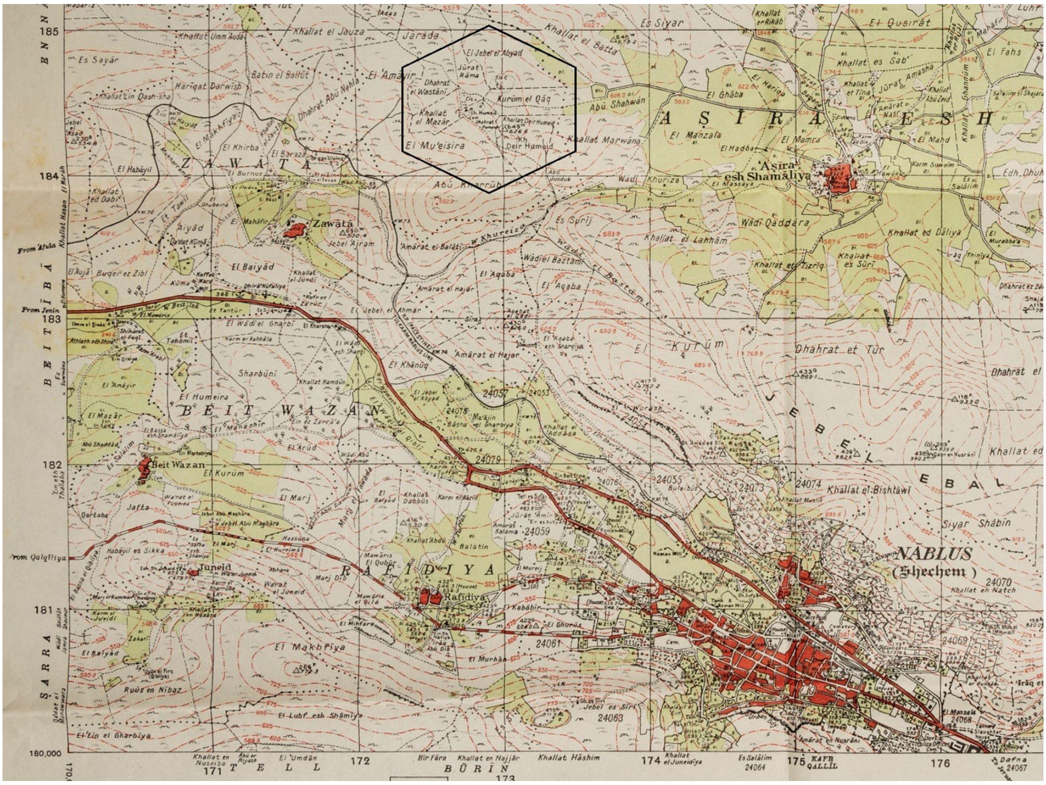

Figure 1 Topographic map of Nablus area and the location of Kh. Al- Sheikh Humaid. British Survey of Palestine, 1933. Scale 1: 20.000. Series 2. Sheet 17-18, Nablus 1942. (Collection of the Albright Institute, Jerusalem.)

and international tourism in the future. The local community will learn of the importance of the ruins as part of their cultural heritage and will be motivated to protect them from vandalism, looting, and attack.

AIMS

The focus of this paper concerns the skeletal remains found, and the objective was to use scientific analysis to obtain chronological and dietary information on the individual, using radiocarbon (^{14}C), stable isotope, which in turn would give information on the history of the site, including lifestyle and land use. A general aim for the Khirbet Al-Sheikh Humaid archaeological site is to record all the buildings and structures, including the wells hewn into bedrock and the small mosque discovered, using notes, photographs, and illustrations, Another aim based on analysis of the skeletal remains is to research continuity of human inhabitation at the site and the reasons for disputes between families from Khirbet Al-Sheikh Humaid, Barqa Burqa and the village of Sebastia that resulted in the expulsion of the inhabitants from Khirbet Al-Sheikh Humaid in the nineteenth century, when buildings were left to fall into ruin.

ISSUES

Various issues affected the authors' research task. Firstly, there arose the question of why the village with its centuries-old buildings and structures was left to suffer damage from

https://doi.org/10.1017/RDC.2023.115 Published online by Cambridge University Press

environmental erosion and natural disaster. Secondly, the ruins had been subjected to illegal excavation by antiquities looters in search of antiquities or gold, resulting in loss and damage to the site, and hence to the Palestinian material cultural heritage in general. Thirdly, the absence of any early sources on the history and archaeology of Khirbet Al-Sheikh Humaid had left a vacuum of knowledge on the site. Fourthly, when the area came under control of the Israeli army in 1967 it became a military corridor for access to the Mount Ebal summit, overlooking the city of Nablus, and also to the Shavei Shomron settlement. Lastly, urban development and expansion has become a serious threat to Palestinian antiquities research and preservation, due to bulldozing and road construction, which has led to the destruction of archaeological sites, especially in areas not under official Palestinian control. This is particularly relevant in the case of Khirbet Al-Sheikh Humaid.

BACKGROUND

In the past, neither local nor foreign researchers in the central highlands of Palestine, and in particular, the Nablus area, had analyzed human skeletal remains to obtain historical information on an archaeological site. The study of the diet of the inhabitants of a site, using resources from auxiliary sciences, had not been given consideration, as archaeological studies remained based on traditional methods. Due to this archaeological focus on a traditional approach, records of large quantities of human bones from former periods previously found in numerous early tombs in the Nablus area have not been retained. This may have happened for several reasons. One may have been the high costs of laboratory analysis in the last century, as compared to the present. Another one, such as illegal digging, and a lack of sustained national interest in this issue (Yahia 2008:39). Lastly, until recently, local laboratories capable of performing this type of analysis were not available in Palestine. The only available resources were forensic medical laboratories that examined skeletal remains by sight to determine cause of death and age at the time of death.

Nevertheless, from 2016 to the present, the first author has undertaken several studies to examine and date human skeletal remains using European scientific laboratories for accelerator mass spectrometry (AMS) ^{14}C dating and stable isotope analysis to obtain dietary information on the early communities in the region. It was the third time the authors had contracted external scientific laboratories to perform analyses to seek archaeological information not found with standard methods. These laboratories are based in Kyiv, Ukraine, in Debrecen, Hungary, and at the University of Santiago de Compostela, in Spain. This work was made possible with funding from An-Najah National University (Abu Alsaud et al. 2019, 2021).

RADIOCARBON ANALYSIS

Method

Male human skeletal remains from Khirbet Al-Sheikh Humaid, consisting of part of a skull with a tooth attached, were found *in situ* by the first author in an un-looted tomb. The tooth sample for analysis was labelled Sample I/2956/2 by the laboratory in Debrecen, Hungary.

The collagen fraction of the sample was prepared according to the modified Longin method (Major et al. 2019a, 2019b). At the pretreatment stage, visible surface marks were noted. After repeated ultrasonication in ultrapure water, the sample was dried overnight in a controlled environment at at temperature of 60°C. The outer surface of the sample was removed with

https://doi.org/10.1017/RDC.2023.115 Published online by Cambridge University Press

Table 1 Data from laboratory analysis of tooth sample.

HEKAL sample no.	Sample name	$\delta^{13}C$ vs. PDB (‰) (±0.1‰)	C content (%) (±0.2%)	$\delta^{15}N$ vs. air (‰) (±0.1‰)	N content (%) (±0.2%)	C/N ratio	Collagen yield (%)
I/2956/2	Tooth from Khirbet Al-Sheikh Humaid	–20.0	18.9	8.0	6.4	3.4	1.2

Table 2 Age range results summary of tooth sample analysis.

AMS ^{14}C lab code	Sample no.	Sample name	Sample material	Conventional ^{14}C age (yrs BP) (± 1σ)	Calibrated Calendar age (cal AD/BC) (2σ)
DeA-35241	I/2956/2	Tooth from Khirbet Al-Sheikh Humaid	Tooth	1064 ± 16	AD 900–1030

abrasion. The tooth fragment was then ground and sieved to obtain a fraction size of 0.5–1.0 mm. For chemical pretreatment, 500–1000 mg of the ground powder was placed in a test tube to undergo the ABA (acid-base-acid) process. After pretreatment, the pH was adjusted to 3 to eliminate absorbed ambient CO_2. The acid-insoluble collagen was then placed in a test tube containing 5 mL of HCl solution with a pH of 3, and it was then placed in a block heater set at 75°C, for 24 hr. Dissolved gelatine then passed through a 2 μm glass fiber filter into a 20 mL vial (Milles AP20), precleaned with nitrogen gas, and once frozen, was freeze-dried for at least 2 days. To provide AMS ^{14}C dating, the gelatine samples were combusted using a modified sealed-tube method—the sample and MnO_2 reagent went together into a borosilicate combustion tube. After flame sealing, the tubes were placed in a muffle furnace set at 550°C for at least 12 hr to combust the gelatine. The CO_2 gas produced was then purified to eliminate byproduct gases, using a vacuum line in which carbon content was also quantified (Janovics et al. 2018; Molnár et al. 2013a, 2013b).

Carbon and nitrogen stable isotope measurements ($\delta^{13}C$ and $\delta^{15}N$) were carried out on the formerly obtained gelatine using a Thermo Finnigan Delta Plus XP isotope ratio mass spectrometer: duplicated gelatine subsamples (ca 0.3 mg) were packed into ultraclean aluminum cups and combusted using an elemental analyser (Thermo Scientific™, EA IsoLink CNSOH). Stable carbon and nitrogen isotope content and ratios were produced (Table 1).

Results

The ^{14}C analysis results showed a conventional ^{14}C age of 1064 ± 16 BP, corresponding to a calibrated calendar age range of 900–1030 ACE (Table 2 and Figure 2). This signifies a 95%

https://doi.org/10.1017/RDC.2023.115 Published online by Cambridge University Press

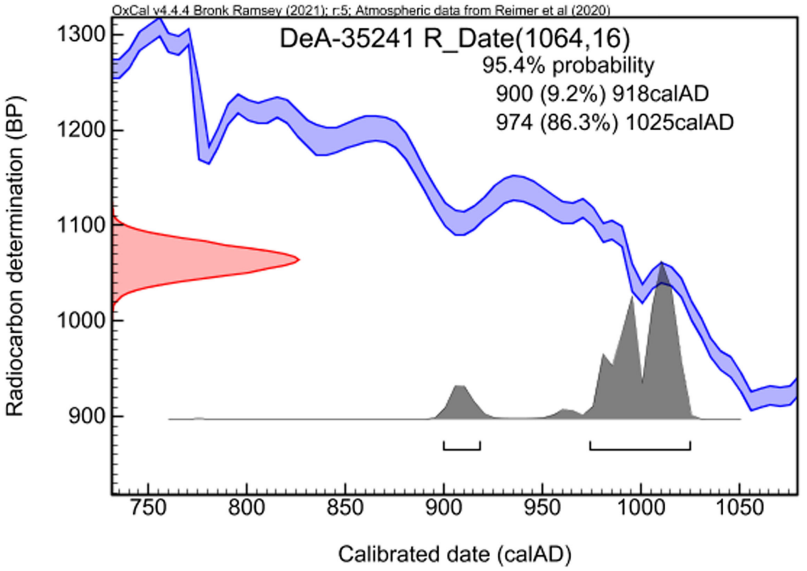

Figure 2 Tooth sample calibrated age range chart.

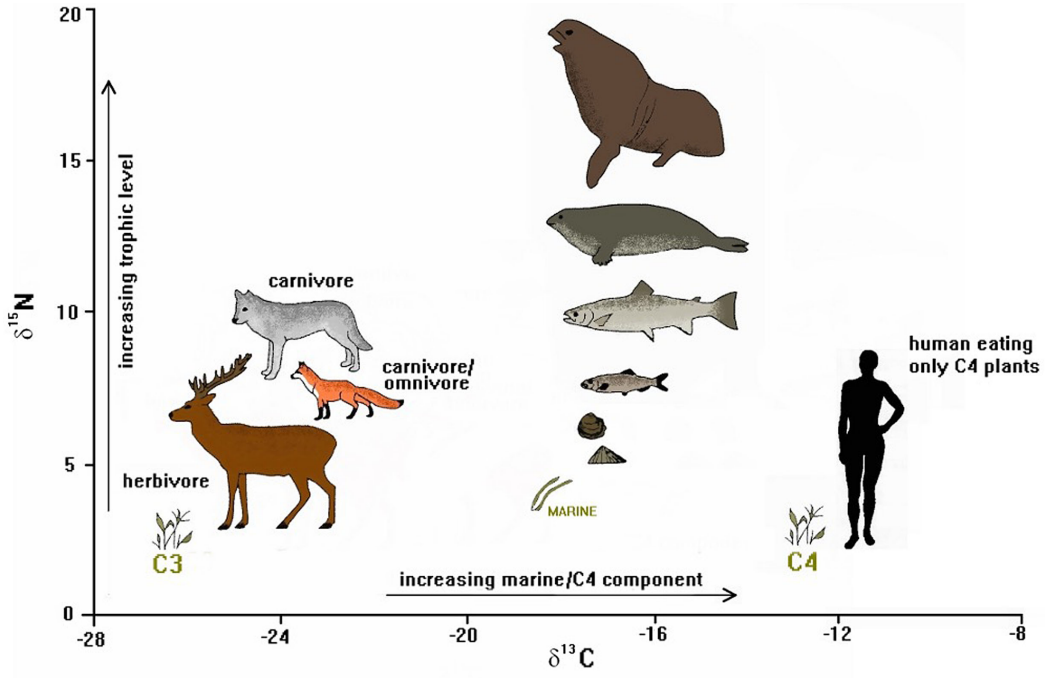

Figure 3 Schematic representation of carbon and nitrogen values for terrestrial and marine ecosystems (values are for flesh; to convert to bone collagen values, 5‰ should be added to $\delta^{13}C$ values; $\delta^{15}N$ values are the same for flesh and bone). Adapted from R. Schulting (1998).

https://doi.org/10.1017/RDC.2023.115 Published online by Cambridge University Press

probability that the death of the individual occurred within this time range. However, in regard to probability density, a value above 85% represents the range 970–1030 ACE.

Although the collagen content of the human tooth found was relatively low, with a C/N ratio of 3.4, it falls within the acceptable range, 2.9–3.6. The $\delta^{13}C$ of –20.0‰ indicates a basic C3 plant-based diet, although millet, a C4 plant, may have been widespread in the region as well. The stable nitrogen isotopic result ($\delta^{15}N$) 8.0‰ falls in the lower spectrum of the general human range (~8–12‰). The results suggest the tooth belonged to an individual who ate a mainly plant-based diet with little animal-derived protein (Figure 3).

CONCLUSION

Due to new building plans, an archaeological rescue operation on previously unexplored terrain uncovered evidence of an Abbasid period, revealing the foundations and mosaic floors of opulent dwellings, as well as a number of wells, a small mosque, and various other finds. The finding of part of a human skull with a tooth attached provided an opportunity to seek additional information on the history of the site. Analyses, including AMS ^{14}C, stable isotope, and DNA analysis, placed the individual in the Abbasid period (750–1258) and produced results that showed a dependence on a C3 diet of vegetables and legumes, indicating agricultural practices in the area.

REFERENCES

Abu Alsaud L, Al-Qobbaj A, Al-Khateeb M, Fanjul Peraza A. 2021. New chronological information from radiocarbon dating of human remains at Jacob's Well, Nablus, Palestine. Radiocarbon 63(3):759–769. doi: 10.1017/RDC.2021.17

Abu Alsaud L, Shawamra A, Qobbaj A, Yasin J, Al-Khateeb M, Issa A. 2019. Stable isotope dietary analysis on human remains: a case study at Khirbet Aqabet Al Qadi burial chamber, Nablus, Palestine. Radiocarbon 64(4): 1107–1120. doi: 10.1017/RDC.2019.65

Janovics R, Futó I, Molnár M. 2018. Sealed tube combustion method with MnO_2 for AMS ^{14}C measurements. Radiocarbon 60(5):1347–1355. doi: 10.1017/RDC.2018.110

Major I, Dani J, Kiss V, Melis E, Patay R, Szabó G, Hubay K, Túri M, Futó I, Huszánk R, Jull AJT, Molnár M. 2019a. Adoption and evaluation of a sample pretreatment protocol for radiocarbon dating of cremated bones at HEKAL. Radiocarbon 61(1):159–171. doi: 10.1017/RDC.2018.41

Major I, Futó I, Dani J, Cserpák-Laczi O, Gasparik M, Jull AJT, Molnár M. 2019b. Assessment and development of bone preparation for radiocarbon dating at HEKAL. Radiocarbon 61(5): 1551–1561. doi: 10.1017/RDC.2019.60

Molnár M, Janovics R, Major I, Orsovszki J, Gönczi R, Veres M, Leonard AG, Castle SM, Lange TE, Wacker L, Hajdas I, Jull AJT. 2013a. Status report of the new AMS ^{14}C preparation lab of the Hertelendi Laboratory of Environmental Studies, Debrecen. Hungary. Radiocarbon 55(2–3):665–676. doi: 10.1017/S0033822200057829

Molnár M, Rinyu L, Veres M, Seiler M, Wacker L, Synal HA. 2013b. Environ MICADAS: a mini ^{14}C AMS with enhanced Gas Ion Source Interface in the Hertelendi Laboratory of Environmental Studies (HEKAL), Hungary. Radiocarbon 55(2–3):338–344. doi: 10.1017/S0033822200057453

Schulting RJ. 1998. Slighting the sea: stable isotope evidence for the transition to farming in north-western Europe. Documenta Praehistorica 25:203–218.

Yahia AH. 2008. Looting and salvaging. Jerusalem Quarterly 33. Institute for Palestine Studies. p. 39–55.

https://doi.org/10.1017/RDC.2023.115 Published online by Cambridge University Press