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Who was buried there and what did they eat? Dietary study of the Balazote late Roman villa (Albacete, Spain)

1. Introduction

The archaeological study of skeletal remains of ancient populations has experienced significant developments over the last few decades due to the application of new methodologies borrowed from health sciences such as physical anthropology and molecular biology. Skeletal remains, even when it comes to fragmentary skeletal remains, can provide information on demographics (sex and age at death of individuals, infant mortality rates, etc.), health history or past human activities (Osterholtz 2016; Nikita *et al.* 2019). They can also shed light on these individuals' origins, dietary habits or genetic traits.

The application of these analytical techniques in the Iberian Peninsula, especially in the Mediterranean area, where our study is focused, has increased of late. Nowadays an important set of data exists about past dietary patterns, both for specific periods of time and from a diachronic perspective. Several studies have dealt with the period focused on in our study, the transition between the late Roman period and the early medieval era (5th-8th centuries AD), critically analyzing status, dietary patterns and population movements using isotope analysis and anthropological data (Alexander *et al.* 2015; Fuller *et al.* 2010; Lubritto *et al.* 2017; García-Collado *et al.* 2018; Munde 2010; Prevedorou *et al.* 2010; Quirós *et al.* 2013; Salazar-García *et al.* 2014). The most interesting aspects of the application of this diachronic perspective are the examination of the historical evolution of patterns of consumption and the identification of dietary and ethnogenetic markers, which could help to investigate possible historical migrational episodes of Germanic populations into the Peninsula. Regarding diet, available

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data have shown variations in the dietary patterns of individuals from the same sites and geographical locations in different periods of time, which suggests that they were due to cultural, not environmental factors (Salazar-García *et al.* 2016). As for migrational episodes, the extraordinary weight given in Spanish academic literature to the historical paradigm of “barbarian” migrations from around the 5th century AD, particularly under the Franco dictatorship (mid-20th century), is well known. This explains the systematic classification as “Visigothic necropolis” of burials belonging to this time period, without taking into account the immense variability and complexity shown by the archaeological assemblages, or the limited demographic impact that the establishment of a Visigothic State would have had on the indigenous Hispano-Roman population.

In order to further explore these multicultural dietary patterns and possible migration processes, our study presents the results of the anthropological and stable light isotope analysis of human remains belonging to 17 individuals recovered during the 1970-1976, 1986, 1987 and 2018 excavations in what is known as the Balazote Roman villa (Albacete, Spain) (Sarabia-Bautista 2012).

1.1. Case study: the Balazote Roman villa

Ever since the 1940s, there have been descriptions of Roman archaeological finds in the area known as Los Villares (Gamo 2017), in the municipality of Balazote (Albacete, Spain). Following on from these, Samuel de los Santos (Museum of Albacete) started an archaeological excavation in a small site in what was known as Camino Viejo de las Sepulturas (“old road of the burials”).

The excavations carried out between 1970–1976 revealed part of a grand Roman villa complex, in which it was possible to distinguish several episodes of occupation and transformation spanning the 1st-5th centuries AD. This included a sector of its *pars urbana*, with a thermal area (*balneum*) and several dwelling spaces – more than 40 in total.

In addition to the remains found at the archaeological setting in Camino Viejo de las Sepulturas (CVS), new structures were unearthed in subsequent archaeological interventions, which confirmed that the area underwent extensive occupation during the Roman, late antique and early medieval periods. These interventions included a preventive excavation carried out in 1986 to the northeast of the villa, in the La Vega site (VB), and two brief excavation campaigns in 1987 and 2018 associated with nearby roadworks, where two Visigothic burials (1987) and 40 Islamic burials (2018) were found. These finds seem to indicate the existence of a late antique necropolis that was still in use during the early medieval era to the east of the remains found at CVS. Near La Vega, in the area known as Los Majuelos, in the late 19th century, the Iberian sculpture called “*Bicha* (Beast) of Balazote” was discovered, probably belonging to a funerary monument from the 6th century BC (Chapa 2017). This is an interesting element to consider in

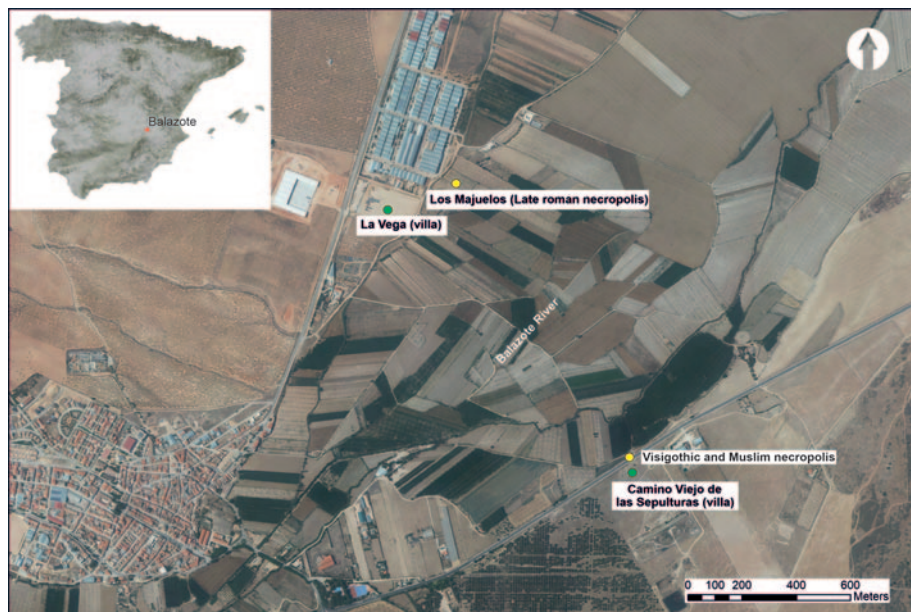


Fig. 1. Layout of the Camino Viejo de las Sepulturas (CVS) and La Vega (VB) sites, with indications of the sectors excavated.

terms of the enduring resilience of funerary spaces in the areas surrounding the Balazote river, the inhumations examined in our study being part of a continuum spanning more than two millennia (fig. 1).

The VB sector probably belonged to the *pars urbana* of an early Roman period villa, with a rich decorative program, which from the 3rd century AD was integrated into the late Roman villa complex identified in CVS. Very likely, this happened in a context of creation of a larger *fundus*, with the acquisition and incorporation of smaller villas such as VB into the property. From this moment on, the owner of the CVS villa invested great resources in the extension and monumentalization of this dwelling, including a rich ornamental program which was a reflection of its prestigious status (Abad *et al.* 2017; Sarabia-Bautista 2012, 2017).

Therefore, the Balazote villa underwent several construction and occupation phases since its origins around the 1st century AD. The original construction stage was followed by a phase of development and monumentalization during the late Roman period (3rd-4th centuries AD), to which most of the archaeological finds unearthed during the excavations belong. After this period of prosperity, from the late 4th century and during the 5th century AD, the decorative programs of the villa stopped, with only *ad hoc* repairs that evidence the loss of the aristocratic status that the villa had enjoyed in previous centuries – a situation in line

with cases documented elsewhere in Hispania (Brogiolo, Chavarría 2008). During this phase, several rooms were abandoned and only areas used for activities such as cooking (with hearths, benches or basins), storage (with silos or rubbish dumps) or burial (with several inhumations recorded in the old *balneum* of the CVS villa and in the VB area) remained in use. Very likely, this phase of marginal occupation was related to the creation of smaller agricultural dwellings in the villa's surroundings, in a general context of late Roman elites abandoning rural establishments as their main place of residence. This was due to changes in the organization of rural territories and the new administrative, economic, social and ideological circumstances that emerged after the disintegration of the Roman imperial government structure. These changes saw the emergence of new kinds of dwellings for the old and new aristocracies (fortified *turri/domus*, *castrum/castellum*), as well as a new model of agrarian exploitation with rural populations settling in hamlets and small villages surroundings former villas, from which the exploitation of the agrarian landscape articulated during the Roman period would be maintained. During this stage, villas were reused as burial grounds or for occasional domestic and industrial activities (Sarabia-Bautista 2014).

This new pattern, initiated in the early 5th century AD, would become increasingly generalized, as indicated by the identification near the CVS site of what seems to be a collective or community necropolis. This suggests that there must have been a rural settlement nearby, whose inhabitants buried their dead in this area for several generations. Graves were dug into the ground, with bodies placed in a supine position with the east–west orientation typical of Christian burials (with the head at the western end) and grave goods corresponding to the 7th century AD. This necropolis remained in use during the Islamic period, which started in 711 AD with the invasion of the Iberian Peninsula by Arab and Berber populations. Recent excavations have identified up to 40 burials that, despite sharing space and morphological similarities with the Christian ones, follow Muslim rites (body in right lateral position with the head turned to face Mecca)². Radiocarbon dates obtained in some of these burials indicate a time-frame from 776 to 1018 cal AD, which suggests continuity in the use of this funerary space from the Visigothic period onwards. These human remains could thus belong to the first Muslim populations of what Arab sources called *Balāt al-Šūf*, a toponym that originated the modern Balazote. Although the first mention of this toponym appears in Arab sources from the Caliphate era (935 AD), it was probably associated with the *Cora*³ or province of Tudmir, created in 713 with the signature of the treaty of capitulation between *Abd al-Aziz ibn Musa* (son of the North African

² Data provided by commercial archaeology company Carpetania.

³ The term "Cora" (*Kūra* in Arabic, from Greek *Chóra*) designates in early Islam a political-administrative unit and comes from the administrative terminology of the Muslim East.

governor) and the Visigothic count Teodomiro (Tudmir). This treaty, known as the “Pact of Tudmir” (Gutiérrez-Lloret 1996), allowed the Hispano-Visigoth population to maintain their religious beliefs and to keep their properties in return for the payment of taxes. The coexistence of Christian and Muslim burial rites has been archaeologically documented in other multi-generational necropolises associated with settlements within the *Cora* of Tudmir, such as the city of *Iyyu* (Tolmo de Minateda) where, from the 8th century AD, Christian and Muslim burials coexisted (Gutiérrez-Lloret 2011).

2. Materials

In this study we analyze human and faunal remains found in the two different archaeological settings that, as we have indicated, belonged to the same late Roman rural establishment: Camino Viejo de las Sepulturas villa (CVS) (two human individuals and six faunal remains) and La Vega de Balazote villa (VB) (six human individuals). In addition, we include in this study the skeletal and dental human remains from the early medieval necropolis, indicated as CVS Visigothic necropolis (eight human individuals) and the remains from the Islamic necropolis, called CVS Muslim necropolis (three human individuals). We must note that in the case of tombs from the late Roman period and, especially, those from the Visigothic period, we are dealing with collective burials in which some individuals appear in a secondary position. This fact sometimes makes it difficult to identify the remains belonging to each of the individuals.

Six human individuals from each different archaeological setting were sampled for radiocarbon dating and OxCal v.4.4.4. (Bronk Ramsey 2021, 2017) was used to calibrate the results according to IntCal20 atmospheric curve (Reimer *et al.* 2020). Radiocarbon dates obtained in this study (fig. 2), ceramic materials and the scarce funerary assemblages found with the burials have allowed us to establish two separate funerary contexts in the Roman villa and its surroundings. The first is late Roman, associated with the period when the villa ceases to be used as a luxurious high-status residence (4th-5th centuries AD)⁴, corresponding to CVS villa and VB Roman establishment. The second is a late antique and early medieval phase that includes the creation of a Visigothic necropolis near CVS (7th-8th centuries AD)⁵, whose use survived into the Islamic period (8th-10th centuries AD)⁶.

⁴ Two radiocarbon dates have been obtained from two individuals buried in the upper archaeological levels of the villa. One was buried in the *hypocaustum* of the *caldarium* in CVS (242-386 cal AD: CVS-001/A), and the other in sector C in VB (254-406 cal AD: VB-001).

⁵ Based on a radiocarbon date on an individual (660-770 cal AD: CVS-003/A).

⁶ Three of the human remains yielded the radiocarbon dating of 776-971 cal AD: CVS-E32; 854-981 cal AD: CVS-E43 and 938-1018 cal AD: CVS-E33.

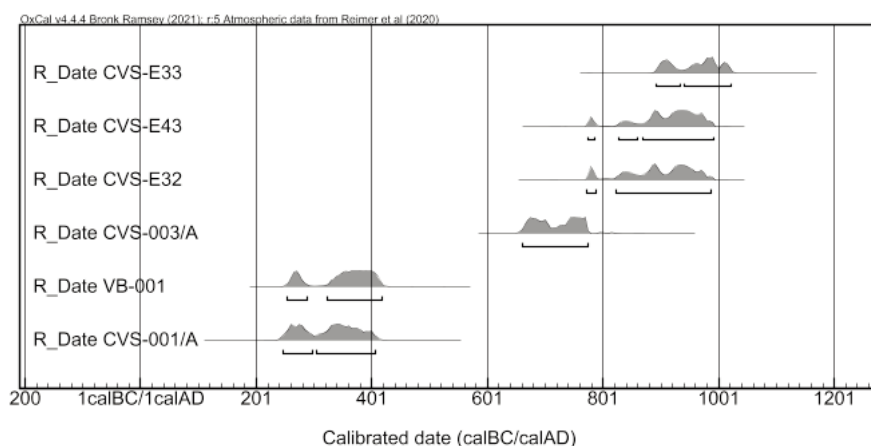


Fig. 2. Diagram with radiocarbon dates obtained from six individuals from CVS and VB: CVS-001/A (inhumation in the *hypocaustum* of the *caldarium* in CVS); VB-001 (inhumation in sector C of VB); CVS-003/A (Christian inhumation from necropolis near CVS); CVS-E32, CVS-E33, CVS-E43 (Islamic inhumations from the same necropolis).

3. Methods and results

Table 1 contains the results of the anthropological and isotope analyses of the human and faunal remains from CVS and VB. It includes biological attributes such as the sex of the individual, estimated age at death and stature, as well as their possible chronology and the C:N, $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ ratios (tab. 1).

3.1. Anthropological analysis

Carrying out an anthropological examination prior to isotope analyses was essential since the remains studied were found in excavations that took place more than thirty years previously. Although each burial was bagged individually when they were stored at the Museum of Albacete, an itemized and systematic identification of the individual remains within each burial was never undertaken. This analysis was carried out on all the previously mentioned individuals except for the three from the Muslim necropolis⁷ (total of 16 individuals), although from the individuals analyzed we have only been able to extract information related to biological sex, age or height in 12 individuals. The osteoarchaeological analysis included a macroscopic study of the human skeletal remains, identifying and

⁷ The preservation of the of individuals of the Islamic necropolis did not allow us to perform the anthropological analysis since the remains come from an emergency excavation in which there was a break in a water pipe that damaged the bone remains.

Species	Individual	Chronology	Area	Sex	Age (years)	Height	C:N	$\delta^{13}\text{C}$	$\delta^{15}\text{N}$
Human	CVS-001/A	242-386 Cal AD (Late Roman)	CVS (Villa-caldarium)	Male	+45	177 \pm 7.89 cm	2.8	-19.5	10.4
Human	CVS-001/B	Late Roman	CVS (Villa-caldarium)	Possib. Male	16-25	161.26 \pm 5 cm	2.9	-19.2	10.6
Human	CVS-003/A	660-770 Cal AD (Visigothic)	CVS (necropolis)	-	24-29	-	3.0	-19.7	10.2
Human	CVS-003/B	Visigothic	CVS (necropolis)	-	+25	-	3.0	-19.5	10.1
Human	CVS-003/C	Visigothic	CVS (necropolis)	-	Advanced	-	-	-	-
Human	CVS-004/B	Visigothic	CVS (necropolis)	-	Old	-	2.9	-19.5	10.4
Human	CVS-004/C	Visigothic	CVS (necropolis)	-	38-60	-	2.9	-19.1	10.1
Human	CVS-004/D	Visigothic	CVS (necropolis)	Possib. Female	Young	142.9 \pm 3.96 cm	2.8	-18.7	9.9
Human	CVS-004/E	Visigothic	CVS (necropolis)	-	-	-	2.8	-18.7	9.8
Human	CVS-004/F	Visigothic	CVS (necropolis)	-	-	-	2.8	-19.0	9.7
Human	CVS-E32	776-981 Cal AD (Muslim)	CVS (necropolis)	-	-	-	3.3	-18.8	9.6
Human	CVS-E43	854-981 cal AD (Muslim)	CVS (necropolis)	-	-	-	3.3	-18.4	10.7
Human	CVS-E33	938 - 1018 cal AD (Muslim)	CVS (necropolis)	-	-	-	3.2	-18.5	9.3
Human	VB-001	254-406 Cal AD (Late Roman)	VB (Villa-C3)	Female	25-35	-	2.8	-19.0	9.7
Human	VB-002	Late Roman	VB (Villa-C1)	-	-	-	-	-	-
Human	VB-003/A	Late Roman	VB (necropolis-Los Majuelos)	-	Advanced	-	3.1	-20.0	10.8
Human	VB-003/B	Late Roman	VB (necropolis-Los Majuelos)	-	-	-	2.8	-19.1	11.2
Human	VB-003/C	Late Roman	VB (necropolis-Los Majuelos)	-	Adult	-	2.8	-19.0	9.6
Human	VB-003/D	Late Roman	VB (necropolis-Los Majuelos)	-	Adult	-	2.8	-19.0	10.3
Bovid	Bovid 1	Late Roman	CVS (Villa)	-	-	-	2.8	-20.8	7.3
Bovid	Bovid 2	Late Roman	CVS (Villa)	-	-	-	2.9	-20.1	8.0
Ovicaprid	Ovicaprid 1	Late Roman	CVS (Villa)	-	-	-	2.8	-20.3	5.1
Ovicaprid	Ovicaprid 2	Late Roman	CVS (Villa)	-	-	-	2.8	-20.0	6.7
Ovicaprid	Ovicaprid 3	Late Roman	CVS (Villa)	-	-	-	2.8	-19.3	8.5
Dog	Dog 1	Late Roman	CVS (Villa)	-	-	-	-	-	-

Table 1. Results of the anthropological data and stable carbon and nitrogen isotopes analyses in human (n=19) and faunal (n=6) remains.

grouping the bones belonging to each individual and following different methodologies to establish sex (Buikstra, Ubelaker 1994; Phenice 1969; Walker 2008), age at death (Buckberry, Chamberlain 2002; Buikstra, Ubelaker 1994; Lovejoy *et al.* 1985; Meindl, Lovejoy 1985) and stature estimation (Sjøvold 1990; Trotter, Gleser 1952; Zeman, Králík 2012) of the best-preserved individuals.

3.1.1. Remains analyses and results from Camino Viejo de las Sepulturas (CVS)

Among the burials recovered from this site, some were found inside the villa and some came from the Visigothic and Islamic necropolis to the northeast of the complex.

The remains recorded inside the villa correspond to a late Roman context of funerary use once the villa had been abandoned as a residence. As mentioned above, those burials are dated around the 4th-5th centuries AD. After this date, there is archaeological evidence of a fire that destroyed the remaining standing structures. This first funerary context yielded two burials. One was located in the old *tablinum/oecus* (CVS-002) and only the head end of the grave was excavated, where one cranium was recovered that was not preserved. Therefore, it is not included in the sample submitted for analysis.

The other burial (CVS-001) contained two individuals, found among the *pilae* of the *hypocaustum*, in the room considered to be the *caldarium* of the villa's *balneum* (fig. 3). Sagittal and lamboid sutures (score 19) suggest an age at death of the first individual (CVS-001/A) of 51.5 ± 12.6 years and the dental wear of the occlusal surfaces could indicate an individual between 33-45 years old, probably closer to 45 if we consider that the fifth lumbar vertebra had developed osteophytes (pathological bony growths that affect adults of advanced age). Based on the combination of these data, we estimated an age at death over 45 years for this individual. Using cranial parameters, the individual was



Fig. 3. Late Roman CVS-001 burial, among the *pilae* of the *caldarium*, in the *balneum* of the villa (Sarabia-Bautista 2012, fig. 118).

identified as male. Stature was estimated thanks to the right humerus that indicated a tall individual around 177 ± 7.89 cm. This individual was radiocarbon dated (tab. 1) offering a chronology of 242-386 cal AD, corresponding to the late Roman period.

The second individual in this burial (CVS-001/B) was identified from skeletal remains found in a secondary deposition inside this grave. A complete cranium and part of the postcranial skeleton were identified. This individual had a complete set of teeth, with the exception of the first lower left molar which had been lost ante-mortem and whose alveolus had filled-in naturally. Slight hypoplasia was found in the lower right canine, perhaps indicating a period of growth disruption caused by stress factors between 18 months and three years of age, likely due to nutritional deficiencies. Examination of dental wear on the occlusal surfaces indicated a possible age at death of between 17-25 years. Sex could not be established with certainty from the remains analyzed. However, the raised glabella is a feature generally associated with male individuals. The stature would have been around 161.26 ± 5 cm.

The next stage of funerary use identified in the CVS is associated with the Visigothic necropolis located near the Roman villa, where two collective burials (CVS-003 and CVS-004) were partially destroyed during nearby roadworks (fig. 4). It was assumed that the first burial (CVS-003) contained two different inhumations, A and B, in a simple grave dug into the ground with an E-W orientation. However, our analysis identified remains belonging to a third individual (C) commingled with these probably as a consequence of being an individual buried in a secondary position. The inhumations recorded (A and B) were in supine position, with the head turned to the right so that the mandible rested over the clavicle and the scapula.

Individual A probably was buried first, since the remains seemed to have been displaced slightly laterally when individual B was laid, while still remaining

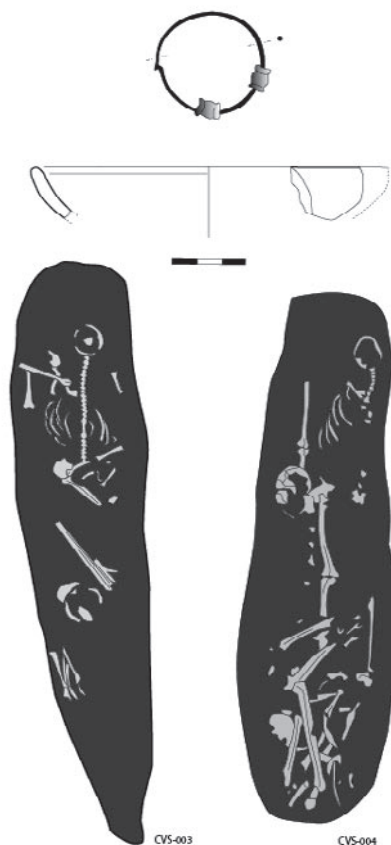


Fig. 4. Plan of the two collective burials found in the Visigothic necropolis near CVS, burials CVS-003 and CVS-004 (Sarabia-Bautista 2012, fig. 120).

in anatomical connection. The grave goods recovered included a bronze earring that was found between the cranium and the mandible of the second individual, and a fragment of the lip of a common ware bowl (Abascal, Sanz 1993). The largest number of remains in this group belonged to individual CVS-003/A, however it did not include any complete long bones, so stature could not be estimated. The cranium had a juvenile aspect, with small size and unfused and well-defined sutures, perhaps an indicator of a gracile bone structure. Sex was undetermined, since there were insufficient diagnostic elements. Age at death was estimated through the examination of the auricular surface of the ilium. The auricular surface was relatively smooth, with no wrinkles and very slight granularity, and was considered as Stage 2, situating age at death in the range of 24-29 years. This individual was radiocarbon dated (tab. 1) in 660-770 cal AD, belonging to Visigothic period.

Few anatomical remains belonging to the second individual in this burial (CVS-003/B) could be identified due to their poor state of preservation and the damages that the burial suffered when it was found. Stature could not be estimated due to the lack of complete long bones. There were no features to help establish sex or age at death, beyond indications that this was an adult older than 25-30 years.

Analysis of human remains in this burial identified some fragments that could not belong to either Individual A or B, and thus were ascribed to a new individual, CVS-003/C but the poor condition of these remains do not allowed to estimate sex, age at death neither stature.

The second burial of the Visigothic necropolis, CVS-004, was similarly destroyed during roadworks and presents human remains scattered along the shoulder of the road. From these partial remains, at least three individuals have been identified. No accompanying grave goods were recovered. The grave is similar to the previous one with an irregular rectangular shape and simply dug into the ground. We identified partial fragments of three different craniums with different thickness and state of preservation as well as postcranial fragments belonging to three individuals. These remains were not individualized during the excavation and it was not possible to establish relations between cranial and postcranial remains based only on morphometric criteria, so they were analyzed as six separate individuals. (CVS-004/A, B, C, D, E, F).

Individual CVS-004/A, described in the excavation notes was not stored together the other remains from this burial and could not be analyzed. The second individual (CVS-004/B) could only be identified through a few cranial fragments, and it could not be associated with any postcranial remains. The degree of obliteration of its cranial sutures indicates the eldest age at death for this individual within this burial. The third individual (CVS-004/C) was identified by a neurocranial fragment, with well fused sutures although their ridges were still noticeable. Examination of the cranial sutures suggested an age at death of around 38.3-59.3 years.

Regarding the postcranial remains, the first group contained lighter bones, (CVS-004/D) with a wide sciatic notch, which is generally considered a female characteristic. The classification as female was tentative, as there were no corroborating elements. The stature of this individual was estimated based on the biomechanical length of the right femur (Sjøvold 1990), with a result of 142.9 ± 3.96 cm.

The majority of the human remains from the Islamic necropolis (around 40 burials located) could not be recovered, because of poor preservation of the bones. Some of the human bones of the burials E32, E33 and E43 were in good state of conservation, not enough for an anthropological analysis but we were able to carry out radiocarbon dating. These individuals are dated between 776-1018 cal AD, after the Islamic arrival to the Iberian Peninsula.

In the CVS sector we identified also remains from some domestic animals. Ovicaprids were represented by three long bones, one right femur, one tibia and one metapod from different levels. We also found a metapod and a mandible of bovid, both from different stratigraphic units, and the right hemimandible of a dog.

3.1.2. Remains analyses and results from La Vega de Balazote (VB)

The funerary contexts of the VB site, as also happened in CVS, were associated with the chronological horizon of occasional occupation of spaces belonging to the late Roman villa from the late 4th-early 5th centuries AD. Burial remains were found to the northeast of what had been the summer *triclinium* (sector 3C).

The excavation of the superficial level revealed a wall with a roof tile leaning on it, under which was found a relatively well-preserved articulated inhumation. This adult individual (VB-001) was laid in a supine position, with the right hand leaning on the pelvis and a W-E orientation with the head at the western end (fig. 5). Although there is no mention of a grave having been identified, the skeleton seemed to have been laid over a bed of *imbrices* with their convex side up and ceramic material covered the burial. This is similar to the CVS-002 inhumation found in the *caldarium* of CVS. The grave goods consisted of a late meridional Hispanic *Terra Sigillata* bowl (Form 1) and a small common ware jug that were deposited near the head, which is a frequent attribute of early Christian burials. Photographic record of this burial (fig. 5) show a well-preserved skeleton, with some fragments of cranium, two femurs, two tibia (with at least the left fibula), the right humerus, the right radius and ulna and at least four metacarpal bones in the right hand. Nevertheless, only a partial number of remains of this inhumation were individually stored and the rest were mixed with other different bone remains. The cranial sutures of individual VB-001 were closed but not completely fused. Examination of dental wear, as we have done with all humans with well-preserved molars, was used to establish age at death for this individual, suggesting a range between 25-35 years (Buikstra, Ubelaker 1994). The coxal bone



Fig. 5. Image from the late Roman burial VB-001, located in Sector C of the Vega de Balazote (VB) site (Sarabia-Bautista 2012, fig. 121).

was used to determine the sex. The wide sciatic notch (degree 2 of 5) suggested a female (Buikstra, Ubelaker 1994). However, since the pubic bone was not well preserved, we could not apply the Phenice method (1969). This inhumation was radiocarbon dated in 254-406 cal AD, corresponding to late Roman period.

More burials were also found in sector C1, where among other disarticulated skeletal remains, a cranium (VB-002) was found, near a ceramic vessel. Toward the west within this excavation area, another cranium and some vertebrae fragments were found together with a bronze spoon of the *ligula* type (Galliazzo 1979) and a bronze *situla*, both dated around the 4th century AD (Abascal, Sanz 1993).

Outside the late Roman villa complex, a trench was excavated in the area known as Los Majuelos. The first burial identified in this outside area contained the skeletal remains of an individual of advanced age (VB-003/A). The costoclavicular groove was well-defined, which might have been an indicator of activities involving regular rotational or back-to-front shoulder movements. The second individual found in this trench (VB-003/B) was identified from a left mandibular condyle (without its corresponding coronoid process), as well as some fragments of long-bone diaphysis, probably a tibia. Finally, the identification of two pairs of femurs in this trench allowed us to establish the existence of two more individuals (VB-003/C and VB-003/D).

3.2. Carbon and nitrogen isotope analyses and results

Samples were taken from all human individuals identified, totaling 19 samples, selecting those bones that might guarantee better collagen preservation, such as long-bone diaphyses, mandibles and cranial bones, in this order (Hyland *et al.* 2021). Six samples were also taken from animal remains from

CVS. Of all these samples, only 17 human and 5 faunal individuals gave results (tab. 1).

Individuals chosen for sampling were cleaned and processed in a laminar flood hood. Bones were cleaned with localized abrasion and samples were taken with a manual rotating tool in order to obtain between 300-900 mg per sample. Each sample was crushed and soaked in HCl 1M for demineralization (to remove their mineral fraction), then gelatinized to a pH₃ with HCl 1mM, following the method published by DeNiro and Epstein (1978). They were analyzed with a EA 1112-HT elemental analyzer, coupled in continuous-flow mode to a Delta V-Advantage isotope ratio mass spectrometer. Results were referenced against international carbon and nitrogen standards (V-PDB and AIR). The demineralization and gelatinization processes and subsequent analyses were carried out at the Stable Isotope Laboratory of the Interdepartmental Research Service of the Universidad Autónoma de Madrid (Autonomous University of Madrid) (SIIdI-UAM). Results are expressed as parts per mil (‰) for $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$. Standard for $\delta^{13}\text{C}$ is V-PDB (Vienna Pee Dee Belemnite), and AIR (Ambient Inhalable Reservoir) for $\delta^{15}\text{N}$.

The results of the analysis of the carbon and nitrogen stable isotope ratio of the human and faunal remains from the Balazote Roman villa are presented in table 1. Of the 25 samples extracted (19 human and 6 faunal samples), 22 contained enough measurable collagen (17 human and 5 faunal samples).

In order to determine the quality of the collagen samples, their C:N ratio (%) was examined. Ratios from 2.9 to 3.6 are considered an indicator of good collagen preservation (DeNiro 1985). Values below or beyond this range are considered indicators of diagenetic alterations or contaminations, and should be considered with extra caution. In our study, the lowest C:N ratio was 2.8 for 17 samples and, since the total nitrogen and carbon values sat within the expected range for collagen, all samples with this value were included in the analysis. Human samples that could not be analyzed were those from individuals VB-002 and CVS-003/C. The analysis of faunal remains yielded values fulfilling the collagen quality criteria for five out of six samples. Only sample blz023 (dog) could not be analyzed.

The human samples (n=17) from this study yielded $\delta^{13}\text{C}$ values ranging from -20.0 to -18.4‰ (av. -19.2‰; s.d. 0.4‰) and $\delta^{15}\text{N}$ ranging from 9.6‰ to 11.2‰ (av. 10.2‰; s.d. 0.5‰) (fig. 6).

Bovid samples (n=2) $\delta^{13}\text{C}$ values are av. -20.4‰ and s.d. 0.5‰. From the other domestic species analyzed, ovicaprids (n=3), the $\delta^{13}\text{C}$ values are av. -20.0‰ and s.d. 0.5‰. The total faunal samples (n=6) $\delta^{13}\text{C}$ values range from -20.8 to -19.3‰ (av. -20.1‰; s.d. 0.5‰); in line with expected values for domestic animals feeding on C₃ plants. Nitrogen analysis in bovids yield $\delta^{15}\text{N}$ value of 7.6‰ with a s.d. of 0.5‰, the values in ovicaprids was 6.8‰ with a s.d. of 1.7‰. The $\delta^{15}\text{N}$ values for faunal samples range from 5.1‰ to 8.5‰ (av. 7.1‰; s.d. 1.3‰).

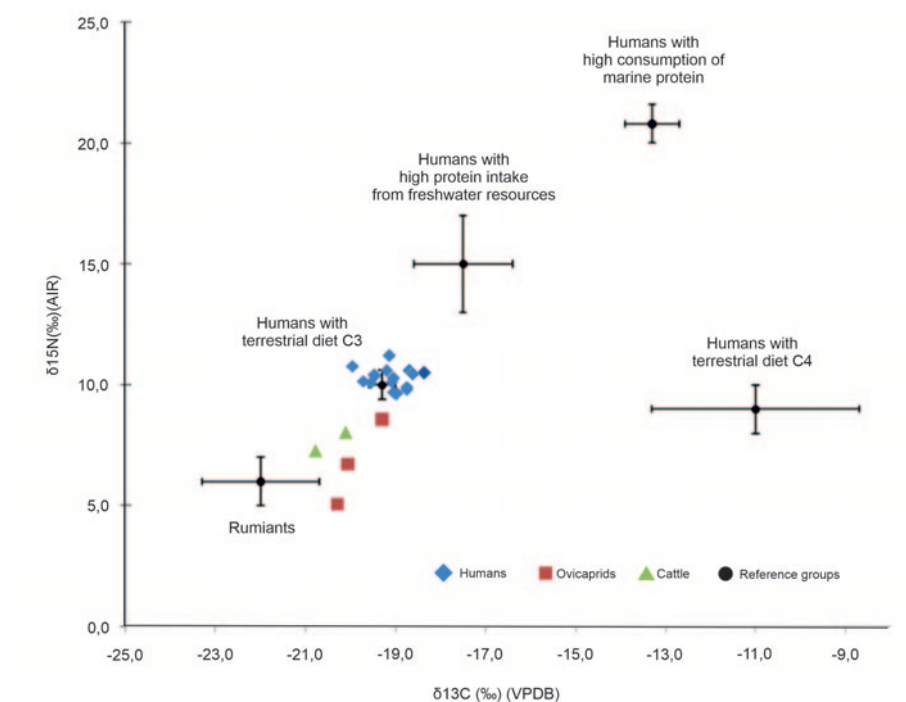


Fig. 6. Diagram with results of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ analyses for samples taken in the present study. Blue: human samples (n=17). Red: ovicaprid samples (n=3). Green: bovid samples (n=2). Black: $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values in populations studied by Honch *et al.* (2012), used as a reference.

4. Discussion

Sex and age at death data provide interesting information but limited data about the main question explored in this study, which is chiefly concerned with changes in dietary habits and the demographic impact of possible migrational episodes during the transition between the late Roman and the early medieval periods.

On the other hand, stature is an anthropometric indicator traditionally considered as a potential ethnogenetic marker due to the height differences existing between Mediterranean and central and northern European populations (Valls 1980). Recent studies on human remains from Iberian Visigothic necropoles such as Dehesa de La Casa (Cuenca, Spain) (Martínez Flórez 2016) have suggested the presence of biological markers belonging to northern populations, based on stature estimations. These estimations, calculated by the dimensions of long bones (notably humerus) following Pearson (1899) and Trotter and Gless-

	Italy			Italy			Dehesa de la Casa (Spain)		
	Late Roman			Medieval			Medieval		
	n	Mean	SD	n	Mean	SD	n	Mean	SD
Men	153	164.4	3.9	187	166.9	4.3	34 (hum.) 46 (femur)	164.5 170.5	7.6 3.6
Women	130	152.1	3.4	150	154.5	3.4	24 (hum.) 28 (femur)	155.6 153.3	5.1 3.9
<p>Z_{score} for the height of CVS individuals in relation to the Roman and Medieval populations in Italy (Giannecchini and Moggi-Cecchi 2008) and Dehesa de la Casa (Martínez Flórez 2016). The comparison of an individual to a population is expressed in Z_{score} or standard score, calculated according to the equation:</p> $Z_{score} = \frac{x - \text{population mean}}{\text{standard deviation of the population (SD)}}$									
Individual	Height calculation method		Height	Z _{score} Roman Italy	Z _{score} Medieval Italy				
CVS-001/A	l _{max} hum. straight		177 ± 7.89	3.23	2.35				
CVS-001/B	l _{max} rad. straight		161.26 ± 5	-0.81	-1.31				
	l _{max} rad. left		164.29 ± 5	-0.03	-0.61				
Individual	Height calculation method		Height	Z _{score} Medieval Dehesa de la Casa	Z _{score} Medieval Italy				
CVS-004/D	L _{biom} fem. straight (men)		142.9 ± 3.96	-7.67	-5.56				
	L _{biom} fem. straight (women)		142.9 ± 3.96	-2.67	-3.38				

Table 2. Average stature estimations in cm, according to the Pearson method (1899), and comparison between the Balazote results and other Italian and Spanish cases.

er (1952) methods yielded higher average height values for historical populations from central and northern Europe (over 169±1 cm for males and 157±2 cm for females) than for Mediterranean populations.

In the case of Balazote, it has been possible to calculate only the height of two male adult individuals from CVS (CVS-001/A and CVS-001/B, found below the *caldarium* dated in the 3rd-4th century AD) and one of the inhumations (possibly a young female) found in the 7th century AD necropolis outside the villa complex (burial 2, CVS-004/D) (tab. 2). This is a very small group of samples (just three individuals), but if we attend to a reflection at the individual level, without extrapolating to the entire population of the sample, the height estimated for the CVS-001/A individual (the eldest one of the two buried in the *caldarium* of the villa's *balneum*) was well over the average values for Mediterranean population. The means for the mediterranean classical and post-classical populations are around 164 cm for males and 152 cm for females (Giannecchini, Moggi-Cecchi 2008; Saragoça 2016; López-Costas, Müldner 2016; Tafuri *et al.* 2018; Marinato 2019; Ricconi 2020). The height of the Balazote individual, at around 175 cm, was however within the range yielded by the Dehesa de La Casa remains

(around 170 cm), assumed to be of central and northern European origin. The z -values indicate the number of standard deviations from the average of the value considered. Z -values of CVS-001/A ranged between 1.5–3, depending on the stature estimation method. Considering the lowest value, this individual would be considered tall and considering a $z_{\text{score}} \geq 2$, this individual's height would fall in the 5th highest percentile and be considered very tall. This could indicate a central European origin or genetic influence.

The stature of individual CVS-001/B, on the other hand, remained below the population average, with z -values ranging from -2.15 to -0.03 . This was considered to be a male whose stature would be between the lowest 5th percentile and the mean.

The z_{score} values for the young and possibly female from burial 2 (CVS-004/D) were below the mean both for the Roman and the medieval periods. The comparison with male and female average values was also used to confirm the sex of this individual. The comparison of z_{score} with male stature means yielded low values, below 5, while the comparison with female stature averages seemed more appropriate (2.67–3.38). It would be possible that this individual was still growing, which would explain her below-mean, together with a Mediterranean origin.

In any case, and in the absence of confirmatory DNA analyses, the use of anthropometric indicators to suggest ethnic origin must be done with caution. In this context, a recent genomic study of 271 ancient individuals from the Iberian Peninsula (Olalde *et al.* 2019) has provided a detailed description of the genetic composition of human populations in the peninsula over a time transect spanning 8000 years. For the classical period, this study identified an important gene flow from North Africa into the southern areas of the Iberian Peninsula, which could probably be related to the mobility and trade patterns existing during the Roman era, or even during the previous period of Phoenician-Punic influence in the area. In contrast to this situation, after the late Roman period population, movements into Iberia had less long-term demographic impact. Between the 3rd–8th centuries AD, the genetic composition of populations in SE Iberia was very similar to that of the Roman period, and included North African and eastern Mediterranean genetic indicators together with the indigenous substratum (Gómez-Sánchez *et al.* 2014). There were, however, exceptions to this. For instance, in Pla de l'Horta (Girona, Spain), the analysis of the human remains found in a necropolis from the Visigothic period (6th–7th centuries AD), located near a former Roman villa (Palahí *et al.* 2016), revealed a more diverse composition than contemporary sites nearby, such as the late antique *castrum* of L'Esquerda (Barcelona, Spain) (Ollich, Rocafiguera 2001). In Pla de l'Horta, together with the local, indigenous substratum and that of central and eastern Mediterranean origin, a genetic contribution from central and northern Europe was also identified. In L'Esquerda, however, the human remains were of local and Mediterranean origin, suggesting continuity of indigenous Hispano-Roman populations and no ge-

netic impact of Germanic-related populations (Olalde *et al.* 2019). This situation seems to be typical of late Roman and early medieval funerary contexts in the Peninsula: the arrival of populations from central and northern Europe would have had a very limited demographic impact on the indigenous genetic substratum, with very few exceptions such as the examples documented in Pla de l'Horta or Dehesa de La Casa.

In this context, stable isotope analyses on the human remains from Balazote and their implications for the study of dietary habits and mobility patterns could help to shed light on the site population movements during the period of decline of the Roman Empire, from the 5th century AD.

4.1. Dietary pattern of Balazote inhabitants

It is generally assumed that $\delta^{13}\text{C}$ values for bone collagen samples from humans living in the European region during the Holocene range between -21‰ and -20‰ . These values are typical of diets based on the consumption of C_3 plants, or on the animals grazing on these⁸. When $\delta^{13}\text{C}$ values are high (C_4 consumers have bone collagen $\delta^{13}\text{C}$ of about -10‰), it is considered an indicator of the presence of C_4 plants or marine protein sources (an exclusive marine diet can be inferred with $\delta^{13}\text{C}$ around -12‰) (Richards, Hedges 1999, p. 719; Richards, Britton 2020, pp. 137-138). Climate conditions also have an impact in the isotopic signature. Studies have shown there are complex relationships between climate and $\delta^{13}\text{C}$, whose values are on average $1\text{--}2\text{‰}$ higher in the southern European regions than in northern ones (Lattanzi 2010).

The results of our analysis of the 17 late Roman and early medieval human remains from the Balazote villa (CVS and VB sites) yielded an average $\delta^{13}\text{C}$ value of -19.1‰ with a standard deviation of 0.4‰ , ranging between -20.0 and -18.4‰ . These results (fig. 6) suggest a typical terrestrial C_3 diet, with no contribution of fish sources, despite the fact that marine shells have been found in the CVS site. As for C_4 plants, 5 individuals tend to have higher $\delta^{13}\text{C}$ values that might suggest contribution of C_4 plants in their diet, although the little impact of these values seems to be the result of a mixed $\text{C}_3\text{--}\text{C}_4$ diet. So probably the influence of known C_4 plants such as millet (*Panicum miliaceum*) or sugar cane (*Saccharum officinarum*), introduced in Iberia by Arab populations since the 8th century AD (Martín, Malpica 1992, p. 22), was not significant.

The five individuals that yield the most elevated $\delta^{13}\text{C}$ values, -18.8‰ , -18.7‰ , -18.5‰ y -18.4‰ , which can be seen in the diagram outlined in a dashed circle (fig. 7), correspond to CVS-004/D and CVS-004/E from the christian burials, and CVS-E32, CVS-E33 and CVS-E43 from the muslim ones. This

⁸ The $\delta^{13}\text{C}$ values of C_3 and C_4 plants generally lie between -20 to -40‰ , and -9 to -17‰ , respectively (Babu Ojha *et al.* 2021, p. 9; Staddon 2004).

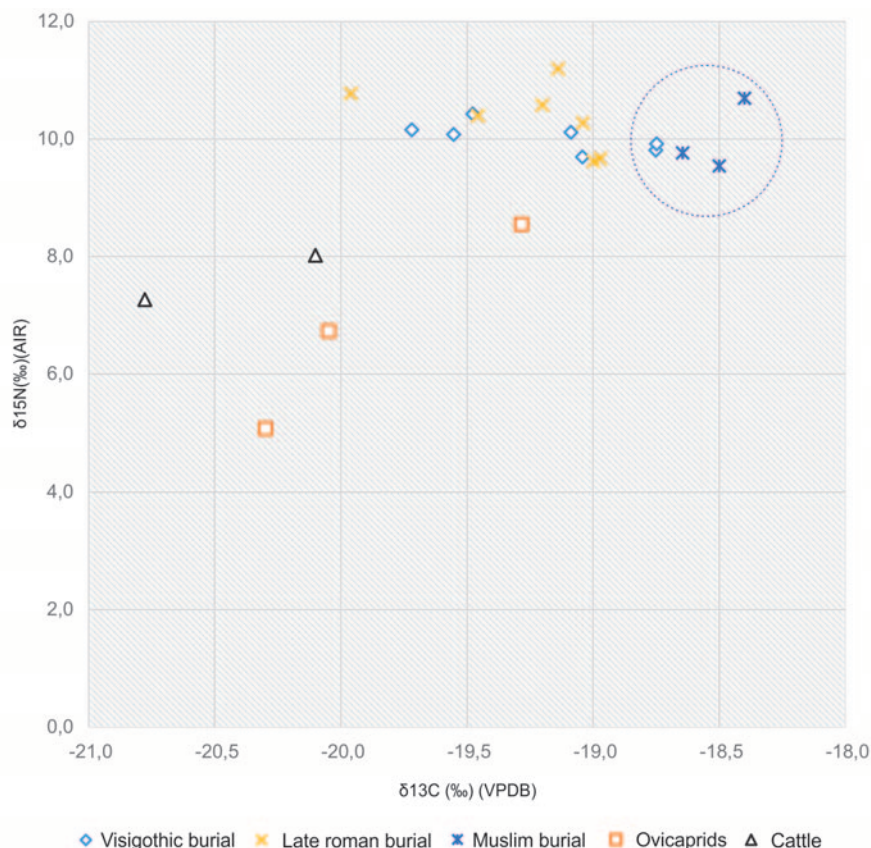


Fig. 7. $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values. The samples from the Early medieval necropolis (CVS-004/D, CVS-004/E, CVS-E32, CVS-E33, CVS-E43) yields the highest $\delta^{13}\text{C}$ values (-18.7‰ , -18.7‰ , -18.8‰ , -18.5‰ , -18.4‰).

could indicate the beginning of a change in the dietary habits of these individuals towards a mixed diet of C_3 and C_4 plants. Taking into account the radiocarbon date of the Islamic burials, this could be related to the so-called “Agrarian Revolution” that took place after the Islamic invasion of the Iberian Peninsula from the 8th century AD, although the introduction of new species of plants and crops would be gradual as it is extracted from Arab agronomic treaties (Jiménez-Castillo, Camarero 2021). In the case of the two Christian individuals we do not have radiocarbon dates, although they could be burials belonging to the beginning of the 8th century if we consider that it is a necropolis with continuity after the Islamic conquest. As has been confirmed in other cases in the region, such as the Tolmo of Minateda (Gutiérrez-Lloret 2011), these are individuals who retain their Christian funerary rituals even though they already live with Islamized

populations, as established in the Pact of Tudmir signed between Hispano-Visigoths and Arabs in the 713⁹.

The results of $\delta^{13}\text{C}$ for faunal remains agree with the expected values for the typical domestic herbivores feeding on C_3 plants from the Iberian Peninsula.

Average $\delta^{15}\text{N}$ for human remains was 10.1‰, with a standard deviation of 0.5‰. The range of $\delta^{15}\text{N}$ values was small, with a minimum of 9.3‰ and a maximum of 11.2‰, indicating consistency in the levels of animal protein consumption (the difference between maximum and minimum values was 1.9‰).

The ratio of light nitrogen isotopes in our analyses indicates a diet based on the consumption of terrestrial animal protein, particularly meat and dairy. In food webs, $\delta^{15}\text{N}$ values increase from producers to consumers. As mentioned in the introduction, for each trophic level this increase is around 4–6‰. The $\delta^{15}\text{N}$ values for bone collagen for Holocene European populations range between 4–10‰ for individuals with a diet based on terrestrial protein, depending on the trophic level of the foods consumed. However, for those consuming marine or freshwater protein the $\delta^{15}\text{N}$ values are higher, between 10–22‰ (Richards, Hedges 1999). Consumption of freshwater fish raises additional problems for the study of ancient diets due to a variety of effects caused by the aquatic biomes (seasonal production variability, wider range of food chains, etc.), which require extra caution when analyzing the results (Hedges, Reynard 2007). All the human individuals analyzed yielded $\delta^{15}\text{N}$ values of 3‰ higher than those reported for the faunal remains (mean of 10.1‰ \pm 0.5‰ compared to the faunal mean of 7.1‰ \pm 1.3‰). However, if we consider the results of the human individuals within each archaeological site (see fig. 7), it is possible to appreciate a little variability in the $\delta^{15}\text{N}$ values among the individuals from La Vega (VB) than in the other sites. The values for fauna, while not unusual, were slightly higher than expected for the faunal species considered (bovids and ovicaprids). The increase on $\delta^{15}\text{N}$ values indicates regular consumption of meat or dairy products. Among the faunal remains retrieved from these sites are a variety of domestic species such as bovids (*Bos taurus*), ovicaprids (*Ovis aries* and *Capra hircus*) and pigs (*Sus scrofa*), which probably were regularly consumed by the people living there in all the periods considered.

The little variability range of the population analyzed within each period analyzed suggests a diet homogeneity between the individuals for each period. The isotope analysis suggests that the population from the Balazote villa and its surrounding area had a terrestrial C_3 diet, although, in the individuals analyzed with more recent chronologies, an incipient introduction of C_4 plants in their dietary patterns does seem to be appreciated.

⁹ This non-aggression pact allowed the Hispano-Visigothic population of this area included in the *Cora* or province of Tudmir to maintain their religion and property in exchange for the payment of a fee (Gutiérrez-Lloret 1996).

Site	Reference	Period	Centuries	n	Mean $\delta^{13}\text{C}$	SD $\delta^{13}\text{C}$	Mean $\delta^{15}\text{N}$	SD $\delta^{15}\text{N}$
Velia	Craig <i>et alii</i> 2009	Roman	1st-2nd	116	-19.4	0.3	8.6	1.3
Balazote	This paper	Late Roman	3th-4th	7	-19.3	0.4	10.4	0.6
Tossal de les Basses	Salazar-Garcia <i>et alii</i> 2016	Late Roman	6th-7th	36	-18.2	0.3	10.8	0.9
S'hort dels Limoners	Fuller <i>et alii</i> 2010	Byzantine	4th-6th	60	-19	0.4	11.1	1.1
Balazote	This paper	Visigothic	7th-8th	7	-18.9	0.4	10.2	0.4
La Ontavia	Salazar-Garcia <i>et alii</i> 2013	Early Medieval -Visigothic	5th-8th	24	-19	0.3	10.9	1.0
Balazote	This paper	Islamic	8th-10th	1	-18.6	-	9,9	-
Tossal de les Basses	Salazar-Garcia <i>et alii</i> 2016	Islamic	8th-9th	14	-18.3	0.3	11.4	0.9
Es Soto	Fuller <i>et alii</i> 2010	Islamic	10th-13th	21	-18.3	0.7	10.8	1.0

Table 3. Values of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ from different sites used to compare the Balazote results. Data from Salazar-García *et al.* (2013, 2016), Fuller *et al.* (2010) and Craig *et al.* (2009).

Finally, and despite the limited number of studies available for these chronological periods, we compared the results obtained from the Balazote population with those studies from archaeological settings of similar chronology in the Iberian and Italian peninsulas, or their associated islands, that examine changes in dietary patterns (tab. 3). For the purposes of this study we have focused on data from the Roman, late antique and Islamic populations. These data are from the Roman portuary city of Velia (Italy) (Craig *et al.* 2009), dated between the 1st-2nd centuries AD, as well as burials in La Ontavia (Ciudad Real, Spain) (Salazar-García *et al.* 2013), Tossal de les Basses (Alicante, Spain) (Salazar-García *et al.* 2016), the Byzantine site of S'hort dels Limoners (Ibiza, Balearic Islands) and the Islamic site of Es Soto (Ibiza, Balearic Islands) (Fuller *et al.* 2010). In La Ontavia, the individuals examined were late Roman-early medieval, between the 5th-8th centuries AD, and as in Balazote they were buried within the structures of the *balneum* of a Roman villa from the 1st-4th centuries AD, by then abandoned. The remains from Tossal de les Basses belong to different occupational episodes of the necropolis of this settlement, which was used from the Neolithic

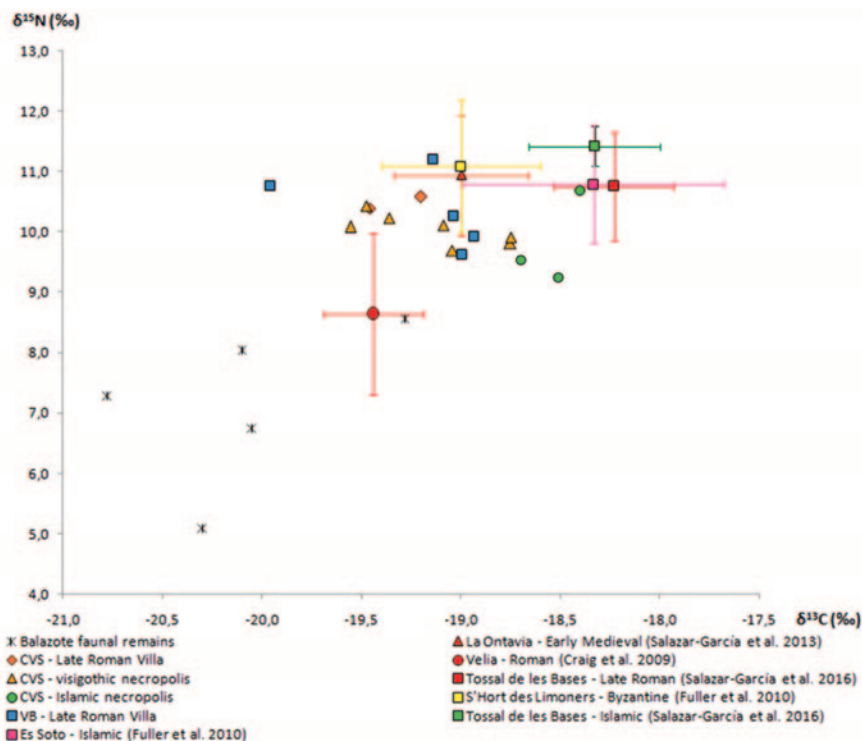


Fig. 8. Comparison between the Balazote bone collagen $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values and other sites: La Ontavia (Salazar-García *et al.* 2013) (Ciudad Real, Spain), Tossal de les Bases (Salazar-García *et al.* 2016) (Alicante, Spain), S'hort dels Limoners (Fuller *et al.* 2010) and Es Soto (Fuller *et al.* 2010) both from Ibiza (Balears, Spain) and Velia (Craig *et al.* 2009) (Naples, Italy).

to the medieval period and for comparison we used the data from the late Roman and medieval periods. The settlement of S'hort dels Limoners was a late antique Byzantine necropolis from 4th-6th centuries AD. The site of Es Soto dates from 10th-13th centuries AD, and is a medieval Islamic necropolis outside the old city walls of *Eivissa* (Ibiza).

This comparison (fig. 8) shows more protein-rich food consumption for the Balazote inhabitants than for Roman population of Velia (Italy), whose diet was considered mainly of staple food (Craig *et al.* 2009). The late Roman population analyzed from the CVS-villa and VB-villa exhibit higher $\delta^{15}\text{N}$ values, but those are slightly lower than the sites of S'hort dels Limoners and La Ontavia. We can assume all had regular access to protein-rich foods like fish or more probably meat and dairy products, according to the $\delta^{15}\text{N}$ values around 10.5-11‰. Tossal de les Bases late Roman inhabitants exhibit the most positive $\delta^{13}\text{C}$ values, and could be derived by some marine protein consumption. Balazote late Roman

population mean value for $\delta^{13}\text{C}$ is -19.3‰ and contrasts with Tossal de les Basses late Roman mean value ($\delta^{13}\text{C} = -18.2\text{‰}$). We can assume that in spite of the marine shells documented in the CVS late Roman excavations, the use of them as a regular source of food is not supported, something logical if we take into account the location far from the sea of the site, unlike the Tossal de les Bases, which is on the coast.

Carbon and nitrogen levels of Visigothic period humans from Balazote are in between the levels of the Roman population of Velia, with low protein-rich food, and the early medieval and Byzantine populations mentioned just before (La Ontavía and S'hort dels Limoners). The latter show a higher degree of protein-rich food consumption, like fish and meat. This can be explained by the progressive abandonment of the elites of the area of Balazote and a impoverishment of the rural populations.

The Islamic humans analyzed of the CVS Muslim necropolis shows remarkable similarities with the $\delta^{13}\text{C}$ values of Islamic population of Es Soto and Tossal de les Basses. The investigations in the Arab settlement of Es Soto report a $\delta^{13}\text{C}$ value for this population of $-18.1 \pm 1.3\text{‰}$ ($n=21$). The authors obtain a single value of -13.1 and, if we consider it as an outlier value (more than 3 times the IQR), we can recalculate the mean in $-18.3 \pm 0.7\text{‰}$ ($n=20$). When we compare the $\delta^{13}\text{C}$ of CVS-004/D (-18.7‰), CVS-004/E (-18.7‰), CVS-E32 (-18.8‰), CVS-E33 (-18.5‰) and CVS-E43 E43 (-18.4‰) to the value of $\delta^{13}\text{C}$ from Es Soto ($-18.3 \pm 0.7\text{‰}$) is quite similar to this population, who had a noticeable intake of C_4 resources according to Fuller *et al.* (2010). Tossal de les Basses Islamic population cluster also with Es Soto group, supporting the influence of some C_4 resources in the diet of Islamic period populations.

An interesting result arising from this comparison is the relationship between the chronological date of the sites and an increase in the $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ values (fig. 9). This suggests an increasing diversification of dietary habits between Roman and medieval periods, with the exception of the Visigoth period when Balazote inhabitants show a decrease in the consumption of protein-rich food of animal origin. This diversification included the introduction of new crops and C_4 plants such as millet (the use of which is documented in Roman times during famines) or sugar cane in the Islamic period.

Dietary changes among the Balazote populations were gradual and, as indicated by anthropological and above all isotope analyses, were not due to a demographic influx of populations of Arab-Berber origin but to a progressive cultural process of Islamization of the indigenous, hispano-roman and hispano-visigothic population, a continuity that is signaled by the persistence of certain practices, such as burying their dead in the necropolis used by their ancestors.

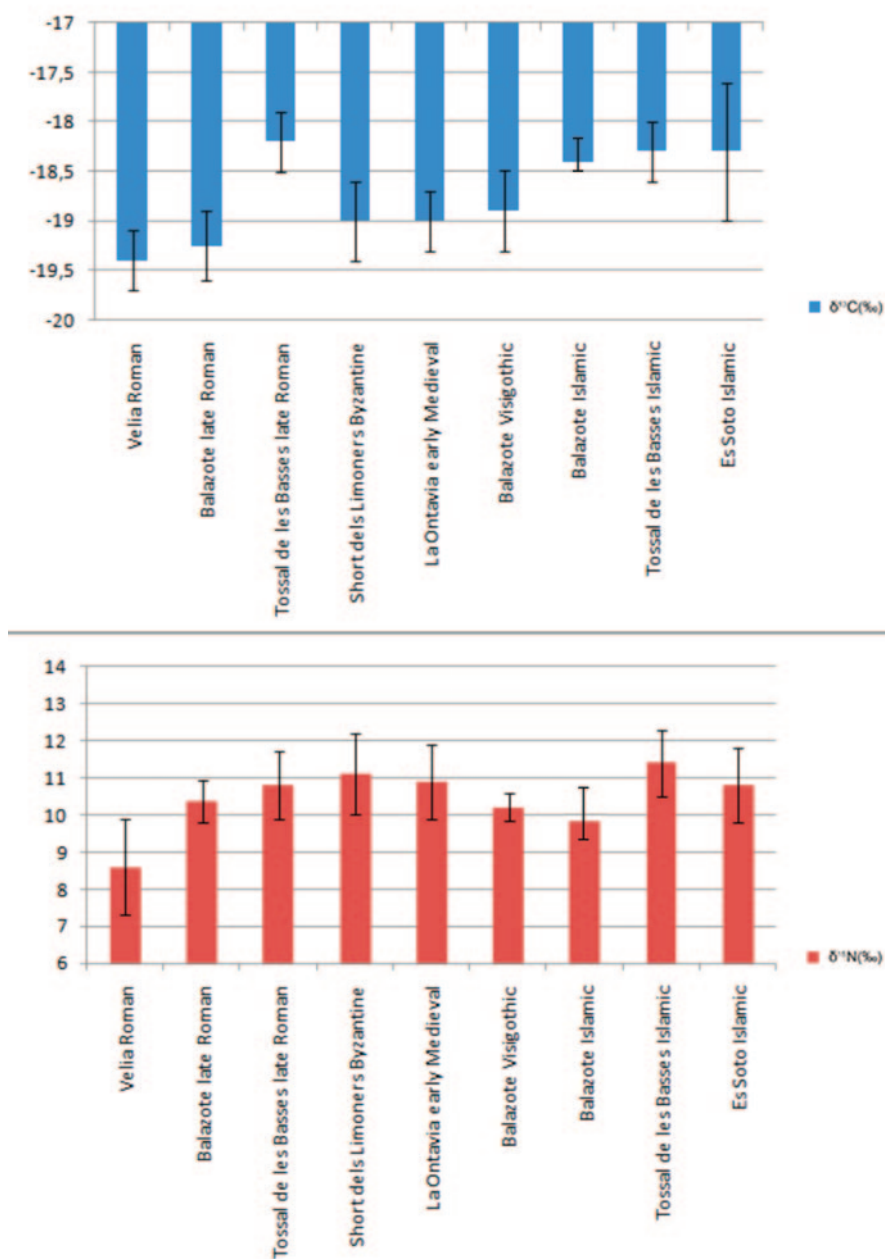


Fig. 9. Values of $\delta^{13}\text{C}$ and $\delta^{15}\text{N}$ ordered chronologically. Data from Salazar-García *et al.* (2013, 2016), Fuller *et al.* (2010) and Craig *et al.* (2009).

5. Conclusions

Despite the conservation status of the archaeological remains from the different areas of occupation of Balazote, we were able to perform a basic anthropological analysis of 12 human remains¹⁰ and obtain carbon and nitrogen isotope results from 17 human and 5 faunal remains. In addition, 6 humans were radio-carbon dated.

The anthropological analysis, together the archaeological evidence of shared burials, indicate population continuity through time. This continuity is also supported by the diet homogeneity revealed with the light isotopes analysis. We found as a special case a Balazote late Roman individual with an exceptional height compared to other Mediterranean populations that it would be interesting to analyze in more detail in order to test a possible central European origin. However, the lack of data on the average height of the rest of the individuals analyzed does not allow us to extract clear assessments about the migratory processes of the population that lived in this region, so questions of ethnicity must be addressed with more representative samples and with caution.

Balazote inhabitants from the different periods analyzed (late Roman, Visigothic and Islamic periods) display a typical C_3 diet as it has been reported by other studies for these chronologies in the Iberian Peninsula. We report similar $\delta^{13}C$ values during the late Roman and Visigoth period. However, an increase in C_4 plants consumption for the Islamic period individuals analyzed is observed that it is similar to the Es Soto archaeological site (Balears, Spain) and Tossal de les Basses (Alicante, Spain). This can be related to the introduction of new crops and C_4 plants due to the influence in the diet of the “Agricultural Revolution” in the Islamic inhabitants.

Our result shows no evidence to support regular contribution of marine or freshwater food resources despite the marine shells found in the late Roman villa surroundings. We observe regular animal protein-rich food consumption in the late Roman and Islamic period that decreases for the Visigothic population of Balazote. These $\delta^{15}N$ values found for the Visigothic necropolis are also lower compared to other Visigothic and Bizantine sites as S’hort dels Limoners and La Ontavia.

¹⁰ Within the 12 individuals, 4 have sex and age estimated, while the other 8 only have an age estimation, in some cases even general.

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Abstract

In order to explore the transition between the late Roman and early medieval periods, we performed an anthropological and stable isotope analysis of human remains recovered from different archaeological sites of Balazote (Albacete, Spain). We focused on two areas that belonged to the same late Roman rural establishment: Camino Viejo de las Sepulturas villa and La Vega de Balazote villa (4th-5th centuries AD), the Visigothic necropolis (7th-8th centuries AD) and the Muslim necropolis (8th-10th centuries AD).

The results indicate a decrease in the animal protein consumption in the Visigothic occupation of Balazote, with similar values in the Islamic sample. Roman and Visigothic inhabitants have shown a similar dietary pattern compatible with a C₃ terrestrial diet, while the Islamic sample presents the introduction of new crops and C₄ plants. We do not observe marine or freshwater resources as a regular source of food in any period.

Keywords: Spain, Late Antiquity, Early Middle Ages, stable isotopes, diet, anthropology.

Per esplorare la transizione tra tardo antico e alto medioevo, si è condotto uno studio antropologico dei resti umani ritrovati nei siti dell'area di Balazote (Albacete, Spagna), correlato all'analisi degli isotopi stabili. Questo studio si focalizza su due aree che appartengono alla medesima entità rurale di epoca romana: le ville di Camino Viejo de las Sepulturas e La Vega de Balazote (IV-V secolo), una necropoli visigota (VII-VIII secolo) e una musulmana (VIII-X secolo).

I risultati indicano un abbassamento dell'apporto proteico nel periodo di occupazione visigota di Balazote, con valori simili ai campioni islamici. Gli individui romani e visigoti hanno mostrato un'alimentazione simile, compatibile con una dieta terrestre a base di piante C₃, mentre il campione islamico presenta l'introduzione di nuove specie a base C₄. Non si osserva il consumo di risorse marine o di acqua dolce come fonte di sostentamento regolare in tutti i periodi analizzati.

Parole chiave: Spagna, tardo antico, alto medioevo, isotopi stabili, dieta, antropologia.

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