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Diet and lifestyle in Bronze Age Northwest Spain: the collective burial of Cova do Santo

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ABSTRACT

A multidisciplinary investigation of the collective burial of Cova do Santo is presented as a novel approach to understand daily life during the Bronze Age in Northwest Iberia. The research is focused on three main aspects: i) taphonomy and patterns of disposal, ii) paleopathology and -demography as indicators of health status and lifestyle, and iii) stable isotope analysis to reconstruct paleodiet and to investigate the timing of the introduction of millet to the Iberian Peninsula. Osteological analyses were performed on 64 bones (61 human and 3 animal); additionally, bone collagen was extracted from 15 samples (13 human and 2 animal) and analyzed for its carbon and nitrogen stable isotopes composition. The radiocarbon age of the human remains is consistent with the Middle Bronze Age (c. 1890 to 1600 cal BC). The recovered remains belonged to a minimum number of 14 individuals with an estimated age at death of forty years or younger. This relatively young age is in contrast to a high prevalence of degenerative joint disease in the group. The isotopic results suggest a very homogeneous diet, which was almost exclusively based on C3 plants and terrestrial animal products. Overall, the data suggest that the studied population belonged to a period prior to the introduction of spring or summer-grown crops such as millets. The collective burial from the cave of Cova de Santo, Galicia, currently represents the largest assemblage of prehistoric human remains from Northwest Spain and the relatively good preservation of the bones offers a unique opportunity to investigate daily life in Northern Iberia during the Bronze Age.

1. Introduction

The gradual introduction of new crops during the Bronze Age had a profound impact on the way of life of prehistoric societies in Western Europe, specifically in bringing about an increase in sedentism and territoriality (Bettencourt, 1999; Tereso et al., 2013). The so-called spring or summer-grown crops, such as millets, with short lifecycles and crucial nutritional value (James et al., 2011; Rachie, 1975), represented a clear advantage in regions where harsh winters frequently ruined crops with longer growing seasons. Spring/summer cultivation may also have enabled to free up large areas of arable land for winter grazing, bestowing further benefits (Sherratt, 1980). Nevertheless, and despite the importance of these new crops, there are still few data on when and how they were introduced to prehistoric Europe and how they impacted on people's everyday life (Lightfoot et al., 2013; Tafuri et al., 2009; Weber and Fuller, 2007). Understanding these issues is of particular importance for those areas situated far from the centers of plant domestication, such as the Iberian Peninsula, where agricultural innovations may have taken longer to arrive.

Based on paleobotanic evidences, millets were introduced to Iberia in the Middle Bronze Age and increased in importance through the Late Bronze Age until they became staple crops in the Iron Age (Buxó and Piqué, 2008: 161). This process may have been most pronounced in NW Iberia where millet had a continuous

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presence in the human diet until the arrival of maize in the 16th century AD (Carballo Arceo, 2006; Vazquez Varela, 1994). There are only few carpological remains of millets from this area dated to the Middle and Late Bronze Age, but the number of finds, *Panicum miliaceum* L. in particular, increases from the Iron Age. Nevertheless, it is acknowledged that their distribution in paleobotanic assemblages is likely affected by differential and often poor preservation (Fig. 1 n°5–7) (Bettencourt, 2001; Tereso, 2012; Tereso et al., 2013). As a consequence, there is an ongoing debate to what extent millets were already established as a regular part of the diet in the Bronze Age (see for example Teira Brión, 2010; Tereso, 2012). To address this question, several paleobotanical investigations have been conducted (e.g. Bettencourt, 1999, Bettencourt, 2001; Teira Brión, 2010; Tereso, 2012; Tereso et al., 2013); however, evidence from the study of human remains and specifically isotope analysis has not yet been brought into the debate.

The most direct way to understand the social and biological characteristics of a population, including its diet and health status, is to analyze the human remains and the burial contexts in which they were deposited. Indeed, skeletal remains frequently yield information which is rarely accessible through other types of evidence (Larsen, 2002). For more than a century, paleodemography and paleopathology have provided crucial data to address health and well-being of past human populations. Recent bioarchaeological work has also included stable isotope analysis of human remains as a means of reconstructing diet at population and individual level (e.g. Fuller et al., 2012; Tafuri et al., 2009). The analysis of carbon and nitrogen isotopes in bone collagen allows identifying the presence of C4 plants in the food web (O'Leary, 1988; Vogel and van der Merwe, 1977). As millets were the only C4 plants available for human consumption in prehistoric inland Spain, isotope data are particularly suited to determine their contribution to the diet. Regular consumption of millet will increase the $\delta^{13}C$ ratio of the consumer's bone collagen, while the $\delta^{15}N$ ratio should remain unaffected, allowing to distinguish C4 plants from the consumption of aquatic resources which are generally also enriched in ^{15}N (Hedges and Reynard, 2007; Schoeninger and DeNiro, 1984). In diets with sufficient protein intake, bone collagen stable isotope ratios, which reflect a long-term average of diet, are biased towards the isotopic composition of dietary protein. As millet and other cereals have low to medium protein content (around 10%), a significant intake of these crops is required to detect a significant change in collagen isotope ratios (Hedges, 2003). Rather than being a weakness of the method, this makes stable isotope analysis particularly suitable for determining when millet became a dietary staple (Lightfoot et al., 2013; Tafuri et al., 2009).

This paper presents the results of osteological and isotopic analyses of human remains from the collective burial of Cova do Santo (SE Galicia) (Fig. 1, n°1), as an alternative approach to understand diet and lifestyle during the Bronze Age in Northwest Iberia. We focused our research on three main aspects: i) taphonomy and patterns of disposal, ii) paleopathology and demographic profile as indicators of health status and life conditions, and iii) stable isotope analysis to reconstruct paleodiet and the possible introduction of millet in the Bronze Age. Our results are contextualized with data available for Chalcolithic and Bronze Age burials of other areas of Iberia.

2. Material and methods

2.1. Collective burials in North-western Iberia

There is a large number of Bronze Age megalithic burial mounds in Galicia (Bettencourt, 2008), but these have rendered no human and only few animal bones to date. Similarly, the Bronze Age cists and the numerous stone built chests (see review in Bettencourt, 2008), only very rarely contain human remains, a fact usually explained by the dominance of acidic soils in the region (López-Costas, 2012). Since any finds of human remains from prehistoric Galicia are therefore highly exceptional, bioarchaeological investigations are not usually possible and most of what is assumed about the demography and lifestyle of Bronze Age populations has been inferred by analogy with later periods.

The Cova do Santo cave is located at 510 m a.s.l. in one of the few karstic regions of NW Spain, in the western slopes of the river Sil valley (Fig. 1, n°1, Fig. 2). Nowadays, the area is sparsely populated; however, pass control of the Sil river valley was of considerable strategic importance in the past, since it formed the main connection between the Castilian plateau of central Spain and the Atlantic coast (via the rivers Miño and Sil) (Ruiz-Gálvez Priego, 1998). From the number of human bones recovered here, Cova de Santo represents the largest prehistoric assemblage of NW Spain. Other caves with prehistoric material have been discovered in the area, namely the sites of Valdavara (Lugo province), Cova do Savalleiro (Lugo) and Pala da Vella (Ourense province) (Fig. 1). The

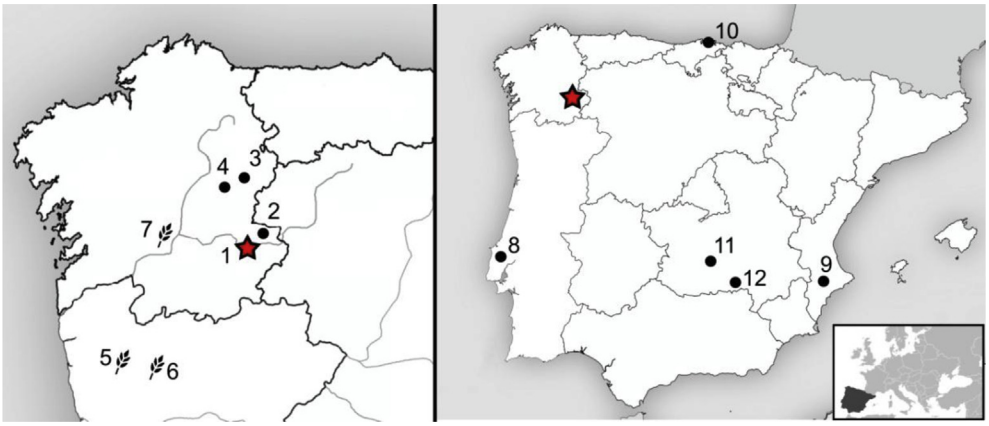

Fig. 1. A map of the geographical areas discussed in the text, including the location of Cova do Santo (1), and other Galician burial caves: Pala da Vella (2) (Fernández Rodríguez et al., 1996), Valdavara I and II (3) (Vaquero Rodríguez et al., 2009) and Cova do Savalleiro (4) (Fernández Rodríguez and Ramil Rego, 1995). The places where millet seeds have been found are also numbered: from the Middle Bronze Age the site of Sola (5) (Bettencourt, 1999), and from the Late Bronze Age the sites of Santinha (6) (Bettencourt, 2001) and As Laias (7) (Tereso et al., 2013). Iberian Chalcolithic and Bronze Age sites from where stable isotope data are available: Bolores (8) (Lillios et al., 2010); Cova Pastora (9) (García Puchol et al., 2010; McClure et al., 2011); La Garma (10) (Arias Cabal, 2005); Motilla de Azuer (12); (Nájera Colino et al., 2010); and Castillejo de Bonete (12); (Salazar-García et al., 2013).