Treponematosis in Pre-Columbian Jamaica: A biocultural approach to the human cranium found in Bull Savannah

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Ana Luisa Santos
University of Coimbra

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Treponematosis in Pre-Columbian Jamaica: a biocultural approach to the human cranium found in Bull Savannah

Ana Luísa Santos [a,*], Michael T. Gardner [b], Philip Allsworth-Jones [c]

[a] CIAS and Department of Life Sciences, University of Coimbra, Apartado 3046, P-3001 401 Coimbra, Portugal
[b] Section of Anatomy, Department of Basic Medical Sciences, The University of the West Indies, Jamaica
[c] Department of Archaeology, University of Sheffield, United Kingdom

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ABSTRACT

The first inhabitants of Jamaica are now generally referred to as Taínos. It is likely that they arrived in the island after about 650 AD and were extinct by the end of the 16th century. In 1968, during the exploration of a small cave in Bull Savannah, St. Elizabeth parish, Dr. James Lee found two skulls, teeth, bones, and pottery. The aim of this work is to interpret in a biocultural perspective the one cranium with pathological lesions, such as *caries sicca*. This adult individual had an artificially modified cranium, a cultural practice common among Taínos, which was studied macroscopically and by radiological and computerized tomography. The radiocarbon dates, obtained by AMS, point to the 10th–11th centuries AD and the stable isotopes analysis revealed either the ingestion of a mixed C3/C4 plant diet or an extensive intake of marine resources, the former being more likely. This is the first cranium to be found in Jamaica with evidence of Pre-Columbian treponematosis, most probably syphilis, which has also been demonstrated in a few cases elsewhere in the Caribbean region. This finding agrees with the ethnohistorical narrative, according to which syphilis existed among the native population, who used plant extracts to treat the disease. This paper contributes to our knowledge about the Taínos and the history of treponematosis in the Americas.

1. Introduction

The Taínos were the inhabitants of the Greater Antilles, including Jamaica, and the northern Lesser Antilles at the time of European contact (Rouse, 1992; Atkinson, 2006a). Their origin has been much debated by linguists (Taylor, 1977; Oliver, 1989), archaeologists (Rouse, 1992; Keegan, 2000, 2004), and geneticists (Lalueza-Fox et al., 2003). It is believed that colonization of the Caribbean by pottery-using people started from South America and took the form of successive migration movements (Rouse, 1992; Lalueza-Fox et al., 2003), although Keegan (2004) has pointed out this "stepping stone" model may be too simplistic, and it may need to be reconsidered. In Rouse's scheme (1992) the colonization of the islands by pottery users commenced from about 500 BC onwards with the so-called Saladoid period.

In Jamaica, radiocarbon dates put the first inhabitants at around 645–898 A.D. on the basis of evidence from Bottom Bay and Paradise Park (Vanderwal, 1968b; Keegan et al., 2003: range as published using CALIB program v. 4.4; Allsworth-Jones, 2008: 101). Their dominant ceramic style was referred to by Lee (1980) as Redware, which is regarded as the equivalent of the Ostionan. This was followed by the Meillacan, as elsewhere in the Greater Antilles. In Jamaica it has been common to refer to this phase as White Marl, after the site of that name (Howard, 1956, 1965; Silverberg et al., 1972; Vanderwal, 1968b). Its span extends from about 859 to 1525 AD (lower and upper calibrated limits using CALIB version 4.4) (Allsworth-Jones, 2008: Table 6). Later, around 100 years after the contact with Europeans, historical accounts considered that due to various factors, including diseases, Taínos became extinct (Duerden, 1895; Sherlock, 1939). They were certainly present during the Spanish construction and occupation of New Seville (Woodward, 2006), and there is some suggestion that they may have continued for a longer period of time (Rodney-Harrack, 2006), becoming contemporaries of the Maroons (Agorsah, 1994). Nevertheless, this point is debatable (Callum, 2001).

Apart from the ceramics which as noted have served to define different phases of prehistoric occupation in Jamaica, the Taíno also used stone tools (Roobol and Lee, 1976), and produced what we would class as artistic objects of terracotta, stone, and wood

* Corresponding author. Tel.: +351 239 854 108; fax: +351 239 854 129.
E-mail address: alsantos@antrop.uc.pt (A.L. Santos).

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(Duerden, 1897; Bercht et al., 1997). There are also a number of caves with pictographs and petroglyphs (Lee, 1990).

Taíno people lived in houses grouped in villages (Oviedo, 1959 (1526); Rouse, 1992) and depended for their means of subsistence on wild plant gathering and on agriculture, including cassava (Oviedo, 1959 (1526); Rouse, 1992), and according to recent research maize (Mickleburgh and Pagán Jiménez, 2011, 2012), as well as hunting of mammals such as hutia (*Geocapromys brownii*) (Gouldwell et al., 2006), fishing using various devices such as seine nets, hooks and lines (Atkinson, 2006b), and shellfish collecting (Allsworth-Jones et al., 2001; Keegan et al., 2003). According to Rashford (1993) they "transformed Jamaica's natural forests into settlement vegetation by their responses to wild plants and their cultivation of largely introduced domesticated plants", many from South America (Sturtevant, 1961; Piperno and Pearsall, 1998). Apart from cassava and maize, these included several different kinds of roots and tubers, cereals, vegetables, legumes, and what may be described as tree fruits. Some domesticated plants were used for purposes other than consumption, e.g., bottle gourds and cotton, and the same goes for tree fruits, including *cohoba*, commonly identified as *Piptadenia peregrina*, now *Anadenanthera peregrina* (Saunders and Gray, 1996).

It is known that the Taíno buried their dead both in open air sites (Howard, 1961/1962, 1965; Vanderwal, 1968a; Allsworth-Jones and Wesler, 2003; Allsworth-Jones, 2008) and in caves (Duerden, 1897; Allsworth-Jones, 2008).

1.1. The site and its archaeological context

Bull Savannah cave (17:52:45 N 77:36:10 W) is situated about 3 km north of Port Kaiser, in St. Elizabeth parish, on the south coast of Jamaica. This site was identified as a Pre-Columbian burial place (designated EC12) by Dr James Lee (1968). According to Lee's sketch plan (Fig. 1), two skulls were found at the back of a low narrow recess, about 4 m^2 in size, with an opening no more than 30 cm high. This recess in turn is linked to the outside world by two low narrow corridors.

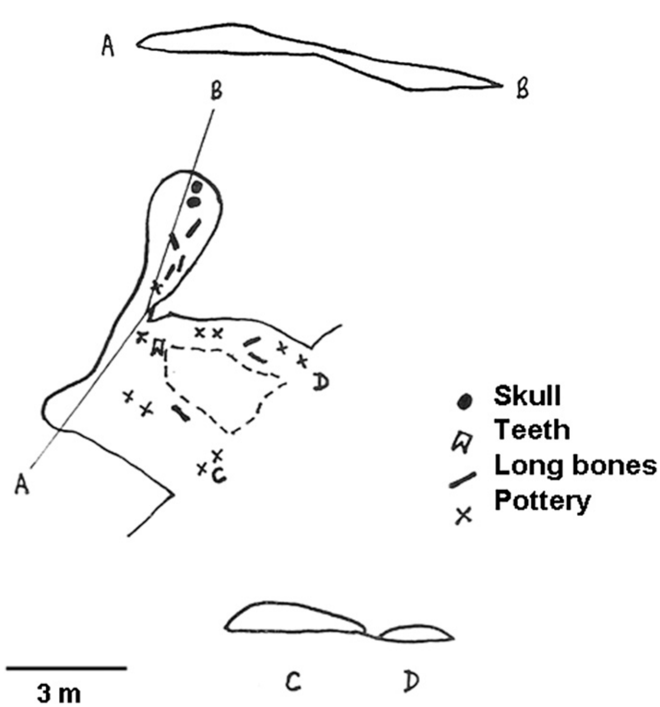

Fig. 1. Plan of Bull Savannah cave made by Dr. James Lee in 1968.

Lee (1968) reported that: "one fairly complete skull with flattened forehead and a second badly decomposed one were found on the cave floor together with a number of teeth, other bones, and pottery". He commented that three ceramic fragments at least were "distinctly Redware style but without the red colouring"; but he obviously did not feel confident that this was sufficient to classify the entire site as such (Lee, 1980). The archaeological material from Bull Savannah, which now forms part of the Lee collection, consists of 112 pottery fragments, 96 of which are plain (undiagnostic) body sherds (Allsworth-Jones, 2008). The rim sherds include at least one of unmistakable White Marl type, and this suggests that the totality of material found at the site may well represent more than one phase of occupation (Allsworth-Jones, 2008).

In April 2003 the site was visited by one of the authors [PAJ]. The location of the limestone outcrop in which the cave occurs is indicated on one of Dr Lee's sketch maps, and is not hard to find, but the same is not true of the cave itself. As is evident from Dr Lee's plan it is in external appearance more of a niche than a cave, and it is quite inconspicuous. There is practically no sediment now in the cave, and no more archaeological remains. In view of its small size and restricted dimensions, it can have been no more than a repository for the skulls and the other materials recorded by Lee. There are no known open air Taíno sites in the vicinity, so one cannot say exactly where the inhabitants at that time are likely to have lived.

Since both Redware (Ostionan) and White Marl (Meillacan) style ceramics have been found in the cave, it is not possible to attribute the skeletal material conclusively to either one of them, and hence no dating on that basis is possible. A repeated use of the cave cannot be ruled out. But the archaeological context is exclusively Pre-Columbian, and the appearance of both crania is entirely consistent with that. They both show signs of artificial modification, with flat frontals and parietal expansion. One cranium (EC12B21B.1) is part of the Lee Collection (Santos et al., 2002) and it has no apparent pathological features. The second cranium (EC12 #2) is the subject of the current work and it is now housed in the Section of Anatomy, Department of Basic Medical Sciences, at the University of the West Indies, Mona Campus.

The aims of this paper are to put the individual represented by the cranium (EC12 #2) within a biocultural context, including diet and cultural practices in life and after death, and to interpret the pathological evidence chronologically in terms of the spread of treponematosis in the Caribbean region.

2. Materials and methods

The cranium from Bull Savannah cave, object of the current analysis, was evaluated for age at death and sex following the recommendations of Buikstra and Ubelaker (1994). The pathological lesions were observed macroscopically and by computerized tomography and radiological examination. The diagnosis was made according to Hackett (1976) criteria and Harper et al. (2011) scoring criteria. Three samples of bone were dated by AMS and stable isotopes evaluated, at Beta Analytic Inc. laboratory and at the Oxford Radiocarbon Accelerator Unit (ORAU).

3. Results and discussion

3.1. Morphological analyses of the cranium

The cranium from Bull Savannah cave described by Lee (1968) as "fairly complete" has a well preserved face (Fig. 2A) and vault (Fig. 2B), with post mortem destruction of part of the occipital, temporals and portion of sphenoid. The endocranium is discolored due to taphonomic factors such as soil acidity and termite activities. The base of the skull is destroyed (Fig. 3) a characteristic common in

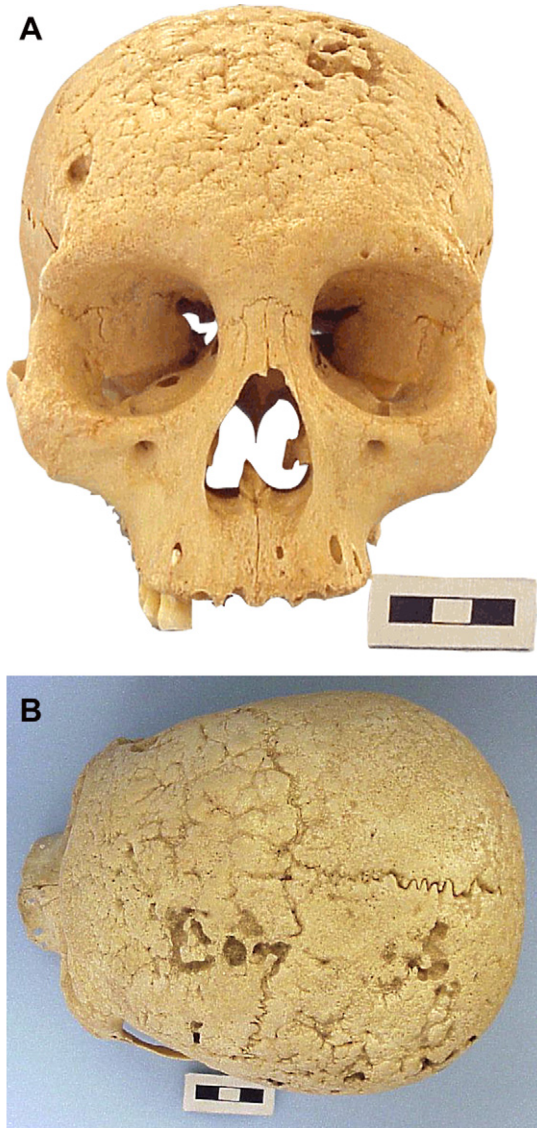

Fig. 2. (A) Anterior view of the cranium (EC12 #2) with granulomatous lesions in the frontal, orbits and zygomatic bones and (B) In superior view showing cavitating cranial lesions and *caries sicca*.

other skulls from Jamaica, particularly those found disarticulated inside caves. Probably the skulls were placed lying on their base and consequently the contact with the soil remaining in the cave could have led to bone damage. If these were secondary burials, of course some damage could have occurred before they were placed in the cave.

The robustness of the cranium, namely the development of the glabella and mastoid process, is more common in adult male individuals. However, the supra-orbital margins are smooth and the orbits are rounded in shape, characteristics associated with females. Thus, the sex diagnosis is quite ambiguous.

In the maxilla only three teeth are preserved: the right canine and premolars. The left first molar was lost ante mortem, with the alveolus completely closed; all the other teeth seem to have been lost post mortem. This individual shows slight periodontal reaction in the right maxilla and occlusal dental wear, classified as grade 5 according to Smith's (1984) scale, in all existent teeth.

The sutures are fully evident, however because the cranium was artificially modified no methods for age estimation were applied. The presence of the alveolus of the erupted third molars associated

Fig. 3. Cranium in inferior view showing the preserved palate and the bone damage on base.

with the dental wear visible in the remaining teeth allows the estimation of a very probable adult, between young to middle age, at the time of death.

This cranium shows a flattened forehead and parietal expansion as in the case of the other cranium from this site (Santos et al., 2002). The alteration present in these crania is so-called "parallelo-fronto-occipital", according to Buikstra and Ubelaker's (1994: 161) classification and has been reported from other Pre-Columbian sites in Jamaica (Flower, 1891, 1895; Haddon, 1897; Harper, 1961/1962; Santos et al., 2002; Allsworth-Jones, 2008; Allsworth-Jones et al., 2011). This characteristic is in accordance with ethnohistorical descriptions, which recorded that Taínos had broad heads (Harper, 1961/1962). Historical accounts mentioned also that they "did not wear much clothing; instead they decorated their bodies with designs using pottery stamps coated with red, white and black pigments obtained from plants and colored clays" (Rodney-Harrack, 2006: 149; cf. Oviedo, 1959 (1526): 13). However, these cultural practices are impossible to confirm by the analyses of human remains.

3.2. Radiocarbon dating

In order to obtain a direct date for this individual, three adjacent samples from the right side of the occipital bone were sent for radiocarbon dating by AMS.

The first sample (Beta-177107) was tested twice by Beta Analytic Inc. producing two uncalibrated dates of 1080 ± 40 and 1050 ± 40 BP, and two older ones (1870 ± 40 and 2760 ± 30 BP). The oldest date listed here was the first to be reported; the others were obtained by re-dating the remaining pre-treated collagen of the first sample three more times. This was done, by request, since the first date seemed far from expectation.

The second and third samples produced three uncalibrated dates from ORAU: (OxA-12995) 1101 ± 27, (OxA-13614) 1123 ± 25, and (OxA-13664) 1069 ± 23 BP. OxA-13614 was given additional solvent extraction, to guard against any possible contamination which the cranium may have undergone, after it was originally removed from the cave.

The radiometric dates obtained, granted that two are outliers, are all Pre-Columbian. Beta Analytic Inc. regards the inconsistent results obtained for the first sample as due to contamination of that portion of bone (which was the outermost) whereas Oxford regards its results as unproblematic (Higham et al., 2007).

Beta Analytic Inc. and ORAU each use somewhat different calibration procedures. In order to ensure comparability, it was decided to obtain the calibration values for all these dates using the CALIB program version 5.01 developed by Stuiver et al. (2006). The results are tabulated below (Table 1) in the manner suggested by them, including the relative area under the probability distribution curve at 1σ range. The figures for this relative area are given in the right hand column of the Table 1.

ORAU already commented that the three Oxford dates are in statistical agreement (Higham et al., 2007), their combined range in terms of the CALIB program being from 915 to 1014 AD. Two of the Beta Analytic dates fit comfortably within this range, but the other two are of course much earlier, and because of the contamination problems apparently associated with the first sample of bone submitted to Beta, it would be prudent to rely on the Oxford dates alone. These dates imply that the cranium belongs to the beginning of the White Marl (Meillacan) period.

3.3. Stable isotope analysis

Stable isotopes, determined in association with radiocarbon analyses, give important insights for an understanding of the paleodiet of the individual concerned (DeNiro, 1985; Price, 1989; Pestle, 2010).

The samples sent to ORAU revealed −14.0, −14.0, and −13.9‰ for δ^{13}C and +11.5, +11.2 and +11.2‰ for δ^{15}N. As a whole, these ratios could be related either to a dominant ingestion of a mixed C3/C4 plant regime or to an extensive intake of marine food, according to the findings of Chisholm et al. (1982).

The values can be compared with others obtained for the Bahamas, where the results for 17 Lucayan Taíno individuals found in caves were plotted against consumed dietary items (Keegan and DeNiro, 1988; Keegan, 1992). The δ^{13}C values for these individuals varied from −9.6 to −15.9 and the δ^{15}N values from +6.5 to +11.9 (Keegan and DeNiro, 1988). The latter were not found to be very good discriminators, but on the basis of the (adjusted) former figures, the authors concluded that the reliance on marine foods by these individuals varied between 29 and 74 per cent (Pestle, 2010: 121).

With regard to the balance between marine and terrestrial vertebrate resources (mainly fish and hutia respectively), some interesting information has been provided for Jamaica by Silverberg et al. (1972). In general, it was observed that the nearer a site was to the sea, the greater its reliance on marine resources. This tendency has been confirmed at other sites for which the fauna has been analyzed (Allsworth-Jones, 2008). The estimation of the comparative input of marine and terrestrial foodstuffs using conventional archaeological criteria is not a particularly easy matter. The proportions of terrestrial versus marine vertebrates at the four Jamaican sites analyzed by Silverberg et al. (1972) varied between 90:10% and 21:79% respectively. These figures do not include invertebrates, particularly molluscs. The latter are much in evidence at all Jamaican open air sites. This does not mean that they necessarily made an important contribution to the diet, on the contrary, as was stated in relation to Paradise Park, they might have been no more than “a garnish or flavoring in stews” (Keegan et al., 2003). In the Bahamas, Keegan and DeNiro (1988) estimated that they made up less than 10% of the diet in total.

Vegetable resources are another matter entirely; the same authors concluded that they would expect “cultigens to comprise at least 50% of the Lucayan Taíno diet” (Keegan and DeNiro, 1988: 328). Cassava has conventionally been regarded as very important for the Taínos (Atkinson, 2006b), and it has traditionally been associated with the clay griddles assumed to be for baking purposes and found at many sites in Jamaica (Allsworth-Jones, 2008: 58). It has been characterized as a species with an intermediate C3–C4 photosynthetic pathway (Angelov et al., 1993; El-Sharkawy, 2003: 631–633), although according to Pestle (2010: Table XXXVII, Appendix B: Floral Tissue Isotope Values) the δ13C values for 10 cassava specimens (counted by him as a C3 plant) varied from −27.6 to −25.9‰ or (adjusted) from −26.1 to −24.35‰. The other C3 cultigens tested by Keegan and DeNiro (1988), including yams, cocoyam, and sweet potato, all of which were known in Jamaica, also produced strongly negative δ^{13}C signals (from −27.3 to −24.4‰). Maize, with a strongly marked C4 pathway and a δ^{13}C signal of about −10.8, has hitherto not been thought to have played a great role in Jamaica (Sturtevant, 1961; Piperno and Pearsall, 1998), or in the Bahamas (Keegan and DeNiro, 1988), but in the light of the results reported by Mickleburgh and Pagán Jiménez (2011, 2012) this assumption obviously requires re-examination. Even the griddles so long assumed to have been connected with the processing of cassava may have had other functions (Mickleburgh and Pagán Jiménez, 2012). The changing of the expected balance between maize and cassava in the Pre-Columbian diet clearly has implications which will require further study.

In the present case, as mentioned above, the recorded δ^{13}C and δ^{15}N values could indicate either a mixed C3/C4 dietary regime, or a more extensive marine component to the diet. “The δ^{13}C values are characteristic of a strong marine signal, but they are not paralleled by enriched δ^{15}N values, as might be expected in that case” (Higham et al., 2007: S10). Hence, a mixed C3/C4 diet is considered “to be more likely.” “The uptake of marine carbon, if this could be demonstrated, would require a correction to account for the marine reservoir offset in the Caribbean. This could be up to c. −380 years, if the individual concerned had been exclusively dependent upon a marine diet” (Higham et al., 2007: S10; Pestle, 2010). An exclusive dependence of that kind is not likely, as is borne out by the various calculations mentioned above in relation to the Taínos' diet in the Bahamas and in Jamaica. On any reasonably probable reconstruction of that diet, the individual described here can still be placed well within the Pre-Columbian White Marl period.

Table 1
Results of radiocarbon analyses performed on three directly adjacent samples from Bull Savannah cranium.

Sample	C14 age BP	1σ cal age range	Relative area
OxA-12995	1101 ± 27	943–982 AD	0.611
OxA-13614	1123 ± 25	915–968 AD	0.844
OxA-13664	1069 ± 23	971–1014 AD	0.905
Beta-177107	2760 ± 40	932–841 BC	0.932
Repeat 1	1870 ± 40	82–172 AD	0.844
Repeat 2	1080 ± 40	947–998 AD	0.636
Repeat 3	1050 ± 40	969–1023 AD	0.898

3.4. Paleopathological analyses in a biocultural perspective

The cranium exhibits exuberant lytic lesions, on the frontal, parietals and occipital, more severe both in size and depth on the left side. Lesions are also present on the left zygomatic bone. Slight pitting is visible all over the cranium, except in the maxillae bones and in the right zygomatic bone arch. The contour of the orbits is thick and there is no nasal cavity lesion but the nasal bones look thick (Fig. 2A). The numerous lytic lesions contrast with areas resulting from destruction followed by repair of bone tissue. The majority of the margins of the lesions are smooth with evidence of healing, with radial scars particularly visible in the frontal and left parietal bones. The computed tomography and radiological examination (Fig. 4) shows that the lesions spread throughout the diplöe producing an irregular surface. In the vault, zygomatic, mastoid process there is

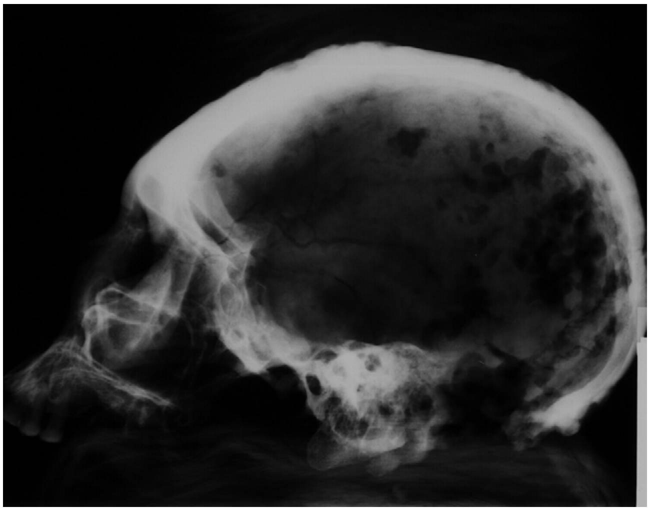

Fig. 4. Radiographic image of the cranium illustrating that osteolytic lesions spread throughout the diplöe producing an irregular surface on the external table and cavitating lesions in the vault.

some perforation of the bones. These holes could be the result of pathology or post mortem damage as is visible in the base of the cranium. In fact the second hypothesis seems the most plausible according to the general aspect, more sharp, of the hole margins.

There are diseases, such as tuberculosis, neoplasia, Langerhans cell histiocytosis, among others, that provoked bone destruction but the bone appearance, location of the lesions and the biological profile of the individual, are quite different from the expected for those diseases (Resnick, 1996). In this case, the crater-like areas and stellate scars are consistent with *caries sicca* resulting from repair of superficial gummatous osteitis (Aufderheide and Rodríguez-Martín, 1998). Thus, this adult cranium shows lesions compatible with treponemal infection. As Hackett (1976) published in his diagnostic criteria, the *caries sicca* sequence from the confluent pits to cavitation of the outer table and later healed stellate scars with rounded margins, are all visible in this individual. Moreover, the presence of *caries sicca* in the cranial vault is considered by some authors (see Hackett, 1976; Aufderheide and Rodríguez-Martín, 1998) as a pathognomonic sign of acquired or venereal syphilis, usually transmitted by sexual intercourse, or, to others, a sign of treponematosis, such as yaws or endemic syphilis or bejel or treponarid (Ortner, 2003). These three variants of treponematosis can leave signs on the skeleton (Hackett, 1983; Aufderheide and Rodríguez-Martín, 1998; Buckley and Dias, 2002; Ortner, 2003, 2005). In paleopathology the distinguishing between these forms is difficult since they can develop similar lesions in the skeleton (Powell and Cook, 2005a). In the current study the difficulty is even greater because only the cranium with incomplete dentition is present. Moreover, the diagnosis of congenital syphilis benefits from the presence of Hutchinson incisors, Mulberry molars and sabre or "bowing" tibiae (Powell and Cook, 2005b) which are not preserved on this individual. According to some authors, yaws was present in the Pre-Columbian Americas, while for others this disease "was apparently introduced into the New World by enslaved Africans in the sixteenth century" (Powell and Cook, 2005b: 17). Moreover, yaws is most commonly acquired in childhood (Marden and Ortner, 2011), making it improbable in this adult individual.

While yaws is a disease of humid tropical areas, bejel is of dry and arid regions (Ortner, 2003; Powell and Cook, 2005b), which is not the case of Jamaica. Moreover, tertiary syphilis affects more commonly the skull (Ortner, 2003; Powell and Cook, 2005b; Marden and Ortner, 2011). The search for aDNA from *Treponema* organism to help to clarify this diagnosis does not seem a valid option according to recent studies (Bouwman and Brown, 2005; Von Hunnius et al., 2007).

So far as the history of treponematosis is concerned, one of the most intense debates during the 20th century has been whether syphilis originated in the New or in the Old World (Baker and Armelagos, 1988; Dutour et al., 1994; Brothwell, 2005; Powell and Cook, 2005b; Harper et al., 2008; Melo et al., 2010). Currently, it is said that "[i]n the Americas, treponemal disease is widely acknowledged to be Pre-Columbian and ubiquitous in late prehistoric contexts" (Smith, 2006: 205). Nevertheless, there are still some questions about "the geographical distribution and time depth of treponematosis" (Ortner, 2005: ix). In North America (Canada, USA and Mexico) the situation regarding the paleopathology of treponematosis was summed up in 2005 in a book edited by Powell and Cook, with the oldest evidence dating from 6000 to 1000 BC. For Central and South America, including the Caribbean, the results are somewhat more scanty. There is evidence of Pre-Columbian treponemal infection from the U. S. Virgin Islands, dating from Saladoid (AD 450–960) and Ostionoid (AD 1170–1535) periods (Sandford et al., 2005). In Belize, Saul and Saul (1997: 38 in Powell et al., 2005: 436) concluded that "treponemal-like disease" was present at the Maya (1200–900 BC) site of Cuello. From Puerto Rico treponemal infection was reported in two females associated with the Ostionan culture (AD 600–1200) (Crespo, 1999; Crespo-Torres, 2005, 2010), and in a further seven aboriginal crania, two of them dated to the 14th-15th century AD (Nunez et al., 2006). In the Dominican Republic there is also evidence of Pre-Columbian treponematosis (Luna-Calderón, 1993; Rothschild et al., 2000). In Guadeloupe, Hoogland and Panhuysen (2003) reported four individuals, dating from the 11th–12th centuries AD, with yaws and bejel, according to their assessment. In Cuba the earliest evidence of treponematosis is claimed to date back to 3000 BC in the site of Cueva Calero (Vento and González, 1996; Vento, 2005). In Jamaica, Flower (1895: 608) reported, in the human remains found at Halberstadt cave, that "one of the left tibiae shows throughout the shaft marked evidence of chronic periostitis, the surface being thickened and vascular. A bone of the opposite side, which might have been of the same individual, shows the same condition in a less marked degree." Among the commingled material from an open air site at Black River, in St. Elizabeth, are fragments of one fibula and two tibiae with well-remodeled periostitis and a huge increase of thickness that could be related to treponemal diseases (Santos et al., 2002). Thus, the evidence presented in the Bull Savannah cranium (EC 12 # 2) is not unexpected for the presence of treponemal infection in the Caribbean region about the first millennium AD. The small number of cases reported so far may be a reflection of the fact that only a few human remains have been exhumed and studied in this area. Moreover, it is also important to note that paleopathological identification is only possible in the tertiary stage of the disease (Smith et al., 2011), and that only ca. 15% of untreated cases of syphilis are known to have developed skeletal changes (Robinson et al., 1999).

The exuberance of the lesions on the Bull Savannah cranium leads to the assumption that they were visible during life. It is known that the native population were aware of the disease, and as Crespo-Torres (2005: 396) points out, Taíno society devoted considerable attention to the care of individuals infected with syphilis, both in life and after death. This is probably because, in their mythology, it was linked to "a divine character in this society". Thus, the chronicler Gonzálo Fernández de Oviedo (1959 (1526): 88–90) refers to syphilis and its cure in the "New World" by a "guayacan" concoction (Crosby, 1972) prepared with *Guaiacum officinale*, a plant also referred to as *Lignum vitae*, or "wood of life", now the "national flower" in Jamaica (Lee, 2006; Senior, 2003). Religious or ceremonial paraphernalia such as *zemís* and *duhos* were also made from this wood (Atkinson, 2006b; Saunders and Gray, 1996).

This instance also constitutes a contribution to our knowledge of Taíno funerary practices, which are not as yet fully understood (Schaffer et al., 2012). Commingled human and faunal remains have been found in several caves in Jamaica (Allsworth-Jones, 2008) and at least some of them look like secondary places of burial. This may be the case in Bull Savannah, because the cave seems much too small for two inhumations. Lee's plan (Fig. 1) shows some scattered long bones, no longer in the Collection, in the mid and front part of the cave, but their relationship to the two crania is not clear.

4. Final comments

Despite the incompleteness of these human remains, a multidisciplinary study of them, in a biocultural perspective, has revealed significant information about the Taínos. This adult cranium belonged to an individual that, according to radiocarbon dates, lived at the end of the first or beginning of the second millennium AD, corresponding to the beginning of the White Marl (Meillacan) period. This chronology is in accordance with other evidence, in particular the artificial modification of the head. This practice, visible in skulls from other Taíno contexts in the Greater Antilles, points to a Pre-Columbian chronology for this individual in Jamaica. The stable isotope analyses show either the ingestion of a mixed C3/C4 plant diet or an important marine intake, the former alternative being more likely. The differential diagnosis for the lesions visible on the cranium leads to the conclusion that treponemal infection was present, most probably acquired syphilis. The exuberance of the lesions suggests that this individual presented visible signs of the disease in life. According to historical accounts, the native population prepared plant extracts to treat syphilis and paid special attention to such patients. Thus, we can hypothesize that the location of this cranium at the back of a recess in a small cave in Bull Savannah maybe is related to the position this individual had in the population when alive.

Irrespective of the type of treponematosis present, this case represents one further indication of Pre-Columbian treponematosis in the Caribbean region and, therefore, one more proof of the antiquity of treponematosis in the "New World", as well as the first clear evidence of its kind from Jamaica.

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