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'*Choicest unguents*': molecular evidence for the use of resinous plant exudates in late Roman mortuary rites in Britain

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ABSTRACT

Resinous substances were highly prized in the ancient world for use in ritual contexts. Details gleaned from classical literature indicate that they played a significant role in Roman mortuary rites, in treatment of the body and as offerings at the tomb. Outside of Egypt, however, where research has shown that a range of plant exudates were applied as part of the mummification process, resins have rarely been identified in the burial record. This is despite considerable speculation regarding their use across the Roman Empire.

Focusing on one region, we investigated organic residues from forty-nine late Roman inhumations from Britain. Using gas chromatography–mass spectrometry and the well-attested biomarker approach, terpenic compounds were characterized in fourteen of the burials analysed. These results provided direct chemical evidence for the presence of exudates from three different plant families: coniferous Pinaceae resins, Mediterranean *Pistacia* spp. resins (mastic/terebinth) and exotic *Boswellia* spp. gum-resins (frankincense/olibanum) from southern Arabia or beyond. The individuals accorded this rite had all been interred with a package of procedures more elaborate than the norm.

These findings illuminate the multiplicity of roles played by resinous substances in Roman mortuary practices in acting to disguise the odour of decomposition, aiding temporary soft-tissue preservation and signifying the social status of the deceased. Nevertheless, it was their ritual function in facilitating the transition to the next world that necessitated transportation to the most remote outpost of the late Roman Empire, Britain.

1. Introduction

For centuries there has been speculation about the use of resinous substances in Roman mortuary contexts (Chioffi, 1998; Pearce, 2013). This has been fuelled by the brief insights provided by classical authors (Hope, 2009: 65–85) and unsubstantiated reports of scented substances in elaborate cremation and inhumation burials (e.g. Dunkin, 1844: 91–97; Gage, 1834, 1836; Waugh, 1962; Webster, 1947). As a result, a relationship between interment in stone sarcophagi or lead-lined coffins, plaster body-coatings and the potential use of resins was proposed in the 1970s. The additional level of investment represented, which took the form of increased protection of the cadaver, appeared to be aimed at some degree of body preservation. Inferential links with the doctrine of resurrection and the presence of elements of this 'package' in late Roman burial contexts in north Africa and the Rhineland led to an association with the spread of Christianity (Ramm, 1971; Sparey Green, 1977). It was also suggested that this rite may have had gender correlates (Chioffi, 1998: 24–28) or been a signifier of social status (Philpott, 1991: 92; Toller, 1977: 2). The continuing debate over the nature of these burials has focussed on two key aspects, the botanical source and ritual significance of any resinous

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materials present. Along the way, a mythology has developed through repetition of earlier suppositions despite the absence of any chemical confirmation for the use of resins. This state of affairs, in conjunction with recent continental finds, prompted us to undertake a molecular-based investigation of late Roman period burials from Britain.

2. The archaeological context

Natural resins are complex materials composed of a range of compounds of varying volatility (Howes, 1949: 87–89). The majority of these are terpenic moieties, polycyclic hydrocarbons with oxygen-containing functional groups (terpenoids) and their derivatives, which are classified according to the number of C_5 isoprene ($CH_2{=}C(CH_3)CH{=}CH_2$) units from which they are formed (Pollard and Heron, 2008: 241–242). Those of diagnostic value are primarily the higher molecular mass di- and triterpenoids (with twenty and thirty carbons, respectively) as these are limited in their botanical origins due to the different biosynthetic pathways employed by various plant families (Langenheim, 2003: 24–30). Fortunately, they also comprise the more degradation resistant water-insoluble fraction of 'true' resins and certain gum-resins and so can survive in the archaeological record (Colombini and Modugno, 2009).

Although the tissues of a vast array of species contain terpenic compounds, the number of trees and shrubs that exude aromatic resinous secretions in any abundance is more restricted (Howes, 1949: 86–87; Langenheim, 2003: 51–98). Reviews of those native to the Mediterranean region can be found in Howes (1950) with a discussion of their chemistry in Serpico (1996). With regards to the Roman period, these findings can be supplemented by information from classical texts concerning the properties and exploitation of these products (Hort, 1980: 223–247), ancient trade networks (Huntingford, 1980: 19–57; Rackham, 1968: 31–95), and the use of resinous substances as part of Roman mortuary rites (Groom, 1981: 1–15; Hope, 2007: 97–99, 111–119). The latter describe the anointing of the deceased with perfumed unguents (Fowler and Fowler, 2007: 511; Sullivan, 1977: 87–88), the heaping of aromatic substances on the pyre and within the tomb (AKJV, 2011; John 19: 39–42; Nagle, 2004: 87), the embalming of certain individuals (Grant, 1971: 384; Nagle, 2004: 157) and the burning of vast quantities of incense as part of funerary rituals (Rackham, 1968: 61–62). On a more practical level, these *"choicest unguents* [were also used] *to arrest the progress of decay"* (Fowler and Fowler, 2007: 511) and mask the odour of decomposition (Hope, 2009: 71–74). These texts imply that, while many plant exudates were employed in medicinal preparations or perfumery (Gunther, 1959: 5–92; Hort, 1980: 247–321), a more limited palette was deemed appropriate for the ritual sphere. Definitive evidence for this extensive use of resins has, however, rarely been recovered from the archaeological record (Pearce, 2013).

Organic residue analysis of embalming materials has previously been successful in establishing the role played by resinous substances in Ancient Egyptian mummification processes (Buckley and Evershed, 2001; Serpico and White, 2000; Tchapla et al., 2004). Even in these complex mixtures, marker compounds have enabled the identification of a range of aromatic exudates. This research has shown that a modified form of this body treatment continued into the Roman period in Egypt with an increased use of imported conifer resins (Buckley and Evershed, 2001; Corcoran and Svoboda, 2010). Such findings prompted the analysis of visible residues from exceptional mortuary contexts elsewhere in the Roman Empire with biomarkers denoting the utilization of both diterpenoid coniferous products (Ascenzi et al., 1993; Devièse et al., 2010; Papageorgopoulou et al., 2009; Reifarth, 2013), triterpenoid *Pistacia* spp. (mastic/terebinth) resins (Bruni and Guglielmi, 2005; Devièse, 2008: 115–131; Reifarth, 2013) and *Boswellia* spp. (frankincense/olibanum) gum-resins (Devièse, 2008: 115–131). Most recently, brittle orange materials associated with the remains of an infant inhumed near Arrington, Cambridgeshire, UK have also been shown to be fragments of resin from the genus *Pistacia* (Brettell et al., 2013).

These finds display a number of commonalities which closely resemble the class of late Roman burial proposed by Ramm (1971). The deceased were generally interred in stone sarcophagi or lead-lined coffins and accompanied by high quality gravegoods (Ascenzi et al., 1993; Bruni and Guglielmi, 2005). Most appear to have been wrapped in some form of shroud and several were encased in plaster (Reifarth, 2009). Evidence for garments of damask silk, murex ('Tyrian') purple-dyed wool and spun gold threads has also been recovered (Devièse, 2008: 181–182; Papageorgopoulou et al., 2009; Reifarth, 2013). Indeed, there is a striking correlation between contemporary descriptions of elite Roman funerary rites and these archaeological discoveries: "*Sabaean frankincense, the Indian crop for burning, incense robbed from Palestine's temples … and beads of myrrh …* [her body lies on a bier of] *Chinese silk beneath the shade a purple canopy provides*" (Nagle, 2004: 157).

Thus, to test the hypothesis that the use of exotic resinous exudates formed part of mortuary practices introduced to Britain in the Roman period, samples were selected from both 'package' burials and normative inhumations. These were analysed using gas chromatography–mass spectrometry (GC–MS) and the well-attested biomarker approach (Evershed, 2008). The rationale behind this process is that suites of molecular markers have the potential to permit identification of source materials. With regards to plant exudates, it is the higher molecular mass terpenic components in the resin fraction that are both degradation resistant and diagnostic. These compounds may, therefore, survive over archaeologically relevant time periods and provide evidence for any resins utilized. Where our methodology differs is in the nature of the samples selected. Previously, research has only been conducted where visible residues or resin fragments were observed. Although these materials were sampled when present, the focus here was on the potential survival of biomarkers within the heterogeneous detritus, best described as 'grave deposits', found in the base of the more substantial containers or closely associated with the human remains.

Mortuary rites in late Roman Britain are particularly suited to this approach as they are sufficiently defined in both space and time to enable a systematic study to be undertaken. Moreover, the absence of visible residues as a result of the comminution of resinous deposits can be predicted due to a lack of surviving protective structures (e.g. mausolea, burial vaults or catacombs) and inclement environmental conditions. The recovery of biomarkers from these unprepossessing samples can, however, be attributed to archaeological sources with some confidence as only one native species, *Pinus sylvestris*, readily produces a terpenoid-containing resin and then not in any significant abundance (Howes, 1949: 109). As the natural distribution of this conifer is in northern, upland areas of Britain while issues of access and availability restricted sample acquisition to southern and/or lowland sites, the potential for contamination within the surrounding soil matrix was considered to be minimal. Molecular evidence for resinous exudates in these burials offers, therefore, a rare opportunity to discern the ritual actions that created this archaeological record. Traces of these highly valued commodities have important implications with respect to both practical and symbolic aspects of Roman mortuary rites and the relationship between Britain and the wider Empire in the 3rd–4th centuries AD.