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# Vegetal grave goods in a female burial on Bornholm (Denmark) from the Late Roman Iron Age period interpreted in a comparative European perspective

Sabine Karg[a,b]*, Ulla Lund Hansen[b], Anne Margrethe Walldén[b], Jens Glastrup[c], Henrik Ærenlund Pedersen[a] and Finn Ole Sonne Nielsen[d]

[a]*Faculty of Science, Natural History Museum of Denmark, University of Copenhagen;* [b]*Faculty of Humanities, Saxo Institute, Department of Archaeology, University of Copenhagen;* [c]*Conservation Department, National Museum of Denmark, Kgs. Lyngby;* [d]*Bornholms Museum, Rønne*

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Knowledge about the healing properties of plant substances is probably as old as humankind, and this can be demonstrated by botanical finds in archaeological contexts. Southern Scandinavia has a long tradition of supplying deceased persons with vegetal material for use in their afterlife, as shown by single seeds or processed plants in the form of foods, drinks or medicines. A well-known example is the small container made of birch bark most probably filled with a kind of mead produced from honey, in the Egtved girl's coffin a find which has been dated to the Early Bronze Age. Another fascinating plant discovery derives from the grave of the Fyrkat woman dated to the Viking Age: a handful seeds of the poisonous plant henbane (*Hyoscyamus niger*) was found in a small pocket fixed to the woman's belt. Plant materials enclosed in small amulet boxes are quite common and are frequently attached to necklaces that the deceased had certainly worn during their lives. In this article, we discuss the organic finds from a newly excavated amulet box which was discovered in a woman's grave at the Late Roman Iron Age site of Vellensby, on the island of Bornholm. The box contained two 'chewing gum-like objects' with dental impressions and three vegetal objects. Gas chromatography/mass spectrometry analysis was applied to one of the 'chewing gums' and the results show that it consists of a mixture of birch tar and plant oil. Based on their morphological characteristics, the three uncharred plant parts could be identified as cloves from a wild species of *Allium*, probably *A. scorodoprasum* (sand leek). The traditional medicinal application of sand leek is presented and the symbolic and possible principal meaning of amulet boxes is discussed within a comparative study of related discoveries from female burials throughout Europe.

**Keywords:** vegetal grave goods; Scandinavia; Late Roman Iron Age; *Allium* cloves; birch tar

## The archaeological site Vellensby on Bornholm

An application for a permission to undertake gravel exploitation at the land registry *Vellensby* (BMR 1472) on the island of Bornholm led archaeologists from Bornholm's Museum to inspect the surroundings of the site in 1980 (Figures 1 and 2). Within a low ridge of the terrain surrounding the natural gravel deposit, a soil of a darker colour was observed within the plough layer. A few potsherds dated to the Roman Iron Age were found in this layer. More ceramic artefacts and larger stones came to light during the following years, and consequently, archaeological excavations were performed in 1998. A child grave from the Late Roman Iron Age was subsequently unearthed. The coffin was formed in the shape of a small ship and contained the following grave goods: several fibulas, a knife, six ceramic vessels as well as a wooden bowl, of which, only the cast was preserved. In 2009, excavation activities were completed. In total, this site yielded 19 single and 3 double graves. From their sitting position and the associated grave goods, such as beads, hair needles and spindle whirls, the gender of the deceased was determined to be female. Four of them were adults between the ages of 16 and 30 and three were girls. Seven burials were most probably male individuals that were placed on their backs; among them were four adults of ages between 18 and 35 and three boys. Gender could not be determined for two adult and six child burials.

Some of the female graves were richly equipped, for example burial A5, in which the human remains of a young woman at the age of 17–18 years were found (Figure 2). This grave was excavated and described by Maj Britt Schultz Petersen (2009). The following grave goods were found in burial A5: a ceramic cup, a wooden bowl of which only the cast was preserved, a bone comb, a rosette fibula with silver coat, two fibuli made of bronze, one fibula made of iron and an iron knife. In addition, two bead necklaces were placed around the woman's head. One of the necklaces was fashioned from gold foil, 41 amber and bronze beads, and a silver hook. The second necklace consisted of 17 amber and glass mosaic beads, iron beads, a ring made of silver, several bronze hooks, and an amulet box made of bronze. This box warranted closer examination, and its contents are the principal theme of this article (Figure 3).

*Corresponding author. Email: karg@hum.ku.dk

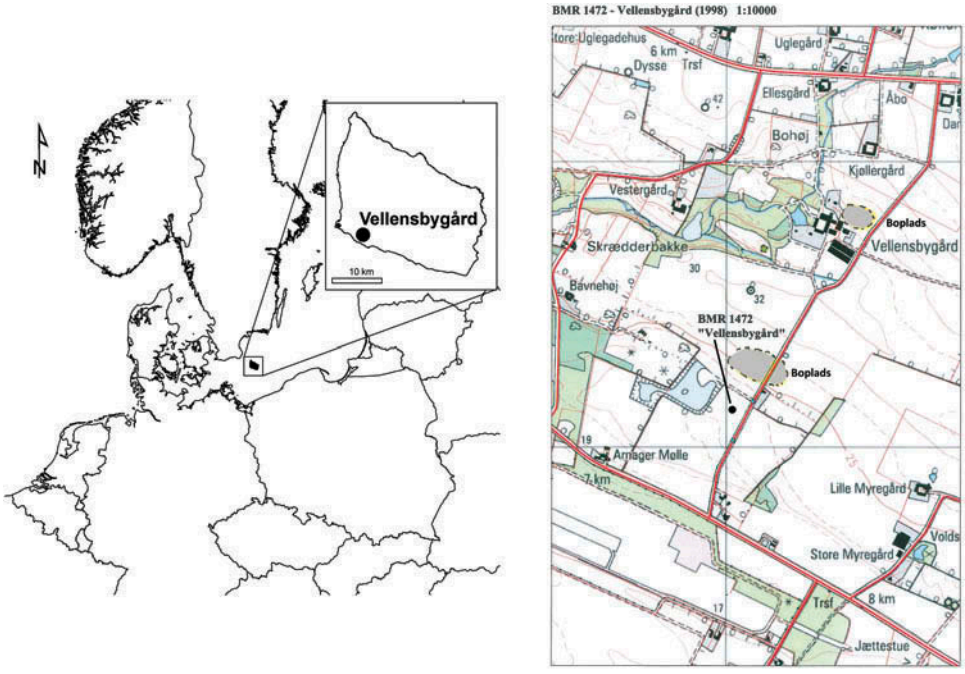


Figure 1. Map with Bornholm and the archaeological site Vellensby (map: Bornholms Museum).

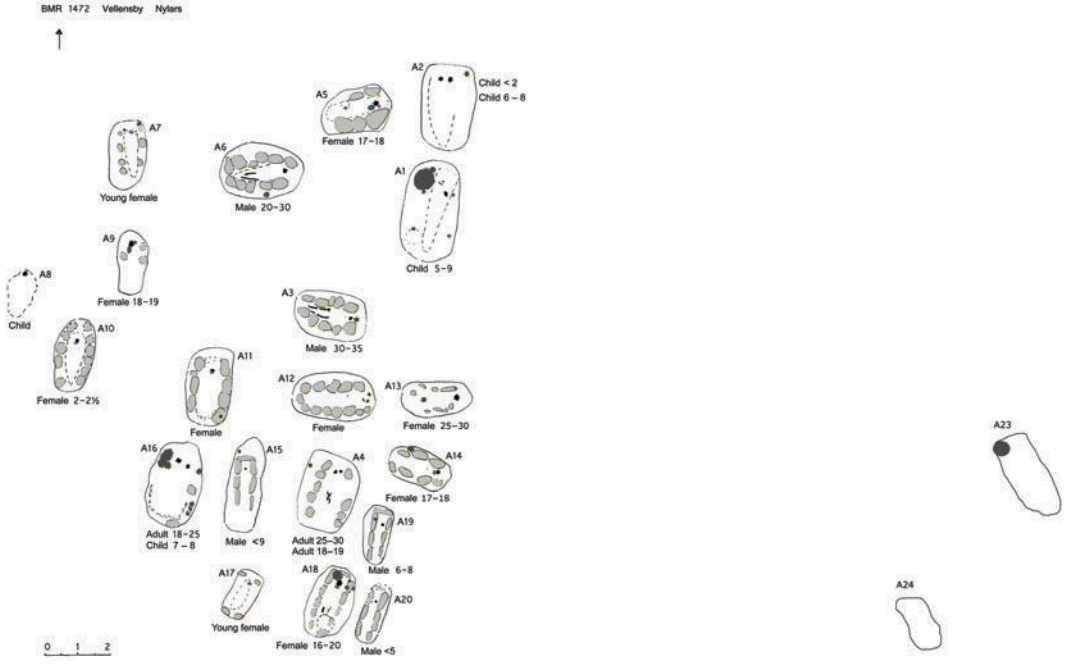


Figure 2. Excavation plan of Vellensby and the graveyard with the healer's grave A5 (illustration: Bornholms Museum).

## The organic content of the amulet box from burial A5 at the site of Vellensby

The small cylindrical box made of bronze was opened in the laboratory by Anne Margrethe Walldén. The amulet contained five organic objects which were, in the first instance, analysed by Sabine Karg and Henrik Ærenlund Pedersen, from the Natural History Museum of Denmark (NHMD), with the help of a Leica stereo microscope with 10–40x magnification. Three objects could be determined to be pieces of dried plant, with two objects resembling

Figure 3. The metal amulet box from the Vellensby grave A5 (BMR 1472, A5 x99) (drawing: The Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation, photos: A.M. Walldén, The Royal Danish Academy of Fine Arts, Schools of Architecture, Design and Conservation and P.V. Nielsen).


Figure 4. One *Allium* clove from Vellensby (photo: R. Fortuna).

Figure 5. Modern plants of sand leek on Bornholm (photo: S. Karg).

chewing gum with distinctive dental impressions. With the help of NHMD's extensive reference collection of recent herbarium material, the plant finds were identified as cloves belonging to the genus *Allium* (onions, family Alliaceae, Figures 4 and 5). Cloves are lateral shoots produced from bulbs, representing vegetative reproduction, as they eventually develop into new bulbs themselves.

### *Identification of the* Allium *cloves*

Based on the morphological examination of the cloves from Vellensby we can rule out *A. schoenoprasum* and *A. ursinum* (both of which have thinner, more elongated cloves). Among the *Allium* species documented from Bornholm, this leaves us with *A. carinatum, A. oleraceum, A. scorodoprasum* and *A. vineale* as the possible identity of the cloves in the amulet box. Unfortunately, macromorphological features recognisable from the old cloves did not enable us to unequivocally refer them to one particular species, though our judgement is slightly in favour of *A. scorodoprasum*.

Seven species of *Allium* are usually considered to be indigenous to the geographical region of modern Denmark and adjoining parts of the southern Baltic area (Jessen 1935, Tillge 1981). A number of foreign cultivated species, introduced relatively late, can probably be disregarded within our context. Among the indigenous species, *A. lusitanicum* (syn.: *A. montanum*) has only been recorded once – from a location near the German border in southernmost Jutland – whereas *A. oleraceum* (field garlic), *A. schoenoprasum* (chives), *A. scorodoprasum* (sand leek), *A. ursinum* (ramson), *A. vineale* (wild onion) and the currently rare *A. carinatum* (keeled garlic) are widespread. While the latter six species are all known to be endemic to Bornholm within a modern context,

*A. schoenoprasum* and especially *A. carinatum* have only been recorded in a few localities. Coastal populations of *A. schoenoprasum* on Bornholm are believed to be the only naturally occurring populations of this species in Denmark; plants from all other Danish occurrences are morphologically slightly different and are usually found in the close vicinity of gardens.

### *Gas chromatographical analysis of the chewing gum*

Besides the three garlic cloves, the amulet box contained two chewing gum-like objects (Figure 6). The objects were twisted and showed dental impressions, probably derived from teeth of children. Jens Glastrup analysed a small sample from one of the gums using the gas chromatography/mass spectrometry (GC/MS) apparatus at the Danish Nationalmuseum's Conservation department to determine the original content of the material(s) used in preparation. The material was hydrolysed in an alkaline KOH solution (10%) in 50% $H_2O$/methanol solution. After acidification and extraction of the neutral and acidic components with diethyl ether, the dried residue was derivatised with diazomethane dissolved in methyl-t-butyl-ether. Hereafter, the solution was injected into the GC, and the resulting chromatogram is shown in Figure 7. The chromatogram shows a multitude of peaks (organic material), most prominent being the di-acid series from $C_{16}$–$C_{22}$ in the 23–35-min region. Also found are peaks within the lupeol/betulin triterpene derivatives in the 38–42-min region. When taken as a whole, this strongly indicates the presence of birch tar, as the combination of the di-acids and the lupeol/betulin derivatives are well known to be present in birch tar (Junkmanns 2001). In addition, the chromatogram shows the presence of palmitic and stearic acids, together with azelaic acid. These components do not normally occur in birch tar and can therefore be surmised that these had been subsequently added to the material. The presence of azelaic acid in the analysed sample indicates that the fatty material added originally contained a high proportion of unsaturated fatty acids, which upon ageing, gives rise to the formation of azelaic acid. It is tempting to speculate that the oil may have been of linseed or hemp origin. However, it is not possible to determine this conclusively solely on the basis of the fatty acids.


Figure 6. Front and back views of the birch tar chewing gums from the amulet box (photos: R. Fortuna).

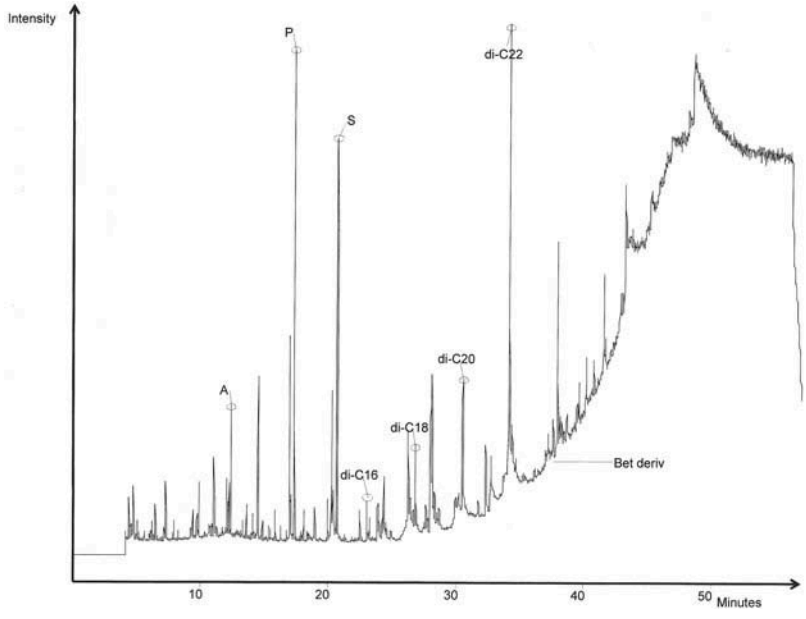


Figure 7. The TIC chromatogram of the analysed material (graph: J. Glastrup).

## Interpretation of the organic content in the amulet box of Vellensby and comparative finds

### *The chewing gums made of birch tar*

Birch tar is extracted from the white bark of birch trees by burning it slowly under hermetically sealed conditions (a dry distillation method) at a temperature of *c*. 300–400°C. Birch bark contains up to 25% of terpenes, a kind of resin which begins to soften at a temperature of *c*. 50–70°C. In cold conditions, this black substance reacts in a similar way to modern chewing gum. It has been used as universal glue since early prehistoric times, mainly to fix flint arrowheads to shafts, but also to repair broken ceramic vessels and to caulk leather (Wahl 2007, p. 185). Several experiments illustrate how birch tar is understood to have been produced in prehistoric times (e.g. Czarnowski and Neubauer 1992, Junkmanns 2001).

Small clumps of the raw birch tar exhibiting distinct dental impressions from human teeth are quite frequently detected in archaeological excavations (Fuchs 2012). The oldest known finds from Denmark are the two *c*. 10.500-year-old clumps with dental impressions of a *c*. 11-year-old child from the site of Barmose I, a settlement in South Zealand (Johansson 2011). In this article, Johansson lists additional Scandinavian prehistoric sites at which birch tar is found: Segebro in Southern Sweden, Huseby in West Sweden and Dværgebakken in central Jutland.

Numerous Neolithic finds of so-called 'chewing gum' have been recorded from the lake shore settlements of the circum alpine region. For example, the site of Hornstaad-Hörnle IA, Lake Constance in Southern Germany, where more than 200 birch tar pieces with dental impressions, mainly from children and young adults, were found in a layer that dated to 3918–3902 cal. BC (Fuchs 2012). The taste of birch tar chewing gum shares similarities with the taste from chewing tobacco and smoked meat; Junkmanns (2001) reports that it tastes sweet and aromatic. Birch tar contains the following constituents: tanning agents, salicylic acids and essential oils. It is known that birch tar has antiseptic properties and has, among other applications, been used in traditional medicine to anesthetise toothache, as a cleaning agent and disinfectant for the mouth, a treatment for skin diseases, malaria, dropsy and gout as well as for colic and mange within a veterinary context. Modern medicine assumes, however, that birch tar contains carcinogenic substances (Fuchs 2012).

### *The* Allium *gloves*

The genus *Allium* has a rich ethnobotanical history in Denmark (Brøndegaard 1987), and the use of wild onions may well extend back to prehistoric times. It is particularly interesting that, in some neighbouring areas, the modern occurrence of sand leek is closely related to historical and probably even to prehistoric settlement ruins. Sernander mentions, in 1941, that '*Allium scorodoprasum* on the island of Gotland can often be found in close vicinity to ground plans of old houses and enclosures dating to the iron Age period'. The same observation that the modern distribution of sand leek is tied to old settlements has been made by Naustdal (1945) in his review of finds along the west coast of Norway. This suggests that this species was cultivated in former times as a vegetable for culinary use and as medicinal plant. Based on the references above, Fægri concluded in 1951 that the *leek* (Lauka) mentioned in the Edda sagas and in all the old Nordic literature was *Allium scorodoprasum* (cited from Hjelmqvist 1955, pp. 165–166).

### *Traditional use of cultivated garlic*

Cultivated garlic (*Allium sativum* L.) occupies a special position within the genus *Allium*, as the bulbs can be used for several purposes, including food (vegetable), spices and medicine. The oldest written evidence on the use of garlic is documented in the 22 medical recipes in the famous Ebers Papyrus dated to *c*. 1550 BC (Koch and Hahn 1988). It is not known when cultivated garlic was introduced to Southern Scandinavia as no archaeobotanical finds have yet been made.

Modern scientific analysis and experiments support the abundant information in the antique, medieval and ethnographical literature relating to the pharmaceutical properties of garlic, which seem to be equally present both within the wild species *A. scorodoprasum* and *A. ursinum*, and in the domestic species (e.g. Fritsch and Keusgen 2006).

These various medical applications are attributed to the high antibiotic, anti-sclerotic and anti-carcinogenic effect of the garlic substances. At the same time, garlic acts as a disinfectant which may indicate that the cloves in the amulet were probably used as a remedy for toothache.

Marco Polo reported that in China garlic juice was used to preserve meat (Moule and Pelliot 1938). Biochemical analyses have shown that garlic contains the amino acid alliin which reacts with the enzyme alliinase to form a strong antimicrobial and strong smelling substance (allicin) when cloves are freshly crushed (Melchior and Kastner 1974).

Garlic is associated with vitality and is associated with long lifespans and resistance against cancer throughout the Mediterranean. Garlic has enjoyed (and in some regions even today) the reputation to protect against evil powers, mainly during the dark hours. Until recently, it was a common habit in Southern Europe to place garlic beside women who were due to give birth. Thieves can be threatened and witches warded off by hanging single garlic bulbs or whole garlands below or beside entrances. The legend that vampires detest garlic is known worldwide. One of the oldest written sources on garlic's

supernatural attributes is the episode in Homer's epic, the Odyssey, in which the god Hermes orders Odysseus to eat yellow garlic so as not be transformed to a pig by Circe, the daughter of Helios, who was a goddess of magic (Harris 1975).

### Amulet boxes from contemporaneous female burials in other European countries

The discovery of botanical parts within the small amulet box from the woman's grave A5 at the site of Vellensby has inspired further investigation of similar boxes from Denmark and abroad. Based on Katarzyna Czarnecka's catalogue (Czarnecka 2010, pp. 234–236), it was possible to compare 16 amulet boxes with the find from Vellensby (Figure 8 and Table 1). All boxes can be dated to the periods C1b and C2 of the Late Roman Iron Age. Five of the amulets were found in Denmark, one in Sweden, five in Germany, four in Poland, one in Hungary and one in Serbia (Figure 8 and Table 1). It is possible to identify some time-related variations within this group. The boxes from Northern Europe, in addition to the find from Serbia, date to the period C1b and differ from the others by not having any decoration. Exceptions, however, include the box from Himlingøje, Denmark, and one of the boxes from Preetz, Northern Germany. The three most extensively decorated amulet boxes are from Himlingøje, Moythienen and Babienten, dated to the period C1b and C2. All 17 amulet boxes belonged to wealthy women whose graves contained objects of both Roman and Germanic origin. The boxes can be described as small cylindrical metal containers with lids, which were attached to a long necklace of beads. A small metal chain connects the lid to the box. Only the amulet box from Stuchowo, northern Poland, differs from the cylindrical boxes by having a round base. The design is most likely a reflection of its intended contents, in this case caused by a large black agate bead. The Stuchowo box is made of silver like the box from Himlingøje. The remaining 15 amulet boxes are made of bronze. The metal chain between lid and box is only apparent on 15 of the boxes. In contrast to the two others from Rebenstorf and Wechmar, Germany, a small cross bar fixes the lid to the box.

An object type that is found in all of the graves is beads, in particular glass and amber beads. In graves outside Northern Europe, beads of semi-precious stones, such as agate, carnelian and rock crystal, are more common. In the Hungarian grave, Szeged Sárgapart, which is interpreted as a Sarmatian grave, many beads were found, especially prismatic carnelian beads. The woman here

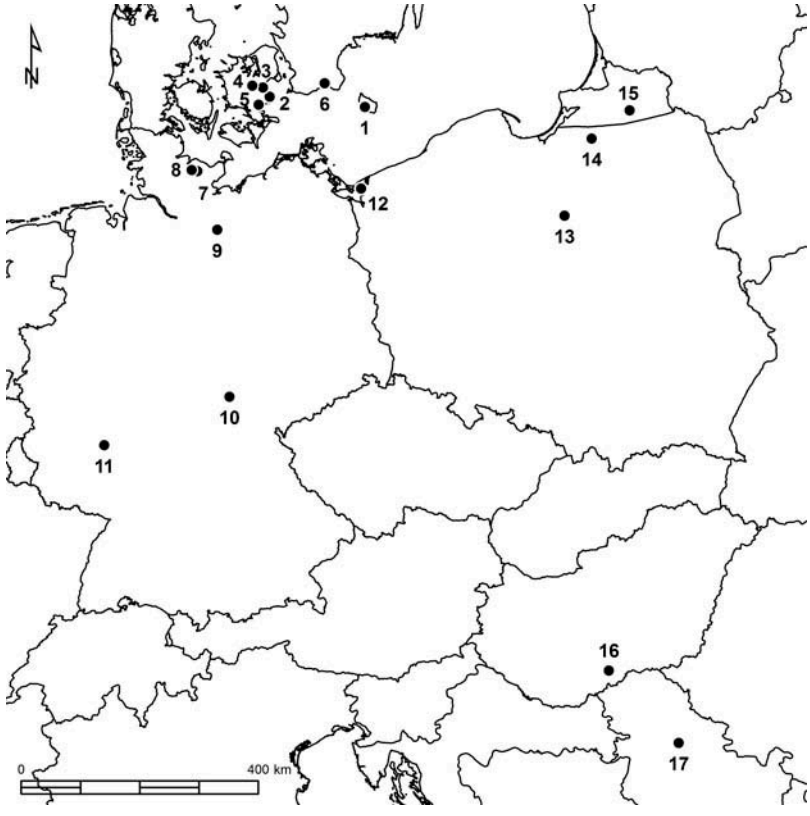


Figure 8. Geographical distribution of the 17 contemporary female burial sites dated to the Late Roman Iron Age in Europe. For site names, dating and descriptions of the amulet boxes see Table 1 (graph: A.M. Walldén).

Table 1. Description of the 17 contemporary sites of female burials with amulet boxes in Europe mapped on Figure 8.

| Number on map | Country code | Site name | Dating | Burial type | Age in years | Material | Size in cm height/ width | Decoration | Plant parts | Textile fibres | Ointment | Leather with hair | Silver/iron fragments/ bead | Agate bead with silver thread | References |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | DK | Vellensby | late C1b | inhumation | 14–18 | bronze | 3.5 × 3.9 | x | x | x | | | | | Karg *et al.* this article |
| 2 | DK | Broskov | C1b | inhumation | | bronze | 2.6 × 2.5 | | | | | | | | Broholm (1930) |
| 3 | DK | Himlingøje | C1b | inhumation | 40–50 | silver | 2.3 × 3.0 | x | x | x | | x | x | | Hansen (1995) |
| 4 | DK | Nordrup | late C1b | inhumation | young | bronze | 2.0 × 3.4 | | | | x | | | | Petersen (1890) |
| 5 | DK | Skovgårde | late C1b | inhumation | 16 | bronze | 2.44 × 2.48 | | | | | | x | | Ethelberg (1997) |
| 6 | S | Balkåkra | late C1b | inhumation | young | bronze | 2.6 × 2.8 | | | | | | x | | Sundin (1919) |
| 7 | D | Preetz, 45 | C1b | urn | | bronze | | x | | | | | | | Brandt and Schäfer (1960) |
| 8 | D | Preetz, 123 | C2 | urn | 6–8 | bronze | 2.6 | x | | | | | | | Brandt and Schäfer (1960) |
| 9 | D | Rebensdorf | C2 | urn | | bronze | | | | | x | | | | Müller (1893) |
| 10 | D | Wechmar | C2 | urn | young | bronze | 2.8 × 2.7 | x | x | | | | | | Kaufmann (1984) |
| 11 | D | Lauffen | late C2 | inhumation | 14–16 | bronze | 2.3 × 2.0 | x | | | | | | | Schach-Dörges (1981) |
| 12 | PL | Stuchowo | C2 | inhumation | | silver | | x | | | | | | x | Eggers (1938) |
| 13 | PL | Crossen | C1b1 | inhumation | | bronze | | | | | | | | | Gaerte (1929) |
| 14 | PL | Moythienen | C2 | urn | | bronze | 3.6 × 4.7 | x | | | | | | | Hollack and Peiser (1904) |
| 15 | PL | Babienten | C2 | not known | | bronze | | x | | | x | | | | Gaerte (1929) |
| 16 | H | Szentes-Sárgapart | C1b | inhumation | | bronze | | | | | | | | | Párducz (1950) |
| 17 | SRB | Pancsova | C2 | inhumation | | bronze | 4.3 × 5 | x | | | | | | | Párducz (1963) |

had several necklaces around her neck, wrists, upper arms and ankles; with more than 300 beads used to adorn her ankles alone. The bronze amulet box in this grave is, in fact, two boxes tied together. The upper box has a handle while the lower features a chain. Another point of interest is the two silver rings, which were placed on the woman's temple (Párducz 1950).

The graves of Stuchowo, Babienten and Crossen in Poland, Balkåkra in Sweden and Lauffen in Germany are outstanding, with regard to special grave goods or the characteristics of the deceased. The woman in Stuchowo had a 45-cm-diameter bowl made of bronze placed over her face (Eggers 1938). The Babienten girl had a barbed spearhead, a point of a lance and two sickles in her grave (Gaerte 1929). The grave of Crossen contained spurs and a terminal pendant (Gaerte 1929). The young girl of Balkåkra was missing her left hand while her feet were found tied together. She also had a belemnite in her grave and a large quantity of charcoal had been placed on her body (Sundin 1919). The Lauffen girl had a Roman bronze key, six Terra Sigillata bowls and a 4.8-$cm^2$ gilded silver plate with a large red/violet glass bead, which had most likely been attached to a belt (Schach-Dörges 1981).

Although the 17 amulet boxes show many similarities, they must have been manufactured in different locations. Their decoration and assemblages differ, as well as the methods by which the metal chain was attached to both the lid and the box. In addition, five of the boxes have a lid that is fixed to the exterior; in the case of the remaining boxes, the lid is fixed to the inside. The small bucket-shaped charms are normally seen in bead necklaces, but are affixed to the amulet boxes at Lauffen and Wechmar.

It has only been possible to identify the contents of nine out of the 17 boxes. The materials can be identified as: plant parts, textile fibres, ointment, leather with hair, silver/iron fragments/bead and one agate bead with silver thread (Table 1).

## Summary and conclusions

The Late Roman Iron Age (periods C1b and C2) was a politically unstable period. This is, among other things, reflected in the numerous weapon graves within the archaeological record, and in other evidence for unrest along the Limes during the period. New centres of power and wealth were established, and social networks and alliances between these centres were strengthened. Contact and communication between the centres are, among other archaeological finds, reflected in the grave goods within the previously described female burials containing amulet boxes. The objects in their graves indicate the existence of an extensive social network that is, for example, also reflected by the glass finds of the Eggers Type 189, found among the Late Roman Iron Age (C1b) graves of Himlingøje, Nordrup and Crossen. The glass is of Roman origin and had been transported from Cologne to Zealand and Bornholm, and from there onwards to Poland (Kokowski 2004, p. 38). The distribution of the fibula types Almgren VII 196 and Almgren IX 217 also reflects the existence of trading a network across the Baltic Sea.

The richness of the grave goods within the female burials at each of the 17 archaeological sites described reflects the fact that these women belonged to the Late Roman Iron Age elite. It can be hypothesised that some of these women entered into marriages with members of other tribes (Przybyla 2011, p. 321), while others maintained different forms of social networks especially those buried in the large female cemetery in Preetz or those, whose graves were not placed on an actual burial ground, such as the women of Babienten, Stuchowo, Balkåkra, Pancsova and Lauffen.

One possible explanation for the outstanding characteristics of each of these female burials may be that all these women, as with many other women in Late Roman Iron Age Barbaric Europe, shared a common knowledge of the healing properties of natural medicines, such as birch tar, that can be used against tooth pain, and *Allium* cloves, which are known for disinfectant properties. The woman from Vellensby was herself part of this body of knowledge.

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