Journal of Archaeological Science 67 (2016) 32–42

Contents lists available at ScienceDirect

Journal of Archaeological Science

journal homepage: http://www.elsevier.com/locate/jas

Dietary practices at the castle of Middelburg, Belgium: Organic residue analysis of 16th- to 17th-century ceramics

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ARTICLE INFO

Article history:
Received 22 July 2015
Received in revised form
3 November 2015
Accepted 3 January 2016
Available online xxx

Keywords:
Residue analysis
Lipid biomarkers
Mid-chain ketones
PAHs
Sterols
Gas chromatography
Mass spectrometry

ABSTRACT

Between 2002 and 2004, excavations on the castle of Middelburg (Belgium) revealed ample pottery assemblages dating to the 16th and 17th centuries. Gas chromatography mass spectrometry (GC–MS) analysis of preserved surface residues on these ceramics allowed the identification of biomarkers for animal and vegetal foods, and thermal processing. This paper furthermore reinforces the methodology for examining food residues by GC–MS, particularly in pottery in which highly varied meals were prepared. For example, this study forms the first instance in which dairy signals have been identified in mid-chain ketones. Moreover, insights are gained in the multiple uses of vessel types and questions arise on the dietary and medicinal practices of the inhabitants of this particular castle site.

1. Introduction

Several travelers made accounts of their visit to the Low Countries in the 16th and 17th centuries. In their journals, they reported on the manners and behavior of both Dutch and Flemings (e.g. de Rocherfort 1672; Havard de la Montagne, 1913; Moryson, 1908). These traveler's accounts, together with several cookery books, make up a considerable part of the current knowledge on dietary and medicinal practices in the early modern Low Countries. However, as these are often products made by and written for the better off, the information available is biased towards specific social groups. In this paper, it is explored how gas chromatography mass spectrometry (GC–MS) can contribute to this debate, using surface residues on 16th- to 17th-century ceramics from the castle site of Middelburg as an example.

Middelburg (Maldegem, East-Flanders) is a small town with associated castle, situated in the Flemish part of Belgium on the border with the Netherlands and in the near vicinity of some major late medieval and early modern urban centers such as Aardenburg, Bruges and Sluis (Fig. 1). During most of the 15th–16th century, this small town was rather prosperous (De Clercq et al., 2007). However, with the outbreak of religious and political troubles in the second half of the 16th century, Middelburg became a focal point in the frontline of the Dutch Revolt. In the late 16th century, the city's castle was frequently seized and occupied by Spanish and Dutch armies, losing its function as a noble residence. Subsequent military actions made that the castle had fallen completely in ruins by the middle of the 18th century (De Clercq et al., 2007).

Between 2002 and 2004, excavations were carried out on this castle site. In view of the high numbers of well-preserved pottery assemblages, Middelburg constitutes a type-site for the study of pottery in the early modern Low Countries. Previous articles have already reported on the ceramic typology, environmental remains and the content of an ointment jar (Baeten et al., 2010; De Clercq et al., 2007; Poulain et al., 2013). These studies are now complemented with analyses on food crusts and ointments preserved in pottery vessels. Visible surface residues were investigated by GC–MS in order to reveal their original contents and hence shed light on diet and function of the vessels in times of war. The molecular data will then be confronted with contemporary written records.

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http://dx.doi.org/10.1016/j.jas.2016.01.006

Fig. 1. The actual geographical location of Middelburg.

2. Material and methods

2.1. Sample selection

After a visual inspection of the entire ceramic record of the Middelburg excavations, a total of 12 redware cooking pots, 1 redware bowl, 5 ointment pots and 1 unknown redware vessel type were selected based on the presence of visible surface residues (Fig. 2) and retained for further analysis.

The cooking pots are characterized by a wide rim opening (12–21 cm), a short neck and a base with thumbed feet (M03), a tripod base (M04) or a slightly concave base (M08). Most of them are covered with a colorless lead glaze and blackened by soot, indicating an intensive use. Then again, the cuff-shaped rim with pronounced lower lip and the application of lead glaze on the inside is typical of the bowl (M13), *teil* in Dutch. The ointment jars consist of 2 maiolica and 3 redware individuals. The maiolica forms (M15, M18) have a concave base, a sharp transition to a cylindrical body and an overall tin glaze. The redware jars (M14, M16, M17) resemble the maiolica ones with a flat base and sharp transition to the body. Finally, with its upright rim, flat base and green glaze on the inside, M19 constitutes an unknown vessel type.

Fig. 2. Preserved surface residues in sample M04.

The vessels were found all over the castle site (Fig. 3). M10, M11 and M17 were recovered from a garderobe chute on the lower court, while M8 was found amongst the debris of the upper court's southern tower. All other individuals derived from the moats surrounding the castle's buildings. The assemblage containing sample M10, M11 and M17 dates from the late 16th century (Poulain et al., 2013). Sample M08, on the other hand, dates somewhere between 1583 and 1608. Finally, the vessels deposited in the moat can all largely be dated between 1500 and 1700.

A further distinction can be made between ceramics found on the upper court, mostly associated with a more residential/representational function, and the lower court which mainly had a functional character. The common character of the sampled ceramics makes that this distinction is not reflected in their formal aspects. However, as the analysis of the preserved contents may still point to a differentiated use between ceramics on the upper or lower court, this distinction was retained.

2.2. Sample pretreatment

The surface residues were scraped off from the ceramic sherds with a scalpel and thereafter crushed with mortar and pestle. A standard lipid extraction was performed on 10–200 mg of residue using chloroform: methanol (2:1 v/v) as solvent and ultrasonication to assist the extraction. The samples are listed in Table 1 with the results of this lipid extraction. After centrifugation, a portion of the extract was concentrated and derivatized with N,O-bis(trimethylsilyl)trifluoroacetamide + 1% trimethylchlorosilane and dissolved in toluene before analysis with GC–MS. Another portion of the extract was methylated using boron trifluoride in methanol and thereafter reacted with dimethyl disulfide adducts and iodine to yield dimethyl disulfide adducts. Elemental sulfur was present in 9 samples, most likely due to microbial reduction of marine derived sulfates (Pester et al., 2012), and was removed with activated and cleaned copper turnings, according to Environmental Protection Agency method 3660B, to avoid interference with the chromatographic separation. Detailed information on derivatisation protocols can be found in Baeten et al., 2013.