



# ANALECTA

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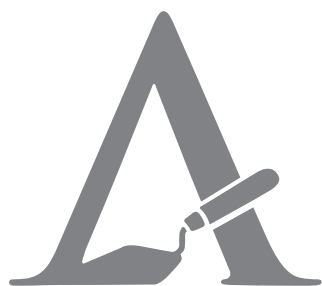


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VOLUME **18** RZESZÓW 2023



Uniwersytet Rzeszowski  
Kolegium Nauk Humanistycznych  
Instytut Archeologii

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Halina Taras<sup>1</sup>, Anna Zakościelna<sup>2</sup>, Marcin Osak<sup>3</sup>,

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## A Contribution to the Study of Traces of Psychotropic Substances Inside Miniature Vessels and Collared Flasks of the Eneolithic Funnel Beaker culture (FBC) from Poland

### Abstract

Taras H., Zakościelna A., Osak M., Buszewicz G., Teresiński G. 2023. A Contribution to the Study of Traces of Psychotropic Substances Inside Miniature Vessels and Collared Flasks of the Eneolithic Funnel Beaker culture (FBC) from Poland. *Analecta Archaeologica Ressoiviensia* 18, 97–102

The text presents the results of laboratory analyses conducted on vegetal intoxicating substances identified on the walls of selected pottery forms discovered at Polish sites attributed to the south-eastern group of the FBC. The samples taken from miniature vessels and collared flasks were examined using the GC-MS/MS method (triple quadrupole) and then the reference method LC-MS/MS (linear ion trap). As a result of the research, psychotropic substances were identified in four samples: papaverine, scopolamine and atropine.

**Keywords:** psychoactive substances, miniature vessels, Eneolithic, SE group of the FBC, Poland, GC-MS/MS, LC-MS/MS

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### Introduction

The importance of various stimulants, especially psychoactive substances, in rites and religions of primary societies, including prehistoric communities and many civilisations, has already been highlighted in several publications, including ethnological and archaeological ones (e.g. Furst (ed.) 1972; Harner (ed.) 1973; Motyka 1985; Noll 1985; Eliade 1988; Sherratt 1991; Sikora 1999; Szyjewski 2001; Motyka and Marcinkowski 2014). This phenomenon has already been reported for the earliest times, including the Eneolithic, FBC communities (Rudgley 2002, 21–27; Krzak 1994, 56).

In Polish archaeological literature, the hypothesis that the FBC communities knew and used psychoactive substances was formulated most comprehensively by Jerzy T. Bąbel (2006). He noted that FBC inventories include characteristic containers, so-called collared flasks, which imitate poppy heads. The most faithful copies are known from the northern group (Nowak 2017, fig. 1), especially Jutland. Certain specimens with spherical bellies not only have notched collars but are also ornamented with vertical grooves. So far, this hypothesis has not been supported by any specialist research. It has been suggested that other ceramic artefacts (e.g. smoking pipes, spoons, goblets) might have also been



used for storing and consuming intoxicating substances (Bąbel 2006, fig. 4–6). In our opinion, the group of containers used for this purpose should also include miniature forms (see e.g. Zakościelna and Taras 2022).

Ceramic miniatures which replicate “typical” containers constitute peculiar elements of the FBC inventories throughout the distribution range of the said culture. Their use is unclear. Most often, they are interpreted as children’s toys (e.g. Kulczycka-Leciejewiczowa 1997, 242; 2002, 82; Steiner 1997; Röder 2010), ritual vessels (Sochacki 1988, 73–74; Szmyt 2018, 529), or containers for special substances, such as medicines, cosmetics, seasoning, etc. (Szajt and Wieczorek-Kańczura 2018, 374).

This work presents the results of specialist laboratory analyses conducted on several miniature vessels found at settlement sites and collared flasks from graves attributed to the south-eastern group of the FBC (Fig. 1), the aim of which was to identify psychoactive substances. The research was carried out within the framework of the joint project by the Institute of Archaeology, Maria Curie-Skłodowska University in Lublin and the Chair and Department of Forensic Medicine, Medical University of Lublin.

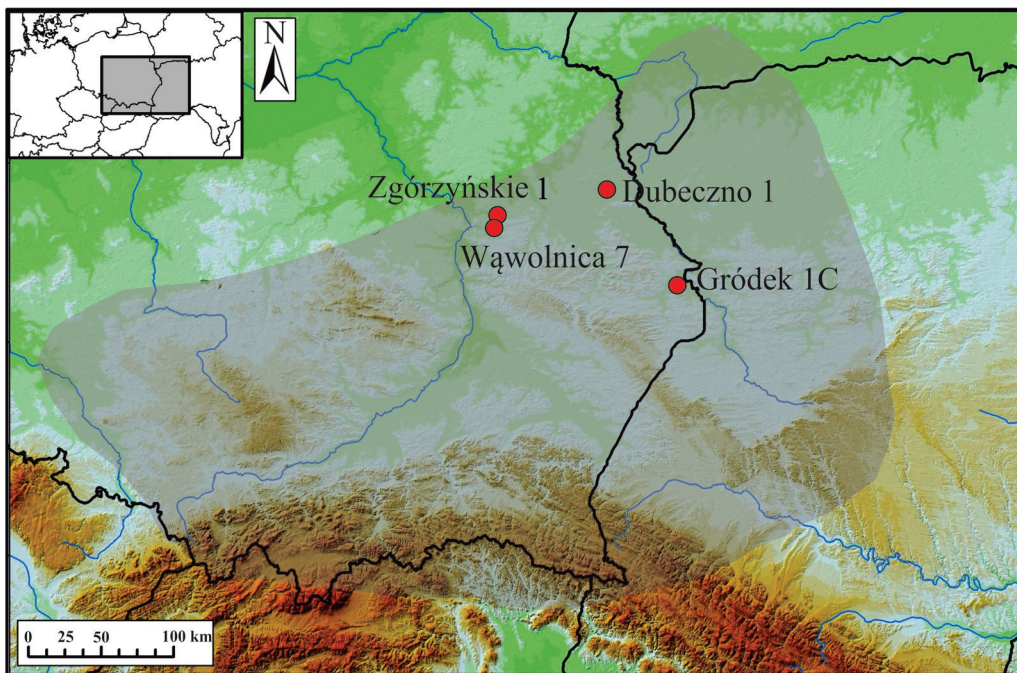
## Materials

Twelve samples were subject to the examination. They included nine specimens of miniature vessels

from two settlements of the SE group of the FBC – six from Dubeczno 1, Włodawa district – settlement, materials from the cultural layer (samples D1–D6 – Zakościelna and Taras 2019) (Fig. 2: 3, 5–9) and three from Gródek 1C, Hrubieszów district – settlement (samples G1–G3 – unpublished vessels in the collection of the museum in Zamość; sample G2 – the cultural layer, level 50–60 cm) (Fig. 2: 1, 2, 4), as well as three collared flasks (Fig. 3). Two specimens included in the latter group had been discovered in the monumental tombs of the FBC on the Nałęczów Plateau, explored in Wąwolnica 7, Puławy district – central grave in megalithic tomb (sample W1 – Bargieł *et al.* 1982) (Fig. 3: 3) and Zgórzyńskie 1, Puławy district – grave in flat cemetery (sample N2 – unpublished vessel, information in Kutylowski 1974) (Fig. 3: 2), while the third flask is a stray find discovered at an unspecified localisation, also within the Nałęczów Plateau (sample N1 – unpublished) (Fig. 3: 1). All artefacts can be dated to the classical phase of the FBC.

## Methods

The analytical study focused on the presence of opiate and tropane alkaloids. The reference samples consisted of randomly selected clay sherds, free of analytical signals corresponding to the target substances, originating from the cultural layer from the same FBC sites as the studied material.



**Fig. 1.** Location of the sites from which the analysed vessels come from, against the background of the territory of the south-eastern FBC group (after Nowak 2017; figure by the authors – based on Leszek Gawrysiak’s map).

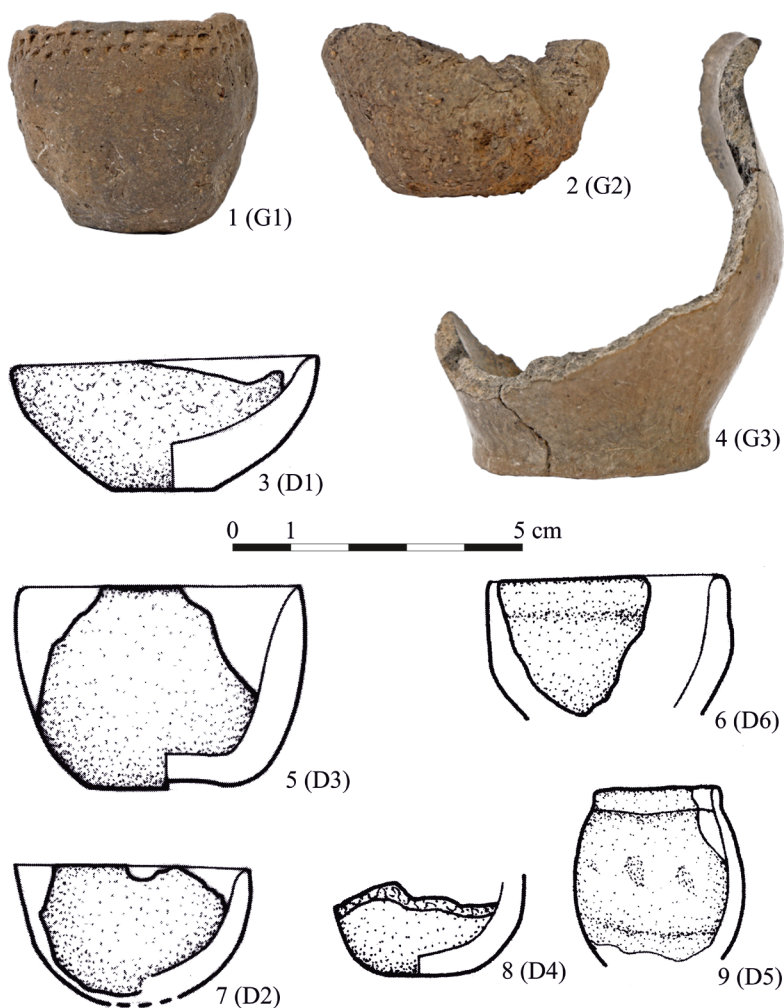


Fig. 2. Analysed vessels: 1, 2, 4 – Gródek 1C; 3, 5–9 – Dubeczno 1 (photo by S. Oliwiak; figure after Zakościelna and Taras 2019).



Fig. 3. Analysed vessels: 1 – unknown locality (Naęczów Plateau); 2 – Zgórzyńskie 1; 3 – Wąwolnica 7 (photo by the authors).

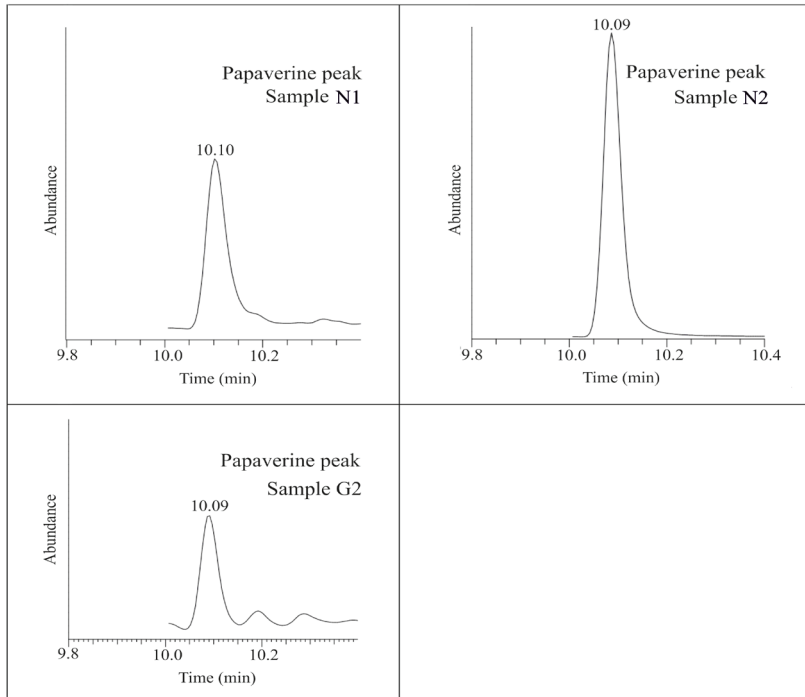
Samples were taken from the inner surface of the vessel bottoms or their immediate vicinity. Both the reference material and the analysed pottery were ground with a mini grinder equipped with a stone tip to obtain the specified amount of ceramic powder. Samples, each weighing 200 mg, were placed in vials and subject to ultrasound-assisted liquid-liquid extraction in an alkaline environment. The analysis of the extract was conducted with gas chromatography–tandem mass spectrometry (GC-MS/MS) method and, subsequently, with liquid chromatography–tandem mass spectrometry (LC-MS/MS) reference method in order to compare the results. Our instrumental sets posed an integrated system of Trace 1310 Gas Chromatograph with TSQ 8000 EVO Triple Quadrupole Mass Spectrometer (Thermo Fisher Scientific®, Waltham, MA,

USA), and configuration of ultra-high performance liquid chromatograph Dionex Ultimate 3000 with linear ion trap spectrometer LTQ Velos Pro (Thermo Fisher Scientific®, Waltham, MA, USA).

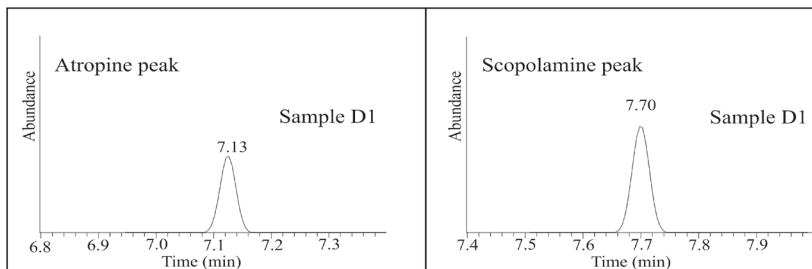
Alkaloids in samples were analysed in two separate sets: in a native or derivatized form, as silyl esters, depending on the requirements of the particular method.

## Results

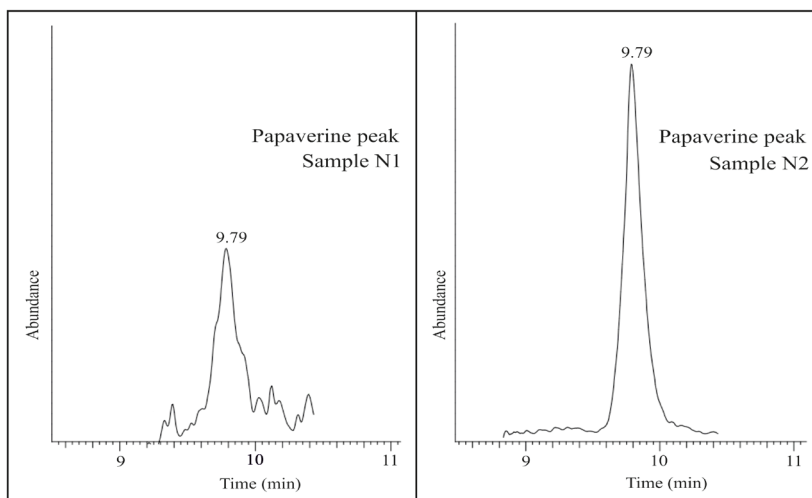
By utilizing the GC-MS/MS technique, a paverine peak was identified in the obtained chromatograms in the case of three archaeological items (Fig. 4), while peaks corresponding to atropine and scopolamine were found in one specimen (sample D1 – miniature vessel) (Fig. 5). Moreover, LC-MS/MS com-



**Fig. 4.** Chromatograms obtained by GC-MS/MS analysis showing the detection of papaverine (figure by the authors).



**Fig. 5.** Chromatograms obtained by GC-MS/MS analysis showing the detection of atropine and scopolamine (figure by the authors).



**Fig. 6.** Chromatograms obtained by LC-MS/MS analysis showing the detection of papaverine (figure by the authors).



parative analysis employed in our protocol confirmed the presence of papaverine in samples N1 and N2, confirming the reliability of the identification (Fig. 6).

## Discussion

Papaverine, identified in three samples, is an opiate alkaloid, present in poppy plants of the cultivable and medical variety (*Papaver somniferum*) (Fig. 4) as well as the wild variety (*Papaver setigerum*). Identification of subfossil remains (especially palynological traces) of poppy plants is difficult, hence it rarely appears in pollen and macroremains analyses (e.g. Lityńska and Wasylkowa 2005, 129–131; Madeja 2012, tab. 3; Filipova-Marínova *et al.* 2013, fig. 3B).

Atropine and scopolamine occur in Europe, North Africa, and Western Asia in certain species of solanaceous family (*Solanaceae* Juss.) such as deadly nightshade (*Atropa belladonna* L.), black henbane (*Hyoscyamus niger* L.), henbane bell (*Scopolia carniolica*), and jimson weed (*Datura stramonium* L.). Solanaceous plants only exceptionally occur in palynological profiles (e.g. *Atropa belladonna* L. – López-Dóriga 2015, 400–401) and among archaeological macro remains (*Hyoscyamus niger* L. – Lityńska and Wasylkowa 2005, fig. IX–23: 18, item 273; Dąbrowski 2010, 48, tab. 1).

The discussed plants were used as poisons, ingredients of medicaments and, when appropriately dosed, as narcotics (e.g. Merlin 2003; King *et al.* 2018; Smith *et al.* 2018).

## Conclusions

The employed analytical procedure confirmed the presence of psychoactive substances, answering previously unsolved questions concerning the non-culinary functions of certain vessel forms. The fact that papaverine was detected with the use of two different techniques indicates the high reliability of the instrumental research, which allows the interpretation of the functions of these particular items.

## Acknowledgements

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