Traces of milk in two Mycenaean cups from Glyka Nera, Attica

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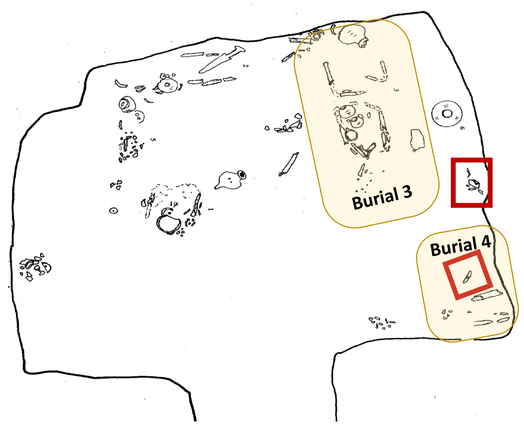
Introduction

The Mycenaean cemetery of Glyka Nera is located at the site Fouresi, by the NE slope of mount Hymettus. It consists of chamber tombs and pit graves and it was used from LH IIB to LH IIIC early.

The chamber tomb in the Panagopoulos/Leka plot is the second biggest tomb of the cemetery. It contained six adult burials, three male and three female, accompanied by clay vessels, jewelry, bronze weapons and tools and a bronze phiale. The burials are dated from LH IIIA2 up until LH IIIC early.

The two cups under discussion belong to the FS 220 type and are dated to LH IIIB1.

They were undecorated, whilst AK 292 is poorly preserved. They were found near the male burials 3 and 4, although they cannot be safely attributed to either of them. Mention should also be made of a feeding bottle of the FS 161 type. It is contemporary to the cups, belonging to the LH IIIA2/B1 period, and it was found beside the head of the male burial 3.



AK 292

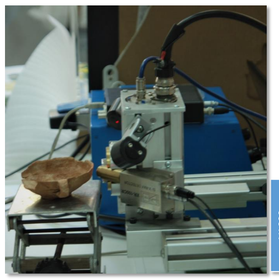
AK 288

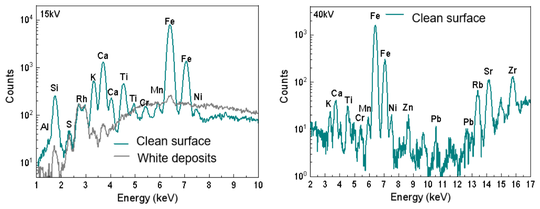
Methodology - Analyses (XRF, RAMAN, FTIR)

The vessels from the tomb were examined with archaeometric techniques as part of a wider study, aiming to determine their manufacture technology. The two cups were of particular interest, due to the white deposits that partially covered their inner surface. Therefore the focus was on identifying the material of those deposits.

The methods used to identify the white matter were XRF, Raman and FTIR spectroscopy. Portable instruments were chosen.

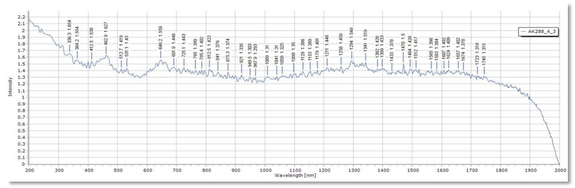
XRF



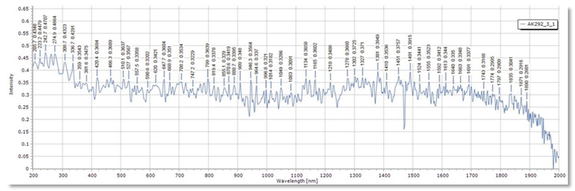


AK 288	Measurement region %	Al_2O_3	SiO_2	SO_4	Cl	K_2O	CaO	TiO_2	Cr_2O_3	MnO_2	Fe_2O_3	NiO	ZnO	As_2O_3	Rb	SrO	Zr	PbO
	Cl. surface	3.38	**20.4**	1.81	0.139	1.93	**12.3**	0.917	0.067	0.263	**46.3**	2.53	0.602	0.201	1.49	2.68	1.8	**0**
	Wh. deposits	3.02	**20.7**	0.798	0.193	1.26	**17.2**	0	0	0	**44.9**	0	0	0	0	0	0	0

RAMAN

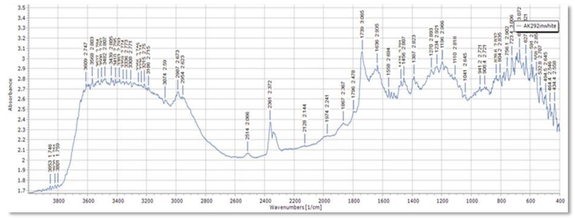


AK288_4_3	Raman (cm^{-1})	Identification
	399.9, 785.4, 921, 1041, 1129, 1294, 1382, 1470	Lactose
	921, 1058	Glucose
	364.2,1153, 1583, 1607	Phenylalanine
	531, 691.9, 765.1, 841, 875.3, 996.9, 1009, 1211	Tryptophan
	646.2,1179	Tyrosine
	1258/1657	Amide III/Amide I
	875.3, 1009, 1129, 1153, 1179, 1258,	Casein



AK292_3_1	Raman (cm^{-1})	Identification
	420.4, 557.5, 708.2, 870.6, 909, 1049, 1327, 1381	Lactose
	1278	Glucose
	527, 747.2, 1218	Phenylalanine
	510.1, 870.6, 1451, 1555, 1613	Tryptophan
	527, 799	Tyrosine
	620, 647.2, 855.1, 1451, 1555, 1613	Casein

FTIR



AK292inwhite	FTIR (cm^{-1})	Identification[1]	Identification[2]
	1387		Casein
	1456	Amide III	Casein
	1558	Amide II	
	1636	vCOO / vC=C	Casein
	1739	vC=O ester	
	1796	vC=O ester	
	1867	vC=O ester	
	2361		Casein
	2514	$CaCO_3$	
	2954	v_{as} CH_2, v_a CH_3	Casein
	2987	vC-H	
	3074		Casein
	3186 - 3609		Casein
	3853		Casein

Results

XRF measurements of the white deposits detected a strong presence of Ca and Si, while Fe, Al, S and K appeared reduced, as they came from the ceramic background. The poor result of chemical elements on the white deposits led the search towards organic material. The Raman and FTIR measurements identified casein, the main protein of milk.

Additionally, from the preliminary study carried out on the feeding bottle using FTIR technique, there were indications of possible traces of milk, however further analyses are necessary.

From the perspective of burial customs, milk is usually considered as an offering to the dead, part of the food or drink, which were given to them for their journey to the underworld.

Furthermore, it was used for the libations during the burial ceremony, together with wine and honey.

AK 296

In our case, milk was traced in two open-shaped drinking vessels of similar type, which were found inside the chamber of the tomb. The residues are visible on the inner surface of the cups, almost up until the lip, a fact that allows us to assume that the vessels were full of milk. On the other hand, feeding bottles, as their name suggests, are usually considered to be vessels for feeding children, but, due to their spout, they could easily be used for pouring liquids.

Conclusions

The picture that can be drawn from the above is that the cups were deposited in the tomb in the first half of the 13th c.BC, accompanying one of the burials. They contained milk, intended as a food offering to the deceased and not for libation. It is possible that the feeding bottle was used to pour the milk inside the cups and was then left, empty or half full, as a burial gift. The process took place inside the chamber, shortly before its sealing. At the re-openings of the tomb the cups were probably swept aside.

References

1. Benzi M. (1975) "Ceramica Micenea in Attica", Milano 1975
2. Byler, D. M. and Farrell, Jr. Harold, M. (1989) 'Infrared Spectroscopic Evidence for Calcium Ion Interaction with Carboxylate Groups of Casein', Journal of Dairy Science. Elsevier, 72(7), pp. 1719–1723. doi: 10.3168/jds.S0022-0302(89)79287-0
3. De Gelder, J. et al. (2007) "Reference database of Raman spectra of biological molecules", Journal of Raman Spectroscopy, 38(9), pp. 1133–114
4. Falconer C. (2014) "An examination of the funerary offerings placed in Mycenaean chamber tombs during the palatial and postpalatial periods in the Aegean", Ontario
5. Fischer J. (2017) "Food in Mycenaean Greece", Kraków
6. Lewartowski K. (2000) "Late Helladic Simple Graves, A study of Mycenaean burial customs" BAR International Series 878
7. Mountjoy P.A.(1998) Μυκηναϊκή Γραπτή Κεραμική, Οδηγός ταύτισης, Αθήνα 1998
8. Nevin A., Osticioli I., Anglos D., Burnstock A., Sharon,C., Castellucci E. (2008) 'The analysis of naturally and artificially aged protein-based paint media using Raman spectroscopy combined with Principal Component Analysis', JOURNAL OF RAMAN SPECTROSCOPY, 39, pp. 993–1000. doi: 10.1002/jrs.1951.
9. Vandenabeele, P. et al. (2000) 'Analysis with micro - Raman spectroscopy of natural organic binding media and varnishes used in art', Analytica Chimica Acta, 407, pp. 261–274. doi: 10.1016/S0003-2670(99)00827-2.
10. Vaskova, H., Buckova, M. and Zalesakova, L. (2016) 'Spectroscopic analysis of milk fat and its mathematical evaluation', International Journal of Biology and Biomedical Engineering, 10, pp. 168–175.
11. Vrettou Eir. (2015) «The dead and their burial gifts; the case of two Mycenaean tombs from Glyka Nera, Attica», in Athens and Attica in Prehistory, Proceedings of the International Conference, Athens 27-31 May 2015, (eds. N. Papadimitriou, J. C. Wright, S. Fachard, N. Polychronakou-Sgouritsa, E. Andrikou), Oxford 2020, 513-520.
12. Παπαθωμά, Ε., Γκανέτσος, Θ., Κανταρέλου, Β., Μουτάφη, Ι., Βρεττού, Ειρ.(2019) 'Μελέτη μυκηναϊκής κεραμικής από την περιοχή των Γλυκών Νερών με φασματοσκοπικές μη δειγματοληπτικές τεχνικές', in 3ο Πανελλήνιο Συνέδριο Ψηφιοποίησης Πολιτιστικής Κληρονομιάς - EuroMed 2019, Αθήνα.

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