CERAMICS and ORGANIC RESIDUE ANALYSIS (ORA)

What information does organic residue analysis provide?

Organic residue analyses determine the biomolecules preserved in various objects. This method is most used for analysing food residues deposited in pottery, as well as various adhesives and tars, but the same method can be used to study any unknown organic object.

Note: ORA can be applied to both charred layers and pottery without charred layers.

1 2 3 4 5

Organic residue analysis can be applied to various archaeological materials: 1) the foodcurst and clay matrix of pottery, 2) a piece of tar, 3) oil used for burning in a lamp, 4) embalming material for mummies, and 5) dog coprolite.

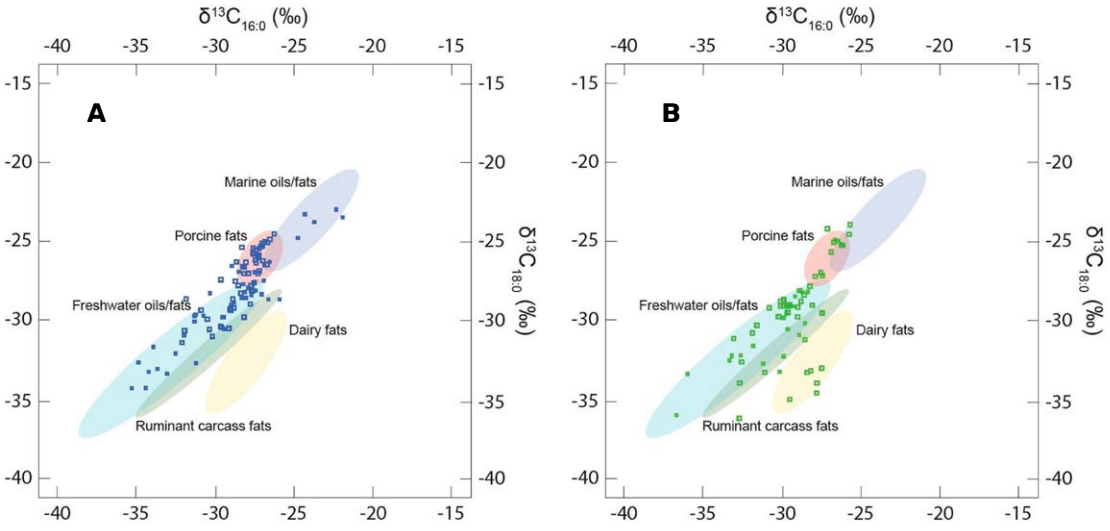
IMPORTANT CONSIDERATIONS DURING ARCHAEOLOGICAL FIELDWORK

Sampe collection

- **Best storage method after excavation:** unwashed shard/object → foil wrap → (open/vented) plastic bag (→ refrigerator if possible).
- **Also good:** unwashed shard → short-term (open/vented) plastic bag → within a few months (covered, breathable storage box).
- Avoid contacting pottery with food and greasy hands, do not eat or spray sunscreen, etc., in the excavation area – contamination risk!
- Handle pottery with bare hands as little as possible – contamination risk!
- Do not wash the pottery shard – clean lightly with a soft brush if necessary.

Preferred samples

- Found in a closed and/or well-dated context, to avoid taking multiple samples from the same vessel.
- Selection of analysis objects in collaboration with a specialist in the field (e.g. ceramics specialist).
- The most suitable for analysis are rim and neck fragments.
- Identify ORA interest early to ensure proper sample preservation, storage, and transport to the laboratory, preferably in collaboration with an ORA expert, to avoid contamination (e.g. taking the sample before numbering).



Organic residue analyses of food crusts and clay matrix of pottery allow us to elucidate past food cultures. For example, the analysis of stable isotopes of fatty acidss in Baltic combed ware shows that the pots contained freshwater fish and pork, with lesser amounts of ruminant and marine fish and mammal meat (A). In corded ware culture pottery, milk becomes visible for the first time (B). Graph: Oras et al. *2023.*

IMPORTANT OBSERVATIONS FOR INDOOR WORK

How to clean, package, and curate ceramics?

- Prefer dry cleaning: e.g. clean the dried shard lightly with a brush – do not wash!
- If there is preserved so-called limescale, do not scrape or remove it (important research material for protein analysis).
- Avoid long-term packaging in plastic bags (risk of plastic contamination!);
- Avoid storage in humid conditions – mould as contamination and the degradation of fats by fungi/bacteria.
- Dry and dark (preferably cold) is almost always right!
- Minimal numbering in a limited area (numbering paint as chemical contamination).
- Do not number the foodcrust layer!
- Handle with (nitrile) gloves and MINIMALLY.
- Avoid creamy or other cosmetic hands!
- If possible, avoid gluing together.

What to pay attention to when taking a sample from ceramics?

- The minimum sample size is 1 g of ceramic powder and 20 mg of charred layer (5–10 mg of tar/pitch), which is collected from an area of about 2 cm² in the case of pottery.
- The minimum size of a pottery shard should therefore be about 5–6 cm².
- ORA analyses can be performed on both the charred foodcrust and ceramic powder, including shards without a foodcrust layer.
- The sample is taken from the inner surface; usually the outer surface and the vessel profile are not damaged.
- Prefer shards with clearly distinuishable features (e.g. rim or neck parts) to avoid taking multiple samples from the same vessel.
- The variability of biomolecules is very different depending on the environment, age, analysis methods, etc., so it is always wise to start with pilot studies of about 3–5 samples per site.

Sampling of pottery sherds for organic residue analysis and a pottery sherd from which the sample was taken.

References

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See also: www.archemy.ee

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