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Ancient dental calculus sampling procedure for optical microscopic analysis

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Dulce Neves[1,2], Emanuela Cristiani[3], António Faustino Carvalho[4], Ana Maria Silva[1,5,6]

[1]University of Coimbra, Research Centre for Anthropology and Health, Department of Life Sciences, Calçada Martim de Freitas, 3000-456 Coimbra, Portugal;
[2]Sapienza University of Rome, Department of History, Anthropology, Religion, and Performing Arts, Piazzale Aldo Moro, 00185 Rome, Italy;
[3]DANTE – Diet and Ancient Technology Laboratory, Department of Oral and Maxillo-Facial Sciences,Sapienza Università di Roma, Roma, Italy;
[4]CEAACP - Centro de Estudos de Arqueologia, Artes e Ciências do Património, University of Algarve, FCHS, Campus de Gambelas, 8000-117, Faro, Portugal;
[5]UNIARQ – University of Lisbon, Portugal;
[6]University of Coimbra, Centre for Functional Ecology, Department of Life Sciences, Calçada Martim de Freitas, 3000-456 Coimbra, Portugal


Dulce Neves

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Abstract

This protocol describes how to sample dental calculus from individual teeth for optical microscopy analysis. The primary use-case is for the analysis of dental micro-remains embedded in the matrix of the dental calculus (e.g. starches, phytoliths, pollens, fungi, fibers, etc.), though it can also be used for biomolecular analysis (DNA and proteomics).

Guidelines

A clean sterile sampling environment is a vital factor to reduce contamination.

Gloves should be worn during the whole sampling procedure.

Materials

- Powder-free nitrile gloves
- Aluminum foil
- Plastic wrap
- Alcohol
- Paper towels
- Sterile disposable blades
- Centrifuge tubes (1.5 or 2 ml)
- Centrifuge tube storage and transport box
- Precision scale
- Vernier caliper
- Magnifying lens (tube/bag labeling)
- Sharpie
- Camera and scale
- Metadata sheet (including Sampling ID; Collection ID; Burial/Tooth ID; Tooth FDI Code; Surface; Pathologies; Other Notes)

Safety warnings

Be careful when handling the disposable blade.

Sampling preparation and dental calculus collection

1 Clean the working table surface using alcohol and paper towels, and use powder-free nitrile gloves throughout the whole steps

2 Make sure to sterilize all utensils used before starting the sample collection and between sampling each tooth. Use alcohol and the paper towels

3 Cover the surface with plastic wrap

4 Label the centrifuge tube ready for sampling

5 Fill in the metadata sheet with all the information and the corresponding tubes IDs. Record the dental pathologies (Hillson, 2001), dental wear (Smith, 1984) and describe the deposit of dental calculus accordingly to its type and size (Buikstra and Ubelaker, 1994)

Note

For tooth numbering, use the FDI system.

CITATION

Simon Hillson (2001). Recording dental caries in archaeological human remains. Int. J. Osteoarchaeol., 11: 249-289.
LINK
https://doi.org/10.1002/oa.538

CITATION

B. Holly Smith (1984). Patterns of molar wear in hunter–gatherers and agriculturalists. Am. J. Phys. Anthropol., 63: 39-56.
LINK
https://doi.org/10.1002/ajpa.1330630107

CITATION

Jane E. Buikstra and Douglas H. Ubelaker (1994). Standards for Data Collection from Human Skeletal Remains: Proceedings of a Seminar at the Field Museum of Natural History organized by Jonathan Haas.
LINK
ISBN 1-56349-075-7

6 Measure the dental calculus deposits using the Vernier caliper

7 Photograph the tooth surfaces before collecting the dental calculus deposit

8 Display aluminum foil on the working table and carefully collect the dental calculus deposit using a sterile disposable blade and under the magnifying lens

Note

Be careful not to scratch the enamel/tooth surface with the tip of the disposable blade.

9 Put the sample in the labelled centrifuge tube

10 Remove and discard the piece of foil

11 Weight the deposit using a precision scale

12 Take new photos of the tooth after the collection of the dental calculus deposit

Control samples

13 Take control samples of the working table surface (and other relevant surfaces) and maxillary bone (if present) to cross-out possible contamination

Citations

Step 5

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