

Best Practice Recommendation for Skeletal Preparation and Sampling in Forensic Anthropology

*Forensic Anthropology Subcommittee
Medicine Scientific Area Committee
Organization of Scientific Area Committees (OSAC) for Forensic Science*





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Prepared by
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Foreword

This best practice recommendation was developed to provide guidance to practitioners for the sampling and preparation of skeletal remains for forensic analyses and curation.

In order to make skeletal material and features more accessible for forensic anthropological analyses, and to procure material that may have additional investigative value, it is sometimes necessary to sample and/or prepare skeletal material or other tissues associated with skeletal material. The condition of the remains upon arrival at the forensic anthropology laboratory and throughout the process of preparation and sampling shall be documented. Any alterations caused by the process of sampling and preparation shall also be documented. Skeletal preparation and sampling should be done in a manner that limits or prevents contamination, unnecessary destruction, or adverse alteration of the remains.

The initial draft of this document was developed by the Anthropology subcommittee of the Organization of Scientific Area Committees (OSAC) using the document initially published by the Scientific Working Group of Forensic Anthropology (SWGANTH) and recognizing skeletal sampling and preparation of skeletal remains as an important part of the investigation of human remains. All hyperlinks and web addresses shown in this document are current as of the publication date of this document.

Keywords: *forensic anthropology; skeleton; sampling; maceration*

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1 Scope

This best practice recommendation sets forth methods and guidance for sampling and preparing skeletal remains for examination and curation. Skeletal preparation and sampling shall be done in a manner that limits or prevents contamination, unnecessary destruction, or adverse alteration of the remains.

2 Normative References

There are no normative reference documents. Annex A, Bibliography, contains informative references.

3 Terms and Definitions

For purposes of this document, the following definitions apply.

3.1

forensic anthropology laboratory

Any facility used in the analysis and/or testing of human skeletal remains of medicolegal significance.

3.2

macerate

The removal of soft tissue by soaking in a liquid.

3.3

skeletal preparation (processing)

The removal of tissue from skeletal remains through various methods.

3.4

skeletal reconstruction

The reassociation of bone and tooth fragments that originated from the same skeletal portion.

4 Requirements

4.1 General

In order to make skeletal remains and features more accessible for forensic anthropological analyses, and in order to procure material that may have additional investigative value, it is sometimes necessary to sample and/or prepare skeletal remains or other tissues associated with skeletal remains. The condition of the remains upon arrival at the forensic anthropology laboratory and throughout the process of preparation and sampling shall be documented. Any alterations caused by the process of sampling and preparation shall also be documented.

Practitioners should implement this best practice recommendation to the fullest extent as applicable, practical, and appropriate.

4.2 Procedure

4.2.1 General Recommendations

All human remains shall be handled with appropriate personal protective equipment to ensure safety of the practitioner and limit contamination of the evidence.

Photographs shall be taken prior to any sampling or preparation of remains. All artifacts caused by sampling or preparation of remains shall be documented.

All tools used in preparation and sampling shall be documented.

All applicable data collection procedures (e.g. visual examination, metric analyses), as well as photographic documentation shall be completed before a skeletal element undergoes sampling.

4.2.2 Sampling

Sampling of soft tissue and skeletal elements may be required for other analyses such as DNA, histological examination, SEM/EDS, etc. Sampling shall be conducted with the knowledge and permission of the relevant jurisdictional authority and with a specific objective.

Soft tissue sampling should be conducted prior to skeletal preparation.

Sampling of skeletal elements for DNA analysis shall employ techniques and equipment that help reduce and control contamination, including the use of blades or saws that are new and/or have been treated with bleach and/or UV light. Consultation with DNA laboratories should occur prior to sampling, and ideally, entire bones are submitted to a DNA laboratory to control contamination.

4.2.3 Skeletal Preparation

Radiographs, when available, shall be taken of remains prior to skeletal preparation to detect or visualize objects such as foreign material, sesamoid bones, and secondary ossification centers.

Coordination with relevant jurisdictional authority regarding the disposition of extraneous soft tissue shall be done prior to processing.

As much adhering soft tissue as possible should be removed without the use of tools. If tools are required in the removal of soft tissue, those made from material which will minimize alteration, such as wood or plastic, are preferred, although it is recognized that tools such as scissors or scalpels may be necessary.

There are three general approaches (mechanical, chemical, and entomological) in skeletal preparation. The use of various methods and techniques within these methods is acknowledged and accepted. Decisions regarding preparation should include consideration of the types of analyses being conducted and if long-term curation is a goal.

Care shall be taken to allow discovery of additional evidence (e.g., entomological, projectile) during preparation. Any additional evidence shall be documented and handled in accordance with applicable procedures.

Any procedure used to macerate the soft tissue is acceptable as long as it does NOT:

- Alter the dimensions of the bone/tooth
- Deteriorate the surfaces of the bone/tooth
- Introduce processing artifacts (e.g. cuts, cracking)
- Change the structure of the bone/tooth
- Render the bone/tooth unsafe or unstable for handling
- Render the bone/tooth unfit for other analyses (e.g., DNA analysis)
- Create the opportunity for commingling of remains
- Interfere with the chain of custody or security of the evidence

Upon completion of skeletal preparation, skeletal elements may be labeled, as appropriate.

4.3 Considerations

In the event that remains require reconstruction, the process and materials used shall be documented. Any reconstruction methods or materials used should be reversible.

The following practices are considered unacceptable and shall be avoided when preparing and sampling skeletal remains:

- The use of chemicals that damage or destroy bone, teeth, or DNA, except for curation purposes

- Excessive soaking of skeletal elements and excessive heat that can damage or destroy bone, teeth, and DNA
- Unnecessary alteration or destruction of skeletal elements
- Unnecessary sampling of skeletal elements useful in identifying the biological profile or the investigation of the cause and manner of death (e.g., restored teeth, areas of trauma, age indicators)
- Unnecessary consumption of complete skeletal elements or complete transverse sectioning of skeletal elements
- Unnecessary reconstruction of skeletal elements

4.4 Reporting

Reports or other means of communication accompanying the analyses of skeletal elements that have undergone preparation or sampling shall include documentation of any damage or destruction to these elements during the preparation or sampling process. Descriptions of the methods used for sampling and preparations should be included in the case documentation.

Annex A (informative)

Bibliography

- 1] Arismendi JL, Baker LE, Matteson KJ. 2004. Effects of processing techniques on the forensic DNA analysis of human skeletal remains. *Journal of Forensic Sciences*, vol. 49, no. 5, pp 930-934.
- 2] Hangay G, Dingley M. 1985. *Biological Museum Methods*. Academic Press, Cambridge, MA.
- 3] Lee EJ, Luedtke JG, Allison JL, Arber CE, Merriwether DA, Steadman DW. 2010. The effects of different maceration techniques on nuclear DNA amplification using human bone. *Journal of Forensic Sciences*, vol. 55, no. 4, pp. 1032-8.
- 4] Rennick SL, Fenton TW, Foran DR. 2005. The Effects of Skeletal Preparation Techniques on DNA from Human and Non-Human Bone. *Journal of Forensic Sciences*, vol. 50, no. 5, pp. 1-5.
- 5] Steadman DW, DiAntonio LL, Wilson JJ, Sheridan KE, Tammariello SP. 2006. The effects of chemical and heat maceration techniques on the recovery of nuclear and mitochondrial DNA from bone. *Journal of Forensic Sciences*, vol. 51, no. 1, pp. 11-17.