



## Physical Anthropology Section - 2013

### H70 The Use of Bone Histomorphology at the Central Identification Laboratory to Remove Nonhuman Remains From CIL Accessions

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After attending this presentation, attendees will understand how histomorphology is used to identify non-human osseous fragments at the Central Identification Laboratory (CIL) at the Joint POW/ MIA Accounting Command (JPAC) and how the techniques used at the CIL could easily be employed into a variety of analytical laboratories that deal with fragmentary osseous material.

This presentation will impact the forensic science community by providing a methodology for the accurate and rapid identification of non-human osseous fragments within any size laboratory.

The CIL has consistently focused on the use of various types of validated methods for the assessment of osseous remains. This includes the use of techniques such as metric analysis, chest radiographic comparison, and various types of DNA testing for the purposes of aiding in identification. Since 2006, the CIL has also incorporated histological analysis for the assessment of possible osseous remains as part of its analytic toolkit.

The CIL has nearly 1,000 accessions that contain biological material housed in its laboratories at any particular time. While turnover is high, the speed at which fragmentary cases are resolved is a bit slower than that of the intact remains. Some of these accessions contain highly fragmentary remains that have been excavated from crash sites. There are many cases, however, that are small fragments of bone with little to no provenience and little to no other loss association information. Histological analysis has helped immensely to cull the non-human/non-osseous materials in these highly fragmentary or information-scarce samples.

The utilization of histological and histomorphometric techniques has significantly reduced the number of non-human osseous remains that are part of accessions at the JPAC-CIL. Since the inception of the Standard Operating Procedure (SOP) for histological analysis, the CIL has been able to efficiently remove non-human remains from an enormous forensic caseload by assessing the histomorphometric features of the often fragmentary remains.

For example, between 2007 and 2012, 112 of 269 samples tested (approximately 42%) were able to be removed from the CIL's active accession lists as they had the characteristic hallmarks of non-human bone. The removal of this large proportion of remains from active accessions using a relatively rapid type of assessment has made a significant impact on the overall number of cases that are able to be resolved as definitively non-human or non-osseous, as well as remove material that has no forensic value for the identification of the individuals the CIL is charged with identifying.

The methodology for standard histologic analysis at the CIL utilizes three steps: embedding, sectioning, and analysis. First, basic epoxy embedding techniques are used to stabilize the fragment for thin sectioning. Next, using a thin-sectioning saw capable of making bone sections approximately 0.8mm thick, the specimen is cut transverse to its longitudinal axis. Finally, the thin section is attached to a glass slide, viewed under a standard light microscope at 50x magnification, and compared to our SOP decision matrix.

The current histomorphology SOP provides analysts with an avenue to efficiently rule out remains as human with a simple histological analysis. The analyst can nominate fragments of bone for histological analysis in much the same manner as they would nominate specimen for DNA analysis. The remains are then assessed by an analyst competency-certified in histological techniques. The current SOP allows for the following analytical conclusions: Match to Non-human, Inconclusive, or Non-Osseous Identification. A visual decision matrix is associated with each category and specific guidelines regarding what constitutes a match to any of the three categories is provided. The triad of categories ensures that only remains that are deemed to be conclusively non-human or non-osseous are removed from accessions. If any fragment cannot conclusively be deemed non-human or non-osseous, the remains are not removed from accession and are often sent for DNA analysis to include 12S species testing.

This method of identification of non-human and non-osseous remains can easily be incorporated into any size laboratory that deals with fragmentary osseous materials. The equipment necessary for this type of analysis is relatively inexpensive and the methodology for conducting this type of histological testing is not highly complicated.

**Physical Anthropology, Histology, Human/Non-Human**