Forensic Anthropology in the Era of Molecular Databasing

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LABORATORY OF MOLECULAR IDENTIFICATION

For information or assistance, please call (800) 279-1339
Beyond providing investigators with information regarding their case,

What is the value of forensic anthropology within the context of molecular analyses and databases.........

For information or assistance, please call (800) 279-1339
Potential Matches

Anthropological information provided to the investigative agency may yield potential match candidates.

Missing persons submissions help to populate the database even if they are excluded as the match for the case in question!

For information or assistance, please call (800) 279-1339
Time and Money…..

Elimination of non-forensic cases

- Animal
- Historical/Archaeological

LFA, 2008: 11 cases

These are cases which no longer:

- contribute to the molecular backlog
- consume investigators time, effort, and expense

For information or assistance, please call (800) 279-1339
Rapid identifications (given appropriate antemortem records)

- Dental
- Radiographic
- Medical appliances / surgical history

LFA, 2008: 8 cases

Again, these are cases no longer in the molecular backlog (meaning your case is processed sooner......)

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Anthropological or dental identifications allow remains to be returned to a waiting family as quickly as possible!

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Improved Database Searches

- Use of anthropological data to help DNA analysts filter possible database matches
- Next generation of CODIS will include sections for metadata, including anthropological data and investigative information (primarily at the LDIS level)

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Supporting DNA Matches

Anthropological and/or dental identifications to confirm weak molecular associations

Due to:
- degraded samples
- Limited reference samples
- Reference samples from distant relatives

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Anthropological Exclusions:

Allow agencies (missing persons and unidentified remains) to refocus their investigations to uncover potential matches.

Excluded potential matches still have value – Those missing persons samples are now in the database!

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Exclusions, cont.

Reduces pressure on the molecular laboratories to expedite cases with ‘presumptive matches’

Pressure from:
• Family of the missing person
• Submitting agencies
• Molecular analysts themselves

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Identifications
Identifications

The ultimate goal! Investigations can fully begin once the identity of the victim has been established.

Skeletal Identifications:

- Dental
- Skeletal Radiographic ID (X-ray, CT, MRI)
- Surgical appliances & history
- DNA

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Dental identifications are possible in cases without restorative dental work or even without teeth!

(given antemortem radiographs with sufficient detail)
Dental Radiographs

Digital dental radiographs for all cases at the Laboratory of Forensic Anthropology

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Orthopedic Surgeries

Pre & post surgical radiographs
Serial numbers on major appliances
  - May be recorded in surgeons notes
  - May be maintained in manufactures database

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Radiographic Identification

Comparisons based on:
• Individual morphology
• Antemortem trauma
• Antemortem pathology
• Surgical appliances
Remember, not all imaging is flat plate X-ray!

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Case Studies
Angelina County, TX

Anthropological Identification

In lieu of a Molecular ID

For information or assistance, please call (800) 279-1339
Remains discovered October 14, 2005 in Angelina County (east Texas)

Received at the Laboratory of Forensic Anthropology on October 17th from the Medical Examiner

Nearly skeletonized

Presumed to be the remains of Amos Harmon, LKA September 9, 2005
Amos Harmon

Male, African American, 73 yrs old, 6’2”
Last seen 9/23/2005
Evacuating Hurricane Rita
Driving north, separated from his daughter in the middle of the night
Vehicle discovered empty in Angelina County

For information or assistance, please call (800) 279-1339
Anthropological Findings

- Sex: male
- Ancestry: African (“African American”, “black”, or other cultural identifier)
- Skeletal Age: 60+
- Stature: 69-75 inches
- Partial sacralization of L5-S1
- Antemortem fracture of right rib #8
- Generalized advanced osteoarthritis
Anthropological Findings, cont.

- Biological profile consistent with Amos Harmon
- Complete denture – no identification (as required) and no dental records
- Initial inability to positively identify
- Recommend sampling for the Missing Persons DNA Database and the collection of family reference samples

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Amos Harmon Identification

Family reported – “no X-rays”

Further requests revealed CT studies of skull, pelvis, and lumbar spine

Positive radiographic ID of Amos Harmon on 10/31/2005, remains returned to family immediately

Receipt of remains to Identification: 14 days

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Denture not marked, no dental records available.
Bay City, TX

Unidentified Remains

Possible/Presumed Identification

Trauma Analysis

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Bay City, TX

Christopher Montalvo, 32, reported missing by his mother in January, 2002.

Skeletal remains recovered Feb. 19, 2004, in a drainage canal

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Case Background

- Remains transported to the Laboratory of Forensic Anthropology by the investigating agency.
- Possible identification of the remains proposed by the investigating agency.
- No antemortem dental records, medical records, or radiographs were available for comparison.

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Anthropological Findings

Biological Profile
Sex: Male
Ancestry:
Mestizo (identified as “Mexican”, “Hispanic”, “Latino”, or other cultural descriptor)
Skeletal Age: 30-40 years
Stature and Physique:
64-67 inches, average to good muscular development

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Anthropological Findings

Postmortem Interval:

6 months – 2 years based on the condition of remains and the known characteristics of the environment

Antemortem trauma / unique identifiers:

None noted (partial remains)
Anthropological Findings

Perimortem Trauma

Two cranial gunshot injuries

Entry: right parietal
Exit: left temporal/sphenoid
Trajectory: back to front, right to left, slightly downward

Entry: left temporal/sphenoid
Exit: right temporal squamosa
Trajectory: left to right, horizontal

Consistent with a small caliber weapon (likely 22 or 25 cal.)
Projectile Trajectories

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Anthropological Conclusions

1. Biological profile is consistent with the proposed victim
2. No antemortem records - Positive identification to be made using DNA at the DNA Identification Laboratory
3. Cause of Death: Gunshot injury of the cranium
4. Manner of Death: Homicide
Submission to Laboratory for Molecular Identification

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Subsequent match with maternal family reference sample
Suspect arrested and indicted on first degree murder charges

Weapon recovered: .25 caliber handgun

Court testimony by the Laboratory for Molecular Identification regarding the DNA Identification

Court testimony by the Laboratory of Forensic Anthropology regarding the biological profile and the ballistic trauma to the cranium
Case Outcome

Conviction of Suspect

Sentenced to: life in prison for the murder charge, 10 years for tampering with evidence, and revocation of deferred adjudication in a previous offense (aggravated robbery)

Earliest opportunity for parole: 70 years

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Hood County, TX

Unidentified Remains
Inter-agency Identification
A True “Cold Hit”

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Hood County, TX
Remains discovered
December 31, 2004

For information or assistance, please call (800) 279-1339
Remains examined, 2005

- 11-14 yrs old, African ancestry, probable female (age related finding)
- No obvious trauma
- No potential match provided by the submitting agency
- Samples submitted and uploaded to the Missing Person DNA Database
Missing Person

Cory White

11 yrs, last seen in Dallas October, 2002

For information or assistance, please call (800) 279-1339
Missing Person

Family reference samples received by the Laboratory for Molecular Identification in November 2006 from the Dallas Police Department

Proposed match with an unidentified remains case recovered in Lubbock, TX

FRS did not match the proposed remains, BUT ............

For information or assistance, please call (800) 279-1339
Potential CODIS match between Hood County remains and a child missing from Dallas since 2002.

Statistically weak match based on the family reference sample submitted.

Additional family reference samples requested, AND........
Dental Confirmation of DNA Analysis

Antemortem dental records available through Dallas Police Department.

Hood County remains identified as those of Cory White by the forensic odontologist.

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What your forensic anthropologist would like to see........

• Complete remains recovered (if your agency retains a reference sample, please indicate that)
• Copies of investigative reports (MEI, Police, Sheriff, etc.) including scene descriptions
• Copies of scene photographs
• Copy of Medical Examiner’s report

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What your CODIS analyst would like to see......

For skeletal unidentified remains cases

- Intact bone if possible (i.e. intact femur)
- 2 samples (2 bones, bone and unrestored tooth, etc.)
- Copies of investigative reports (MEI, Police, Sheriff, etc.)
- Medical Examiner’s report
- Forensic anthropologist’s report

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Confidentiality

Submitted reports, documents, and photographs are confidential documents and are not released to any agency.

Verbal communication limited to the submitting agency.

Forensic anthropology reports are only issued to:

1. The submitting agency
2. Center for Human Identification’s Laboratory for Molecular Identification with the submitting agency’s sample

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