H80 The Use of Non-Unique Dental Characters and Non-Unique DNA Types to Estimate Probability of Identity

Mark D. Leney, PhD and Bradley J. Adams, PhD, U.S. Army Central Identification Laboratory, HI, 310 Worchester Avenue, Hickam AFB, HI 96853*

This presentation will address issues regarding human identification. In particular, the attendee will learn how to statistically evaluate non-unique characteristics as part of the identificaiton process.

Specifically, dental treatment and mitochondrial DNA will be addressed. Case examples will be provided.

Forensic identifications using unique dental characteristics, such as those seen in most antemortem dental radiographs, generally allow the establishment of the identity of a decedent beyond doubt. Similarly, nuclear DNA profiles generated from recent or well-preserved human remains can also serve to establish identity without the need for extensive supporting evidence; it is generally claimed that the probability of a random match to a STR profile using the 13 CODIS loci is less than one in a trillion (Holt et al 2000).

In casework seeking to identify unaccounted for US military personnel, the Central Identification Laboratory, Hawaii (CILHI) usually encounters putative identifications where the biological remains are too old or degraded to produce reliable STR profiles under currently validated technologies. Also, suitable references for nuclear DNA comparisons may not be available. Regarding dental comparison, the antemortem treatment records associated with many of the CILHI cases lack dental radiographs. For these reasons, the CILHI commonly has to rely on other lines of evidence for comparison with an unidentified set of remains. One source includes antemortem narrative dental treatment records (or odontograms) that are part of an individual's medical history. Another avenue is the comparison of mitochondrial DNA family reference sequences for missing servicemen with evidence sequences obtained from the unidentified remains.

A consistent pattern of extraction and restoration between unidentified dental remains and an antemortem narrative dental record does not establish a positive identity. Similarly, mitochondrial DNA sequence matches cannot be used to establish a positive identification as many individuals within the population at large can share the same mitochondrial DNA type. Nevertheless, the recent publication of population databases for these two types of evidence allows the ready estimation of the probability of the evidence matching an individual at random (Adams 2003; Monson et al, 2002). The mitochondrial DNA evidence and the dental evidence can be considered as independent of each other and, therefore, the respective probability inferences can be combined using the product rule. The resulting random match probability provides an explicit quantification of the certainty with which an identity can be determined on the basis of the combined evidence (i.e., the probability of identity). Examples from casework will be presented to illustrate the utility of this approach in the identification process.

Forensic Odontology, Mitochondrial DNA, CILHI

 ** Presenting Author*