DNA TYPING OF UNIDENTIFIED HUMAN REMAINS

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Routine missing persons' identification conducted with DNA analysis has preferentially used bone and teeth samples. These samples are often the only biological material available for DNA typing. Environmental conditions including heat, water, and soil acidity, and duration of exposure to such conditions impart a greater degree of difficulty to DNA typing of missing persons' samples. Early attempts to type DNA from unidentified remains using standard digest buffer yielded little success with STR analysis. We believed that most of the problem was caused by insufficient purification of the DNA specifically from incomplete removal of calcium in the sample.

Past methodologies cited in literature referenced decalcifying bone prior to DNA extraction and purification. We hypothesized that these procedures could lose DNA which could be used for STR analysis. We proposed using a modified DNA extraction procedure which included (1) increasing EDTA concentrations in the digest buffer to enhance decalcification while also extracting DNA; (2) using a QIAGEN Maxi kit to extract the bone digest solution; and (3) concentrating the bone extract using ultra filtration devices. Our modified bone extraction procedure was tested initially with low quantities of DNA, followed with testing using reference bone, and finally tested using bone and tooth samples from skeletal remains. Results of our research using the modified bone extraction procedure are presented.

The skeletal remains were grouped into three categories: long bones, teeth, and 'other' bones (ribs, cranial bones, mastoid, hip, and pubic). Long bone samples (45 samples) had over 90% STR loci detected. Teeth (10 samples) and other bones (7 samples) yielded 100% and 80% of STR loci detected, respectively. Y chromosome STR typing performed on 25 samples yielded over 90% of the loci detected. Additionally, environmental factors for the skeletal remains were examined. Five categories were used to distinguish the bones and were grouped according to known information about the bones. The categories included: burned, aquatic, surface, buried, and unknown. Information regarding STR analysis from the modified bone extraction when compared to environmental conditions is also presented.