B16 The Effect of Formalin Decontamination on STR Analysis Conducted on Human Remains Submitted for Identification

Deborah K. Haller, BS, Armed Forces DNA Identification Laboratory, 1413 Research Boulevard, Building 101, 2nd Floor, Rockville, MD 20850-3125; Susan W. Jones, PhD, Demris A. Lee, MSFS, Timothy P. McMahon, PhD, and Brion C. Smith, DDS, Armed Forces DNA Identification Laboratory, 1413 Research Boulevard, Rockville, MD 20850; Craig Mallak, MD, Armed Forces Medical Examiner System, 1413 Research Boulevard, Building 102, Rockville, MD 20850*

After attending this presentation, attendees will be familiar with the use of 10% formalin in decontaminating human remains and the effect of the decontamination on Short Tandem Repeat (STR) DNA analysis of bone and tissue specimens.

This presentation will show the forensic community that storage of human remains in 10% formalin for up to 30 days will have little to no effect on the ability to obtain an STR profile.

The mission of the Armed Forces DNA Identification Laboratory (AFDIL) is to assist the Armed Forces Medical Examiner System (AFMES) in identifying members of the armed services using nuclear DNA methods. The recent war in Iraq raised the specter that biological and/or chemical weapons could be used against American troops. A decontamination scheme had to be developed so that DNA testing could be used to identify fallen service men while ensuring the protection of all people having contact with the biologically contaminated remains. One of the methods examined to potentially decontaminate the human remains was storing human remains in 10% formalin for a period of time. 10% formalin is known to kill biological agents such as anthrax. However, it is also known that formalin can have a detrimental affect on the DNA contained within the sample. To determine if it was possible to obtain a Short Tandem Repeat (STR) profile from biological samples that had been stored in 10% formalin, the middle portion of an index finger or the tip of an index finger from medical cadavers were submersed in 10% formalin for 5 days, 7 days, 10 days, 15 days, and 30 days. The samples were then removed from the 10% formalin, the tissue was dissected away and stored at –20 ºC, and 0.9 grams – 2.0 grams of bone was immediately extracted using the AFDIL's organic protocol for extracting DNA from bone samples. Quantitation of the samples determined that approximately 100 nanograms of DNA per microliter was recovered. The samples were amplified using the AmpFlSTR® Profiler Plus™ Amplification and Typing Kit. The amplicons were run on an ABI Prism 377 and analyzed using Genotyper version 2.5. Likewise, the tissue samples were extracted following the AFDIL's organic protocol for extracting DNA from tissue samples. The amount of tissue extracted was approximately 5 mm x 9 mm in size. These samples were done in triplicate with the only difference between the extraction sets being a wash step prior to extraction. One set of extractions was conducted as per the protocol (i.e. no wash step). A second set of extractions was conducted after a portion of the tissue had been washed with sterile distilled water. The third set of extractions was conducted after a portion of the tissue was washed with 150mM glycine. The extracted DNA from the tissue samples was amplified and typed as described above. Full STR profiles were obtained in nine (samples stored for 5 days, seven days, and ten days) of the eleven bones extracted. The sample submerged in formalin for 15 days gave results at all loci except D18S51 and D7. The sample submerged in formalin for 30 days gave results at all loci except D7S820. The profiles obtained matched the "expected profiles" and there were no mutations observed in the samples that had been stored in the formalin. It is possible to obtain nuclear DNA profiles from specimens stored in formalin up to 30 days.

The opinions and assertions expressed herein are solely those of the authors and should not be construed as official or as views of the United States Department of Defense or the United States Department of the Army.

[1]Armed Forces DNA Identification Laboratory

[2]Armed Forces Medical Examiner System

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