B127   The Development of a DNA Extraction Method From Rootless Hair Shafts

Sudhir K. Sinha, PhD*, InnoGenomics Technologies, New Orleans, LA 70148-0001; Andrew Loftus, PhD, Innogenomics Technologies, New Orleans, LA 70148; Ryan Gutierrez, BS, Alvin, TX 77511-4161; Clara E. Krzykwa, BS, InnoGenomics Technologies, New Orleans, LA 70148; Hiromi Brown, PhD, InnoGenomics Technologies, New Orleans, LA 70148

Learning Overview: After attending this presentation, attendees will understand the evaluation of a novel extraction and bead purification kit compared to multiple methods for nuclear DNA extraction from rootless hair shafts, demonstrating the potential for the use of this new technology.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by serving as a key aspect of rootless hair extraction as it can augment traditional means of extraction and help to provide further benefit for a class of evidence that is underutilized in the forensic laboratory.

Reported here is a new magnetic bead DNA extraction system for the extraction from highly degraded biological samples. The magnetic beads used were designed to capture degraded DNA, such as found in a hair shaft from rootless hair. The digestion buffers and binding buffers were optimized for the hair samples.

Forensic crime laboratories receive hair shafts and, in particular, rootless hair shafts as evidentiary samples and process them for DNA evidence as a means of identification of individuals. Oftentimes, nuclear DNA is too scarce and degraded to enable sufficient profile recovery from hair shafts using standard methods. Even with current Short Tandem Repeat (STR) kits available on the market, the ability to obtain meaningful profiles may be limited due to the amount of nuclear DNA available to the laboratory. In most cases, laboratories will potentially try and extract mitochondrial DNA (mtDNA) from the hair shafts as there are hundreds of thousands of copies per cell compared to the nuclear DNA. However, the process of recovering, processing, and analyzing the mtDNA can be labor intensive and time consuming on resources in the forensic laboratory. This presentation presents an extraction kit with specially designed buffers and magnetic beads capable of recovering fragmented and low-level DNA from samples such as rootless hair shafts. This will save time and effort on the part of the labs as it fits into the standard workflows of forensic laboratories and has the capabilities of producing greater DNA quantities and more successful STR profiles for difficult sample types.

The studies show results from rootless hair shafts both washed and unwashed using the InnoXtract™ method as well as a comparison to the EZ1™ automated investigator kit. The InnoXtract™ was capable of recovering 0.0015ng/µL compared to the EZ1™ obtaining 0.0006ng/µL of DNA from extraction. Further tests evaluated the length of the rootless hair and the InnoXtract's™ ability to recover larger amounts of DNA from longer pieces of hair strands compared to a traditional method of extraction giving the potential strength to utilizing the InnoXtract™ kit. Further studies looked at artificially degraded sample recovery, mock sample types, and further testing adhering to the Scientific Working Group on DNA Analysis Methods (SWGDAM) guidelines.

DNA Extraction, Rootless Hair DNA, InnoXtract™