



D72 Effect of Machine Laundering Additives on Human Blood

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After attending this presentation, attendees will know more about the interactions of laundry detergent and human blood.

This presentation will impact the forensic science community by helping investigators who find evidence in a washer determine the additive(s). They will also be better able to determine when to send out samples for DNA profiling, which in turn might save money for their department and provide a quicker turnaround time for labs since they would not have to handle unnecessary samples.

Perpetrators sometimes use household cleaners such as laundry detergents to try to hide or remove evidence at or from crime scenes. The effects of detergents containing active oxygen have been studied in the past but the effects of newer enzyme-based cleaners or green-based cleaners have not yet been examined. This research evaluates the effects of newer laundering additives on the detection and genotyping of DNA from human blood.

Two different treatments with detergent and human blood were evaluated for this study. To simulate the direct application of detergent onto a blood stain, one treatment entailed applying an equal volume (1.0mL) of detergent directly to human blood. A simulation of detergent concentrations encountered during laundering (using the detergent manufacturer's recommended concentrations) was also performed with heavily diluted detergent solutions. Eighteen different additives were tested including: detergents; detergent booster; pods; powder; pre-treatments; dryer sheets; and softeners. DNA was extracted from all samples using a phenol-chloroform protocol and isolated with an ethanol precipitation. A Real Time-Polymersae chain Reaction (RT-PCR) approach (Quantifiler[®]) was used to measure the amount of DNA recovered from each sample, with representative samples found to contain DNA being genotyped.

Initial results indicate that the majority of the additives caused a greater loss of detectable human DNA when diluted rather than when undiluted. Detergents with borax, diethylene glycol, pentetic acid, Diethylene Triamine Pentaacetic Acid (DTPA), and disodium diaminostilbene disulfonate caused the greatest loss of DNA when diluted with water. Previous research has mentioned that active oxygen cleaners interfere with preliminary tests for human blood (such as luminol) but do allow DNA to be reliably genotyped. In these experiments, it was found that active oxygen detergents and/or boosters do significantly reduce quantities of DNA obtained from human blood to the point that DNA profiles may not be obtained after laundering with them. Laundry softener also resulted in a statistically significant reduction in the quantities of DNA obtained from these samples.

Further testing needs to be completed on the individual chemicals that are included in the laundry additives to determine which chemicals have the most effect on degrading the DNA. This research may identify a chemical to be removed from detergents to stop evidence from being destroyed. In addition, if investigators find evidence in a washer and can determine the additive(s), investigators may make a better decision as to when to send out samples for DNA profiling, which may save money for investigative agencies and result in quicker turnaround times for labs resulting from the handling of fewer samples.

Laundry, DNA, Persistence