The Effects of Blood Enhancement Chemicals on Subsequent *Profiler Plus*™ Fluorescent Short Tandem Repeat DNA Analysis of Fresh and Aged Bloody Fingerprints

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Blood enhancement chemicals were evaluated for their sensitivity, their possible interference with the DNA extraction process or the PCR amplification using a fluorescence-based system, and their long term effects on subsequent DNA typing analysis. Seven blood enhancement chemicals [amido black, Crowle' s double staining, 1,8-diaza-9-fluorenone (DFO), Hungarian red, leucomalachite green, luminol, ninhydrin] along with nine non-porous and porous substrates [linoleum, glass, metal, wood (pine painted with white latex paint), clothing (65% polyester, 35% cotton; 85% polyester, 15% cotton; blue denim), paper (Domtar Xerox grade; Scott 2 ply)] were evaluated in this study. Phase 1 of the study defined the sensitivity of detection for the blood enhancement chemicals on the various porous and non-porous surfaces selected. Amido black, Crowle' s double staining and luminol showed a greater sensitivity and revealed highly diluted (1:200) bloody fingerprints. Hungarian red, 1,8-diaza-9-fluorenone (DFO), leucomalachite green, and ninhydrin showed a lower sensitivity. Phase 2 of the study evaluated the effect of the enhancement chemicals on the DNA extraction process itself. The DNA yield from enhanced bloody fingerprints was much lower than those obtained from untreated bloody fingerprints. The blood enhancement procedure using Crowle' s double staining reduced the quantity of DNA recovered from bloody fingerprints by a factor of 2 to 10. Phase 3 of the study determined the effects of the chemicals on the subsequent Profiler Plus™ fluorescent STR DNA analysis of the blood recovered from fresh bloody fingerprints. No adverse effects on the PCR amplification of any of the nine STR systems surveyed (D3S1358, HumvWA, HumFGA, D8S1179, D21S11, D18S51, D5S818, D13S317, D7S820) or the gender determination marker amelogenin was noted. The intensity of the fluorescent signals as well as the size measurement of all alleles remained constant and identical to those of the untreated bloody fingerprints. Phase 4 of the study determined the long term effect of enhancement on the subsequent Profiler Plus™ DNA analysis of fresh and aged bloody fingerprints. Enhancement of the bloody fingerprints was performed immediately after, or 7 days or 14 days following the application of the blood. In addition, enhanced fresh and aged blood fingerprints were left at room temperature for 7, 14, or 54 days before being processed for STR analysis. The long term exposure to the seven blood enhancement agents did not compromise the Profiler Plus™ STR DNA analysis of fresh and aged blood prints. This study indicates that significant evidence can be obtained from fresh or aged bloody fingerprints exposed to enhancement chemicals for short or long periods of time.