WHEN SEQUESTRATION IS GOOD: A LOW-TECH MECHANISM FOR INHIBITION REMOVAL

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The success of forensic DNA typing of difficult samples hinges on the ability to remove inhibitors during the extraction process. With the recent advances in silica-based extraction techniques, forensic laboratories are testing significantly more challenging samples. Dark clothing, leather and soiled items have become typical forensic evidence. However, substrate and environmental inhibitors that co-extract with DNA can negatively affect PCR efficiency culminating in DNA typing results that fall short of being useable. In these types of samples, the eluate recovered from the column is often tinted. It has been shown that the residual tint in the extract correlates with PCR inhibition. The ATF Laboratory has tested an inexpensive mechanism of dye removal using sodium carbonate-treated cellulose during the DNA extraction cell lysis step. This modification can theoretically be applied to any DNA extraction protocol. Using this process, increased RFU values for samples containing various inhibitory substrates including fabric dye, leather and two types of soil, were observed. When a bloodstained black t-shirt from an adjudicated homicide case was extracted using the current validated extraction protocol, the sample exhibited inhibition and DNA typing resulted in complete allelic drop-out. Application of the ATF dye removal protocol to the same clothing sample, resulted in a full DNA profile. These results illustrate the utility of a modified extraction protocol to successfully generate DNA profiles from challenging forensic samples.