FORENSIC VALIDATION OF THE IPREP™ DNA PURIFICATION SYSTEM

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We have performed a rigorous validation of the Invitrogen iPrep™ Purification Instrument for use in forensic applications, following SWGDAM standards of biological sample handling and experimental procedures. The iPrep™ protocol is fully automated (thus significantly reducing sample handling) and substantially more rapid than standard manual methods. For purposes of comparison, we employed a 5% chelex DNA extraction protocol as the current standard DNA extraction method. In this study, we aimed to test the instrument in a wide variety of forensically applicable settings. Thus, we compared DNA extracted by the chelex method and the iPrep™ instrument from a variety of biological samples, including buccal swabs, whole blood, saliva, skin, semen, vaginal swabs, as well as simulated trace evidence samples such as hair, serial dilutions of blood, used drinking vessels, touched items, used cigarette butts, and dried blood on a variety of textiles and other substrates commonly encountered in crime scenes. Lastly, we employed the iPrep™ to aid in the selective separation and extraction of DNA from vaginal swabs mixed with semen. For our comparative analyses, we used the industry standard Quantifiler® and Quantifiler-Y® to determine quantity of DNA yield and Identifiler® and Yfiler® to determine suitability of DNA preparations for STR profiling. We found that for a majority of scenarios applicable to forensic extraction of DNA, the iPrep™ instrument consistently performs as well or better than the standard 5% chelex DNA extraction protocol in terms of yielding DNA of sufficient quantity and quality for forensic STR analysis. In one example, we found that the iPrep was consistently able to extract DNA and provide for complete STR profiling from a drop of 1:1000 diluted human blood, while a 5% chelex extraction could not. In summary, we conclude that the iPrep™ successfully automates the DNA extraction procedure, reducing hands on time and increasing reproducibility while performing equivalently or better than the currently used standard Chelex method.