SIDE-BY-SIDE EXTRACTION STUDY BETWEEN THE MAXWELL® 16 BY PROMEGA AND THE EZ1™ BY QIAGEN

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Each year an increasing DNA backlog has placed increasing demand and pressure on the DNA section spurring us to find ways to work cases more efficiently. The availability of several automation platforms tailored for extraction has provided laboratories an opportunity to increase extraction efficiency. Utilizing an organic extraction protocol followed by microcon filtration is both time consuming and labor intensive, necessitating multiple sample manipulations by the forensic scientist and also exposing them to harmful organic solvents. Implementing an automated platform for extraction of samples reduces "hands on" time by the analyst and also decreases their exposure to harmful chemicals. To determine which automated platform would best suit our forensic casework needs, a side-by-side study was conducted between the EZ1™ by Qiagen and the Maxwell® 16 by Promega. Both automated platforms were optimized for maximum DNA recovery and identical sample sets were extracted with both systems. The experimental design goal was to obtain an unbiased data set which could be used to assess the extraction efficiency of each automated platform. The Maxwell® 16 was configured in LEV (low elution volume) mode using the DNA IQ™ Casework Sample Kit and trace sample protocol. The Qiagen EZ1™ Advanced utilized the DNA Investigator Kit and the "tip dance" protocol.

Samples extracted during the side-by-side study included the following: 10ul blood stains (one female source and one male source sample); 0.5ul bloodstains stored at room temperature for 12 years.; 10ul bloodstains exposed to UV light at varying time intervals (4, 20, 24 and 44 hrs.); and trace forensic type samples. Trace samples were collected by swabbing a smear on a glass surface (by rubbing bare forearm on glass), inner surface of a previously worn nitrile glove, steering wheel, gun grips, soda can and shirt collar. All samples were eluted in 50µl TE^{-4} buffer and quantified in duplicate using the Applied Biosystems Quantifiler® Human assay. Samples were amplified using Applied Biosystems Profiler Plus® Amplification Kit.

Quantitation results of the samples demonstrated the Maxwell® 16 recovered more DNA than the EZ1™ in the 12 year old 0.5ul bloodstain, the UV degraded samples and all but one of the trace samples (smear from glass). From the majority of these samples, The Maxwell® 16 yielded approximately 2X the amount of DNA than the EZ1™, the exception being the 12year old 0.5ul bloodstain at room temperature with the Maxwell® 16 recovering 0.298ng/ul versus 0.248ng/ul for the EZ1™. In addition to the smear from the glass, the EZ1™ recovered more DNA than the Maxwell® 16 from the 10ul bloodstains. Both automated platforms recovered sufficient amounts of DNA for amplification from all but one sample type (swab from smear on glass).

Effective recovery of amplifiable amounts of DNA from low level and degraded samples is critical to forensic casework. Comparisons of quantitation data from identical sample pairs extracted using either the Maxwell® 16 or the EZ1™ revealed the Maxwell® 16 and associated extraction chemistry consistently yielded greater amounts of DNA than the EZ1™ and associated extraction chemistry. Samples utilized in this study were exposed to conditions intended to degrade DNA or were low-level samples representative of those encountered in forensic casework. The Maxwell® 16 successfully extracted DNA from virtually all of these challenging samples, indicating acceptable use with a variety of forensic non-semen casework samples. For these reasons, the Maxwell® 16 was selected over the EZ1™ for conducting an internal validation and implementing the Maxwell® 16 for the extraction of non-semen casework samples.