DNA PROFILING OF TOUCH EVIDENCE – DNA IQ™ ON MAXWELL 16® INSTRUMENT, IDENTIFILER PLUS PCR AMPLIFICATION AND 3500XL GENETIC ANALYZER

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Law enforcement agencies are increasingly seeing the use of DNA profiling to identify possible suspect(s) in minor and volume crimes such as house break-ins. However, obtaining good quality DNA profiles from touch/contact surfaces is challenging as the number of cells present is much less than that found in biological fluid stains. This problem is exacerbated by the absence of nuclear DNA in shed keratinised skin cells. Clearly, an effective means of DNA extraction is needed for processing such 'contact' DNA samples.

Prior to 2013, the Singapore DNA Profiling Laboratory primarily used a SDS-proteinase phenol/chloroform-based 'Organic' approach to extract DNA from contact swabs, followed by Short Tandem Repeat (STR) amplification and separation using ABI's Identifiler Amplification Kit and 3100 genetic analyzer, respectively. Although this 'gold' standard DNA extraction method produces high DNA purity and yield, it suffers from a lengthy processing time and is heavily reliant on manual labour. With increasing volume of exhibit submissions, a more efficient approach was clearly needed. The solution came in the form of a semi-automated DNA extraction platform: Promega DNA IQ™ technology with Maxwell 16® instrument in combination with a more robust inhibitor-tolerant STR amplification kit (ABI Identifiler Plus), and a higher-throughput genetic analyzer (ABI 3500xl).

Our studies have shown that DNA profiles obtained from this Maxwell approach produced a comparable number of alleles and loci to the Organic approach, but in less than half the time required for the Organic approach. Tube transfers and human involvement are also reduced, along with the risks of sample cross-contamination or mixup. The laboratory has been using the Maxwell approach since 2013 for DNA profiling of casework contact swab samples. The impact of this transition (Organic to Maxwell) on the number of reportable profiles was also monitored. The Maxwell approach was found to produce approximately 6% more reportable profiles as compared to its Organic counterpart (n > 500 casework samples).

In summary, the quality and reportability of the DNA profiles from the Maxwell approach is comparable to that obtained from the Organic approach. Further, the former approach also offers the advantage of being a rapid and semi-automated method. Taken together, the Maxwell approach is an excellent alternative to the Organic approach for DNA profiling of contact swabs.