A41 Comparison of Automated DNA Extraction Instruments for DNA Extraction From Various Forensic Samples

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After attending this presentation, attendees will understand that AutoMate Express, developed lately by Applied Biosystems, gives sufficient quantity of DNA for STR typing or mitochondrial DNA analysis from various forensic samples, and understand its performance in comparison to EZ1 Advanced XL, Maxwell 16 and QIAcube.

This presentation will impact the forensic science community by providing basic data about automated DNA extraction using commercially available instruments.

Automated DNA extraction instruments were compared for forensic purpose. AutoMate Express was used with "PrepFiler Express Forensic DNA Extraction kit" (Applied Biosystems), EZ1 Advanced XL with "EZ- 1 DNA Investigator kit" (QIAgen), Maxwell 16 with "DNA IQ Casework Sample kit for Maxwell 16," and "Tissue and Hair Extraction kit" (Promega), and QIAcube with "QIAamp DNA Investigator kit" (QIAgen). DNA was extracted from fresh bloodstains (3 µl of whole blood and 3 µl of 10-time diluted blood) on cotton and denim, three 3-mm punches of FTA cards containing buccal cells collected by EasiCollect (GE Healthcare), aged bloodstains, hair roots and hair shafts. For each category of samples except for the aged bloodstains, five samples were prepared from three persons to give 15 samples in total. DNA was eluted in 50 µl of water by EZ1 Advanced XL and QIAcube, in 50 µl of TE by AutoMate Express, and in 50 µl of Elution buffer by Maxwell 16. The genomic and/or mitochondrial DNA was quantified by real-time PCR assay using D17Z1 locus and/or hyper variable region 1 (HV1), respectively. The extracted DNA was used to amplify 15 STR loci of Identifiler kit (Applied Biosystems) and/or the HV1.

The highest DNA concentration was obtained by AutoMate Express from the bloodstains and the diluted bloodstains on cotton and denim, and the hair shafts. Concerning the FTA cards and the hair roots, similar concentration was obtained by AutoMate Express, EZ1 Advanced XL and

QIAcube, but the DNA concentration obtained by Maxwell 16 was lower. Full STR profiles were obtained by all the instruments from the bloodstains on cotton and denim, the FTA cards and the hair roots. Out of the 15 diluted bloodstains, full STR profiles were obtained from 14, 11, 0, and 8 samples on cotton, and from 15, 14, 6, and 14 samples on denim for AutoMate Express, EZ1 Advanced XL, Maxwell 16, and QIAcube, respectively. The denim extract obtained by AutoMate Express and Maxwell 16 slightly inhibited the PCR amplification of Identifiler kit, when 20 µl of the extract was concentrated and amplified with 1ng of 9947A DNA. However, nine µl of the denim extract obtained by both the instruments did no inhibit the PCR.

When the hair root DNA was amplified in the A region (443bp) and the C region (231bp) in the HV1, the similar thickness of bands on agarose gel were obtained in both the regions by all the instruments. On the other hand, when the hair shaft DNA was amplified, the bands of the A region were weaker than those of the C region in the use of all the instruments especially AutoMate Express. This result raises a possibility that AutoMate Express tends to recover small fragment of DNA preferentially from hair shafts compared to the other instruments.

In conclusion, there is a possibility that AutoMate Express can extract DNA from various forensic samples as other conventional instruments do. Further study is needed to validate this instrument to know its performance, feature, and usefulness.

Automated DNA Extraction Instrument, STR, Mitochondrial DNA

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