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Generation of STR Profile From Touched Glass Surface

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Abstract: Crime scene investigation involves analysis of surfaces for criminal traces. Touch DNA analysis now one of the essential tests performed for criminal identification. The aim of this study was to investigate the possibility of generation STR profile from touched glass surface. Window glass surface was touched with clean hand for 15 seconds then a double buccal swab methods used to collect possible skin cells. DNA extraction was performed using Chelex method then quantified by real time PCR. Quantified DNA amplified by STR kit (Minifiler) then analyzed using ABI 3130XL genetic analyzer. The results showed that the extracted DNA was quantified and analyzed successfully to give intact STR profile. These results indicated the capability of generating full DNA STR profile from glass surface using Chelex method.

Key words: Touch DNA, Glass, STR, Minifiler, forensic

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Introduction

Touch DNA is a process that including transfer of DNA from skin to physical objects via contact (1). The process of transfer called shedding (2). Each day human shed about 400,000 skin cells (3). The amount of touch DNA eluted variable but usually less than 300ng (4). There are many factors affect the amount of DNA extracted from different surfaces; gender (5), inter- and inter individual shedding capability (6), age (7), handling time (8), nature of surface (9), collection technique (10) and extraction DNA method (11). Glass is usually part of crime scenes, so its investigation is so important for criminal identification. Many DNA extraction methods were used for touch surfaces such as Chelex (12) and organic (13). Chelex is simple and cheap method (14) usually used for DNA extraction from forensic samples. The aim of this study was to investigate the possibility of generation full DNA STR profile from glass surface using Chelex method.

Materials and methods

Surface touching

Window glass was used for touching. The glass cleaned with commercial bleach (10%) then by alcohol (70%) then left to dry. The touching volunteer did not wash his hand for two hours before touching. Touching glass extended for 15 seconds (6). Twelve touch DNA experiments were done.

DNA extraction

Standard Chelex method (14) was used for DNA extraction from touched surfaces, buccal swab and gloves. DNA purity was estimated by using Nanodrop spectrophotometer.

DNA Quantification

Quantifiler (Applied Biosystem) real time PCR kit was performed for DNA quantification according to manufacture instructions (15).

STR profiling

Minifiler kit (Applied Biosystem) was used for amplification of STR loci according to manufacture instructions. Genetic analyzer 3130XL (Applied Biosystem) was used for STR profiling. The run parameters were according to Minifiler kit instructions (6).

Results and discussion

The purity of extracted DNA was ranged (0.76- 1.02). Generally DNA is accepted as 'pure DNA' when the ratio is~ 1.8 (13). The lower purity in this study may attribute to the extraction method (Chelex) which did not involve specific purification steps. In order to estimate the appearance of extracted DNA in agarose gel, touched and buccal swab extracted DNA subjected to agarose electrophoresis .The results showed that touched extracted DNA did not show any specific bands while DNA extracted from buccal swab showed DNA band and degraded RNA smear. The absence of DNA bands from touched samples is expected due to the lower concentration of the extracted DNA. Increasing the concentration of agarose gel may be required for agarose gel electrophoresis of lower extracted DNA amount (13). Optimization the collection methods and DNA extraction techniques enhance the concentration of the extracted DNA (6). To determine that the extracted DNA from touched surfaces have suitable concentration, without PCR inhibitors and intact, DNA amplified by real time PCR using Quantifiler kit (Figure 1). The results showed that the range of DNA concentration was (0.1-0.16ng/µl) while for the positive control was (8.6-27 ng/µl).

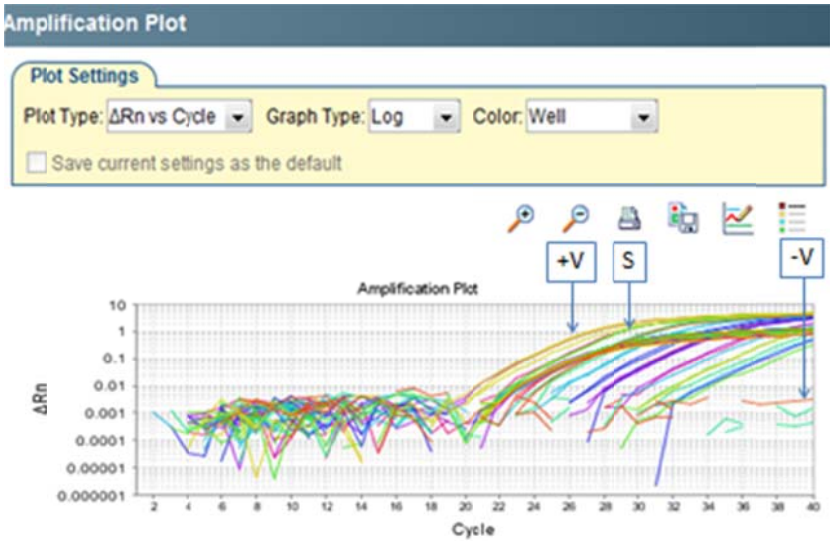

Figure (1): Real time PCR amplification plot of positive (+V), negative (-V) control and touch DNA samples (S).

To verify that the touched DNA is amplified we subjected the real time PCR products to agarose electrophoresis and we get clear amplified products (Figure 2).

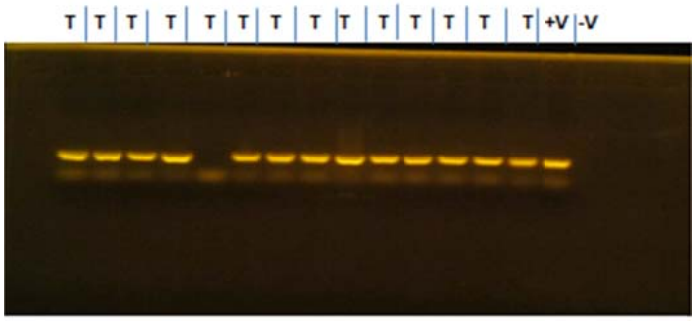

Figure (2): Ethidium bromide stained agarose gel electrophoresis (0.8%) of real time PCR products. T: touch DNA samples, +V: positive control, -V: negative control.

Previous studies showed that the amount of DNA extracted from glass range from (0.0-0.8 ng) (6) to (0.04-0.1 ng) (16). The variation in DNA yield is due to several factors like collection technique, DNA extraction method, the biology of touching person (17, 18). STR analysis using Minifeler kit showed full DNA profile for positive control (from gloves) (Figure 3) and some touched DNA samples (Figure 4). The full STR profile is generated with highest DNA amount collected from glass surface (0.16 ng); low amounts of DNA collected yields partial profiles due to the distribution of STR loci across chromosomes.

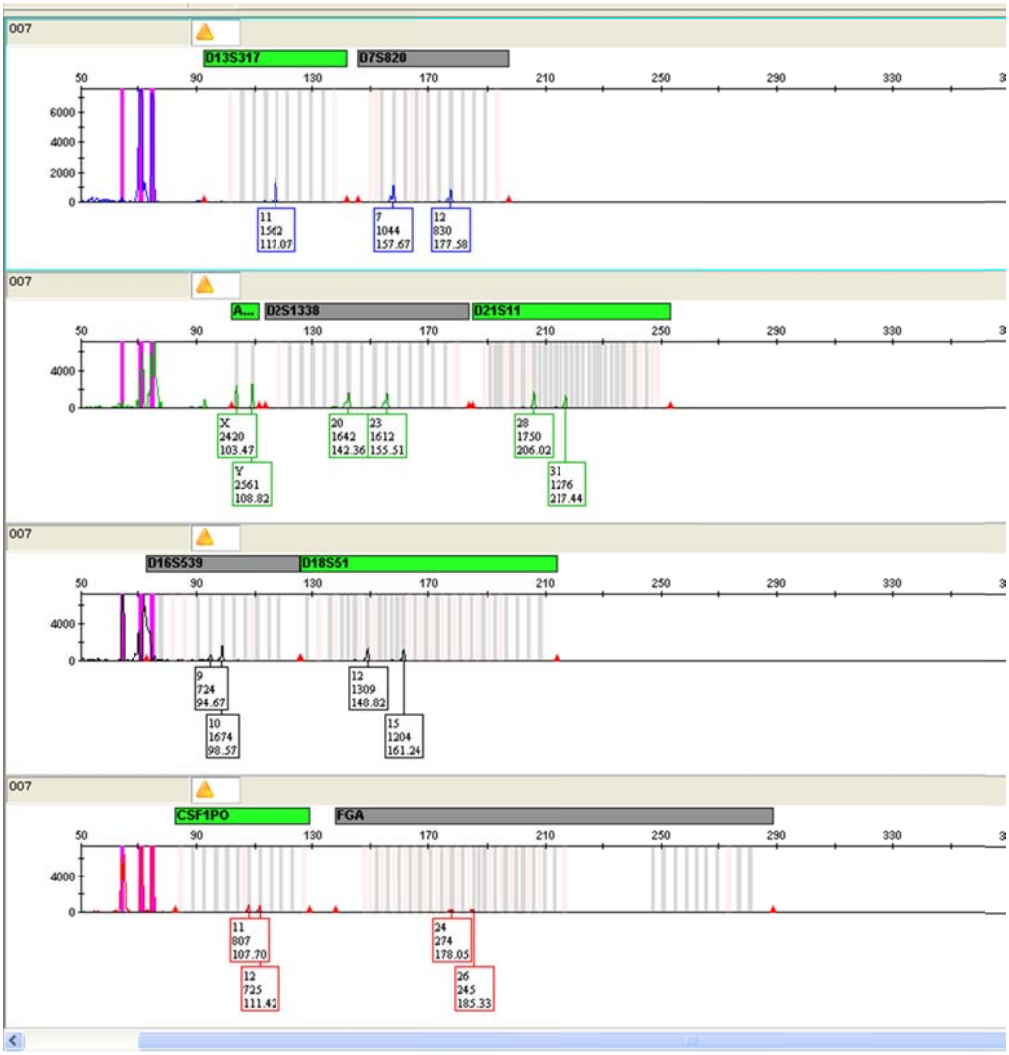

Figure (3): Electropherogram from GeneMapper® IDX software showing the profile of DNA extracted from gloves using Minifiler kit.

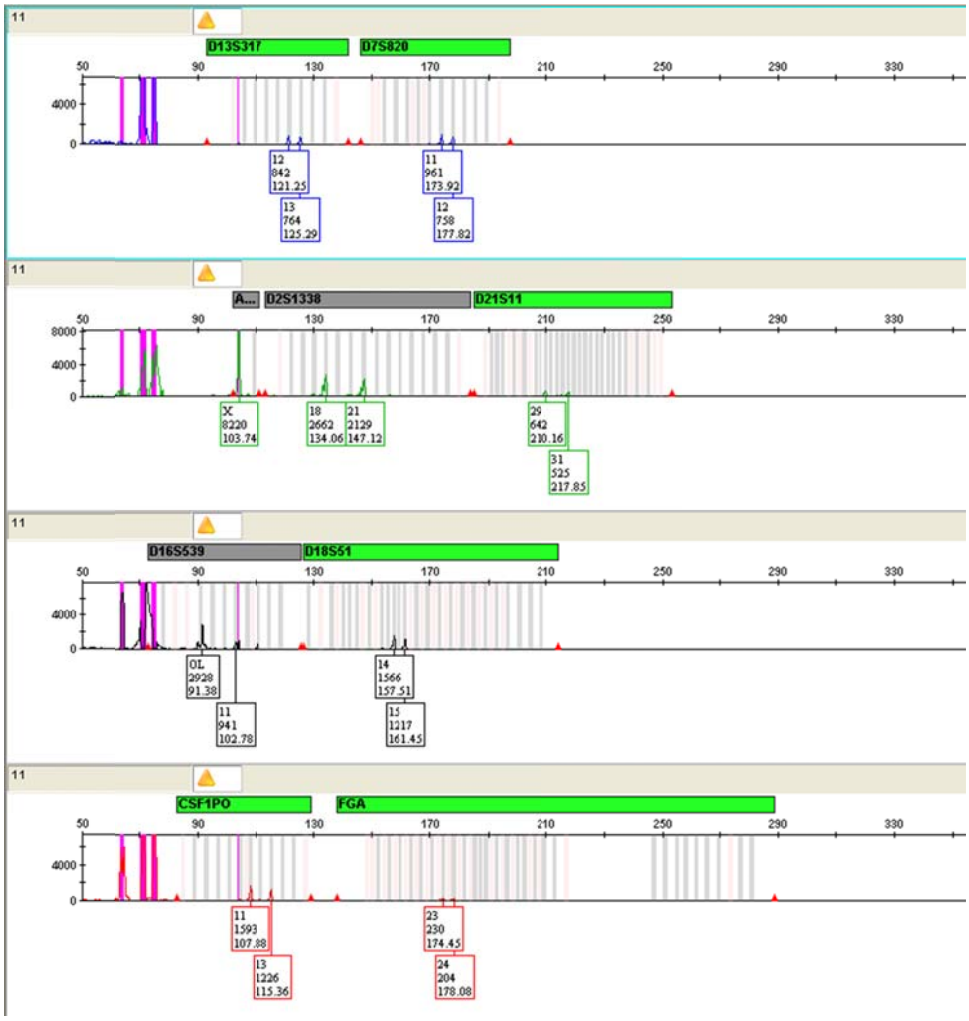

Figure (4): Electropherogram from GeneMapper® IDX software showing the profile of DNA extracted from touched surface using Minifiler kit.

Not all touch samples yields full STR profiles, some yields partial profiles depends on DNA recovery from collection step and DNA eluted during extraction. There are many kits manufactured for human identification but Applied Biosystem Company designed this kit for low DNA amount samples due to its high sensitivity. In previous study the DNA amount that produced full Minifiler profile was 0.09 ng/ µl (6). Several improved methods were developed for low DNA analysis such as consecutive increase of PCR cycles from 30 to 35 (19), using Laser Capture Microdissection which is a technique for isolating highly pure cell populations (20), whole genome amplification (21). Touch DNA involves several steps and each step need to optimize in future work in order to establish an optimized method that can be

used by legal institutes. This study indicated the possibility of generating full DNA STR profile from glass using Chelex method.

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