Research Article

Touch DNA; A Quantitative Study in the Perspective of Forensic Science

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Abstract

“Touch DNA” is a DNA obtained from biological material transferred from a source to an object or a person during physical contact [1]. It is a minute sample which can not be found easily at the crime scene, itotally depends upon the efficiency of the investigating officer. Touch DNA plays an important role in capturing any suspects and bring justice to any victim because “according to the forensic’s principle of exchange (locard’s principle), every contact leaves a trace” [1]. Ronald van oorschot et al., in 1997 it revealed that DNA could be detected not just from bodily fluid but from the traces left by a touch [2]. It is indirect evidence where biological fluid is not found. In India this type of evidence are ignored by the investigator officer due to lack of knowledge. In criminal cases, sampling technique is very important to collect the valuable evidence. The most common technique is collection of “cellular material” and “swab technique”. In this technique, we use sterile cotton for swabbing on the surface of the object. To improve the quality of the resulting DNA profile, the double swab technique is usually applied (Wet and Dry). Another sampling technique frequently used in large number of forensic science laboratories is, “cutting out the area of interest”, this method is especially applied to soft items [3].

Material and Methods

Sample preparation

The sample taken for DNA extraction from these sources are listed in the (Table 1).

The swabbing was taken with the help NS water. Put it in the room temperature to dry and then pack it in the paper envelop. The sample were cut in small pieces with the help of clean scissors and allowed to soak in lysis buffer.

DNA isolation or extraction

Sample was subjected to organic extraction method for DNA isolation. Sample submerged in 400μl of extraction buffer (1.21g TRIS, 5.84gNaCl, Adjust pH to 8.0 with HCL, Add 100ml 20% SDS, Add 20 ml 0.5 M Na₂EDTA-2H₂O Add 6.02 mg DTT/ml) in 1.5 ml of microcentrifuge tube (1.5ml) then 10μl Proteinase K was added and incubated for 2 hours at 56°C on water bath. After incubation an equal volume of Phenol: Chloroform: Isoamyl alcohol (25:24:1) was added to each tube then mixed by inverting the tube up and down for 2 minutes. The tubes were then centrifuged at 10000 rpm for 5-6 min. The upper aqueous layer was then transferred in separate microcentrifuge tube (1.5 ml). Then purification of DNA was done by precipitation with absolute ethanol (2X) and kept at -20°C for 30 min to settle down. After incubation, tubes were then centrifuged at 14000 rpm for 15 min. The pellet of DNA was washed with 70% ethanol to remove remnant salts and dried at room temperature. Add 20-30μlTE buffer must place in water bath (15-30 minute).Place it in -20°C for store purpose.

DNA quantification

The Real-Time Polymerase Chain Reaction (RT-PCR) was performed for the DNA quantification of the samples (Table 1) by using the Quantifier Human DNA Quantification kit (Life Technologies Inc). This kit provides the PCR reaction mix (Human Quantifier), primer sets (Human Quantifier) and standard DNA. RT-PCR reaction setup of 25μl includes 10.5μl of primer sets, 12.5μl of reaction mix and 2μl of DNA templates to each well and run the PCR using Real-Time PCR machine (Applied Biosystems) and model

| S. No | Source         | Sample for DNA Extraction |
|-------|----------------|---------------------------|
| 1     | Mobile phone   | Swabbing                  |
| 2     | Mask           | Cutting                   |
| 3     | Tooth pick     | Cutting                   |
| 4     | Comb           | Swabbing                  |
| 5     | Brush          | Cutting                   |
| 6     | Inner sole of the shoe | Swabbing           |
The samples taken were daily purpose material like, shoes, toothpicks, brush, mobile, and masks, it was dissolved in 10 μl of TE Buffer, and the following findings were observed (Table 2) a little amount of human male DNA was found, on the contrary the comb gave a negative result, which may be due to the presence of inhibitor. Touch DNA can be used as a source of evidence when the bodily fluids are not present in the scene of crime. The observed data indicates that the amount of DNA extracted from the touch DNA source can be sufficient to generate a DNA profile of an individual, if advanced amplification unit is available.

**Result and Discussion**

The samples taken, were daily purpose material like, shoes, toothpicks, brush, mobile and masks, it was dissolved in 10 μl of TE Buffer, and the following findings were observed (Table 2) a little amount of human male DNA was found, on the contrary the comb gave a negative result, which may be due to the presence of inhibitor. Touch DNA can be used as a source of evidence when the bodily fluids are not present in the scene of crime. The observed data indicates that the amount of DNA extracted from the touch DNA source can be sufficient to generate a DNA profile of an individual, if advanced amplification unit is available.

| S. No | Source       | Target     | Task    | Quantity | CT     |
|-------|--------------|------------|---------|----------|--------|
| 1     | Inner-shoe   | Duo Human  | Unknown | 0.0043   | 37.3053|
|       | Duo IPC      | Unknown    | -       | 37.0468  |
|       | Duo Male     | Unknown    | -       | 29.6094  |
| 2     | Comb         | Duo Human  | Unknown | -        | Undetermined |
|       | Duo IPC      | Unknown    | -       | 29.4941  |
|       | Duo Male     | Unknown    | -       | Undetermined |
| 3     | Tooth-pick   | Duo Human  | Unknown | 8.5628   | 26.3779|
|       | Duo IPC      | Unknown    | -       | 26.6673  |
|       | Duo Male     | Unknown    | 7.8999  | 27.254   |
| 4     | Brush        | Duo Human  | Unknown | 0.028    | 34.6078|
|       | Duo IPC      | Unknown    | -       | 29.8518  |
|       | Duo Male     | Unknown    | 0.0376  | 35.183   |
| 5     | Mobile swabbing | Duo Human | Unknown | 0.0478   | 33.838 |
|       | Duo IPC      | Unknown    | -       | 29.7546  |
|       | Duo Male     | Unknown    | 0.0783  | 34.6403  |
| 6     | Mask         | Duo Human  | Unknown | 0.6372   | 30.1145|
|       | Duo IPC      | Unknown    | -       | 29.6081  |
|       | Duo Male     | Unknown    | 0.9187  | 30.6981  |

The other important source of touch DNA could be toothpick, brush, inner-shoe swabbing etc., which can be found at the scene of occurrence. Thus the investigating officer should be made more familiar about the significance of touch DNA.

**Conclusion**

Due to the sudden pandemic-like condition, the use of mask is a 'must', like any other necessary clothing it has also occupied a place in the life of the primate. It is the most efficient evidence in today’s era as it is a rich source of DNA but on the contrary it is being neglected. Generally nasal fluid saliva and sweat soaked by the mask, so investigating officer should not miss a chance to collect this potential evidence. There are many other belongings, which a human carries in his day to day life, the most common is the smart-phone. Sweat and saliva are the primary source of ‘Touch DNA’ in the smart phone, which is ignored and jeopardizing this fingerprint are used instead as a source of evidence. DNA is the most precise and accurate form of evidence to carry out investigation.

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