B75 The Success Rate of Rapid DNA Technology in Genealogical Determination in Forensic Science

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Learning Overview: After attending this presentation, attendees will better understand the role of Rapid DNA technology in paternity studies.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by enabling paternity determination studies to be carried out in a shorter time and with less contamination.

DNA analyses, which are routinely used for various purposes in basic sciences or medical sciences, are used in forensic sciences to provide objective evidence to courts. In forensic sciences, both the determination of paternity-kinship relations and identification of biological samples (blood, bloodstain, semen, semen stain, saliva, saliva stain, hair, bone, etc.) collected from the crime scene are performed by DNA analysis.

In paternity studies, by analyzing the biological samples taken from the mother, the suspect father, and the child; it is determined whether the suspected individual is the father of the child or not. In addition; biological fluids and tissues (blood, semen, saliva, hair, bone, etc.) or the stains of these, which were collected from the crime scene, are identified in the criminal investigations to determine who this evidences may belong to.[1-3]

Various commercial kits are available to enable easy obtaining of Short Tandem Repeat (STR) profiles. The process for obtaining profiles in routine studies is long and arduous. However, the time to reach the perpetrator is very important. Catching the perpetrator as soon as possible can prevent a second victimization in that process. For this reason, it is important to shorten and facilitate the analysis processes to obtain DNA profiles in order to catch the perpetrator quickly. In parallel with this, various studies have been carried out and are still being developed to facilitate the stages of obtaining and interpreting profiles.[4] The RapidHIT® System, which is developed in addition to the devices used routinely for this purpose, is a fully automatic DNA analysis device that enables the obtainment of STR profiles.[2] This system is a complex system that combines the routine laboratory steps by making isolation, DNA quantification, polymerase chain reaction, capillary electrophoresis, and data analysis all together to create DNA profiles in a short time.[5-8] In addition, the RapidHIT® system, which reduces the risk of contamination by keeping analyst number at a minimum and having a single-stepped conventional processes, obtains DNA profiles compatible with the Combined DNA Index System (CODIS) in as little as 90 minutes.[5,7]

Rapid DNA technology, which is known to have ability to work with reference samples and whose improvement process is still in progress, has been used since 2012. However, it has been noted in the literature that the use of rapid DNA technology can have disadvantages in solving cases, such as complex ancestry and paternity cases studied in forensic science.[5,-8]

The aim of this study is to determine whether it is possible to get results more quickly in forensic science studies for the determination of paternity by comparing DNA profiles obtained by using conventional methods and DNA profiles obtained from fast DNA technology that gives results in as little as 90 minutes.

In this study; two buccal swab samples to study by using two different devices were taken from 90 volunteers in total, which were from 30 different families that consisted of mothers, fathers, and children. Twenty-four STR profiles of samples were obtained using the RapidHIT® device. When the profiles of 90 individuals from 30 families were examined by using the RapidHIT® System, a full profile was obtained in 81 individuals. In addition, a partial profile was seen in two individuals, while an allele drop was found in seven individuals. Routine DNA analysis was also used to study samples of the same individuals in steps that consisted first of DNA extraction and quantitation, second by amplification of 24 STRs in a thermal cycler, and third by separating STR loci in capillary electrophoresis. In the last step, the results of both systems were analyzed by cross comparison.

As a result of this study, the success rate of Rapid DNA technology, whose advantages were sorted according to routine DNA analysis in paternity testing, was revealed.

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