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EVALUATING DNA REPORT AS EVIDENCE

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In its recent judgments, the Supreme Court has been critical of admitting DNA report as clinching evidence in criminal cases. In *Rahul v. the State of Delhi,Ministry of Home Affairs* (2022), the Court said “the collection and sealing of the samples sent for examination were not free from suspicion.” It objected to the fact that the Delhi High Court and the trial court did not examine the underlying basis of the findings in the DNA reports and also did not examine whether the expert reliably applied the techniques. Based on this reason, despite the ‘match’ result of the DNA analysis, and other findings, the Court acquitted all the three persons who were accused of rape and murder. In *Manoj v. State of Madhya Pradesh* (2022), where the expert explained the technique of DNA analysis, but did not mention the ‘random occurrence ratio,’ the Court held that there was the likelihood of contamination as one of the reference samples was collected from an open area.

The first responder on the scene of crime needs to ensure that the biological sample is dried under room temperature and sealed in a paper, and not plastic, bag. The sample should be free from any contamination due to humic acid, which is a primary constituent of the soil. Touching areas where DNA may exist, and talking, sneezing and coughing over evidence must be avoided. No other human contact should be allowed, and stained articles must be packed separately.

Liquid blood samples must be collected using blood collection cards or EDTA (Ethylene Diamine Tetra Acetic Acid) vials in a vaccination box with coolants to maintain low temperature. Other body fluid samples may be collected in indicator cards. The investigating officer (IO) must ensure that the properly sealed samples reach the forensic science laboratory (FSL) in the stipulated time period, maintaining proper chain of custody. In fact, the Union Home Ministry had provided a sizeable number of sexual assault evidence collection kits containing blood collection cards and EDTA vials in 2020 to all the States so that the biological samples are collected and preserved in the best possible manner for DNA analysis. The States need to continue with this good practice.

The first step in the FSL is to extract DNA material from a sample by separating other elements, such as RNA, proteins, lipids, cell debris and humic acid. Nowadays, automated machines are used to extract DNA from the biological material depending upon low and high copy number of DNA for further analysis. The next step is the quantification of the extracted DNA material using the RT-PCR machine. Further analysis is carried out irrespective of the number of copies found during quantification. Once the quality as well as the quantity of the sample (both reference and control) is known, the sample is subjected to amplification by STR (Short Tandem Repeats)

typing (with 16, 24 or more genetic markers) using the PCR machine. STR typing means to mark locations which identify uniqueness and are different in every individual.

If the sample does not contain sufficient DNA during quantification, it is indicative of degradation. In spite of the quality of the DNA, if the profile is not obtained, it indicates the possibility of non-amplification of DNA which may be due to contaminants or PCR inhibiters in the sample. In the end, PCR products are separated using automated genetic analysers and the results are compared with the provided referral sample. The result is interpreted as match (inclusion) or not-match (exclusion) or inconclusive (only when partial DNA profile is generated). The obtained STR profile may be from a single source or it may be a mixed profile which is obtained mostly in evidences of sexual assault cases.

Therefore, if the sample size and quality is good enough to reach a ‘match’ result, it cannot be said that the sample might be contaminated (irrespective of the fact that it was collected from an open area). Had the sample been sufficiently contaminated, the ‘match’ result would not have been arrived at. All stakeholders of the criminal justice system need to be sensitised about the techniques of DNA analysis.

The Court has questioned the forensic expert for not mentioning the ‘random occurrence ratio’. This statistical ratio or ‘random match probability’ (RMP) is referred to as the frequency of the particular DNA profile in a population. A small RMP value means the profile is rare in the population and vice versa. The Central FSL, Directorate of Forensic Sciences, released a Working Procedures Manual Forensic DNA Testing in 2019, which prescribes the procedure for calculating RMP for automated STRs. Therefore, there is no justifiable reason for a DNA expert not to mention RMP in its report.

In the *Rahul* case, the Court objected to the fact that the sample was not collected by the inspector who was present in the hospital during the post-mortem, and was collected a day later by a constable. It said there was a possibility of tampering as the samples were kept in the Police Station Malkhana for a few days after seizure. This assumption seems unfounded as unless the chain of custody is broken, and adverse evidence is adduced in the court, only an administrative delay should become a basis to reject the prosecution story.

DNA technology has evolved over the years. As the evidence of DNA matching in criminal cases, particularly those based on circumstantial evidence, acquires great importance, some standard guidelines need to be laid down by the Court for admitting the DNA expert’s report as credible evidence.

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