

TRACING THE INVISIBLE: FORENSIC DNA ANALYSIS FROM CIGARETTE BUTTS IN A MULTI-ASSAILANT SEXUAL ASSAULT CASE

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In complex sexual assault investigations involving multiple perpetrators, identifying individual contributors can be challenging, especially when direct biological evidence such as semen or blood is absent or degraded. This case study highlights the successful application of forensic DNA analysis using secondary biological evidence specifically saliva and buccal epithelial cells recovered from cigarette butts collected at the crime scene of a gang rape. A total of 20 cigarette butts were analysed, out of which 18 yielded sufficient DNA profiles. Autosomal Short Tandem Repeat (STR) and Y-STR profiling enabled the identification of five distinct male DNA profiles, including a mixed profile. Comparative analysis showed that the DNA profiles obtained from reference blood samples provided by the suspects 1 and 2, matched with those obtained from the cigarette butts (number 2, 7, 8, and 13 and number 4 and 9, respectively). Mixed DNA profile revealed to be a mixture of two male contributors, one of whom matched to suspect-1 while the other remains unidentified. The analysis utilised standard forensic methodologies, including human DNA extraction and quantification, STR amplification, Polymerase Chain Reaction (PCR) and capillary electrophoresis. This case highlights the forensic value of secondary DNA evidence from non-traditional sources, the effectiveness of STR technologies in resolving mixed DNA samples, and the importance of careful evidence handling and preservation. The findings underscore how secondary evidence can play a critical role in criminal investigations, especially in the absence of direct biological evidence or eyewitness testimony.

Keywords: Forensic DNA analysis, Mixed DNA profiles, Secondary DNA evidence, STR profiling, Y-STR