

Touch DNA: Unlocking the Potential of Trace Evidence in Forensic Investigations

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EXECUTIVE SUMMARY

Touch DNA analysis has emerged as a powerful tool in forensic science for the identification and profiling of individuals based on the DNA left behind through direct contact with surfaces. This chapter is on touch DNA analysis, focusing on its principles, methodologies, applications, and challenges. Touch DNA refers to the cellular material transferred from the skin to objects during routine human activities, such as handling, grasping, or touching. Touch DNA analysis plays a crucial role in criminal investigations, allowing forensic scientists to link individuals to crime scenes, objects, or victims, even in the absence of visible biological evidence. Overall, touch DNA analysis represents a valuable forensic tool for identifying perpetrators, exonerating the innocent, and contributing to the administration of justice in criminal proceedings.

INTRODUCTION

The field of forensic science has witnessed remarkable advancements in recent years, revolutionizing the way we investigate and solve crimes. One of the significant breakthroughs in this domain is the utilization of Touch DNA analysis. Touch DNA analysis has empowered forensic investigators to extract valuable information from the mere traces of DNA left behind through casual contact with objects and surfaces.

HISTORICAL CONTEXT

The history of DNA analysis in forensics can be traced back to the mid-20th century when the discovery of the double helix structure of DNA by Watson and Crick paved the way for a new era in genetic science. The idea of utilizing DNA in forensic investigations gained prominence in the 1980s, with the first DNA profiling method developed by Sir Alec Jeffreys in 1984, known as DNA fingerprinting. This technique allowed for the comparison of DNA samples and provided a valuable tool for identifying individuals based on their unique genetic markers.

The concept of Touch DNA analysis, however, took some time to emerge. Traditional DNA analysis methods required relatively large and high-quality DNA samples, making it challenging to obtain useful results from minute or degraded samples (Bär et al., 1988). In the late 1990s and early 2000s, scientists and forensic experts began to explore the possibility of extracting DNA from surfaces and objects touched by individuals. This marked the inception of Touch DNA analysis.

1980s-1990s: The Dawn of DNA Profiling

The historical context of touch DNA begins with the emergence of DNA profiling in the early 1980s, primarily focused on analysing blood, semen, and hair samples. The pioneering work of Sir Alec Jeffreys in the mid-1980s laid the foundation for DNA fingerprinting, which allowed for the identification of individuals based on their unique genetic profiles. These early DNA profiling techniques relied on variable number tandem repeats (VNTRs) as markers.

Late 1990s: Transition to Short Tandem Repeats (STRs)

In the late 1990s, forensic DNA analysis shifted from VNTRs to short tandem repeats (STRs). STRs are more sensitive and can provide results from smaller and more degraded DNA samples. This transition significantly improved the ability to analyse touch DNA samples.

2000s: Advancements in DNA Amplification

Advancements in DNA amplification techniques, particularly the development of highly sensitive polymerase chain reaction (PCR) methods, further improved the analysis of low-quantity DNA samples. These innovations made it possible to amplify and analyse the limited DNA present in touch DNA samples.

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