

# Effectiveness of Dactylography over DNA Fingerprinting in the Field of Forensic Medicine: An Overview

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## Abstract

Dactylography or fingerprinting is a time tested method of identification of an individual based on the characteristic feature of the ridges present over fingers, toes or other regions. On the other hand, DNA fingerprinting is comparatively a newer technique which is gaining lot of attention due to the accuracy of its results and smaller sample needed to fix the individual. In the world of Forensic Medicine everyone is over fascinated with DNA fingerprinting but the facts are different at the ground level. This article aims to discuss about the efficacy of dactylography which is a traditional system for identification in any criminal investigation as a more reliable and cost effective method than modern DNA fingerprinting.

**Keyword:** Dactylography; DNA Fingerprinting; Forensic Medicine.

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## Introduction

Dactylography or fingerprinting is the study of the ridge pattern of the skin. The system was first used in India by Sir William Herschel in the year 1858 in Bengal which was later improvised and systematically classified by Sir Francis Galton in 1892.<sup>1</sup> Due to this major contribution by Sir Francis Galton this method of identification of an individual also came to be known as Galton system of identification. It is based on the principles of formation of unique patterns by epidermal or papillary ridges of the fingertips, toe tips or other places. The ridge pattern starts to develop from 12 to 16 the week of intrauterine life and completes by 24th week.<sup>1</sup> They persist constantly during the entire life in the same unique individual pattern. Generally there are 4 types of fingerprints-Arch, whorl, loop and composite (Image 1) having 07, 25, 65 & 2-3% representation in population respectively.<sup>2</sup> Loop is the commonest type of fingerprint among all. The

fingerprints are capable of endless variations so that there is only one in 64 billion chances of two persons having identical fingerprints statistically.

Genetic fingerprinting or DNA profiling is a technique useful for identification at many instances, in forensic investigation. Sir Alec John Jeffereys discovered this revolutionary method in 1984, where DNA is extracted from the different samples like blood, semen, saliva, hairs & even rarely available body tissues found on the crime scene as well as on corpus by RFLP & PCR techniques.<sup>2</sup> Evidence in the form of DNA has become an indispensable tool in fighting crime because it provides unambiguous identification of a criminal from minuscule traces of biological material left at a crime scene. This is of great use in crime scenes where trace evidences are found because of Locard's Principle even without the knowledge of the accused or assailant. This tool is also of great help in sexual offence examination where biological specimens are collected and

foreign DNA is retrieved and matched with alleged accused. But there are some drawbacks also which needs attention in the present scenario.

### Drawbacks of DNA Fingerprinting

*Expenditure:* With respect to developing countries where financial constraints exist in the investigative aspect involving such procedures which need higher expenditure are often sidelined or not preferred.

*Evidence Tampering:* Chances of contriving original sample/evidence or negligent actions by the person(s) who are handling, dealing, preparing and storing the aforementioned evidence may affect/alter the result of the test.

*Destruction of sample:* The method of preservation of sample plays a pivotal role as any mistake or lack of precaution will cause complete destruction of the sample due to either fungal growth which degrades the DNA material or by making the sample not fit for analysis.

*Accessibility:* India is a growing and blooming nation. But when it comes to number of forensic laboratories, they are still insufficient to sustain the awaiting cases. Even among the forensic laboratories very few have the privilege to have run a DNA analysis setup, mainly due to lack of infrastructure and limited number of trained staff and scientists needed for proper functioning. The catchment area at present for this technique is limited to few urban areas and the rural areas are still devoid of it.

*Time Constraints:* This process is lengthy, and usually takes a lot of time to complete all the steps right from purification, extraction and analysis (sometimes even 10 weeks) in current scenario.

*Limitation in fixing identity:* DNA profiling cannot differentiate among monozygotic twins.<sup>2</sup> In such cases, if we will rely on DNA fingerprinting A will do crime & B will be arrested as their genetic fingerprints will be the same.

### Other Issues

- Interpretation of DNA Profile requires trained man power.<sup>2</sup>
- Predispose to contamination.
- Ethical Issues DNA fingerprints are susceptible to hacking.

### Advantages of Dactylography or Finger Printing

Fingerprints are still the most cost-effective and reliable way to identify people.

- They have been used over a 100 years and is a time tested method to provide accurate identification of criminals.
- Every year new prints are added to the fingerprint database which has now achieved a substantial number, which lies in tens of thousands.
- Fingerprints are highly individualistic even in cases of monozygotic twins.
- The chance of fingerprints of two people being identical is 1 in 64 billion.<sup>2</sup>
- Fingerprints solve ten times more unknown – suspect cases than DNA fingerprinting.
- While matching the prints, 16 to 20 points of similarity are taken into consideration for accurate identification.
- Even availability of partial fingerprints is sufficient to fix the identity.
- Under sec. 293 CrPC, it has been stated that for admission of fingerprint as evidence, physical presence of Director of The Fingerprint Bureau is not required, the report itself is sufficient.<sup>3</sup>
- Even if the epidermal layer is lost, prints obtained from the dermis are adequate for evidence.
- Criminals may attempt to mutilate or alter the fingerprint by applying corrosive agents, but the prints are not destroyed unless the skin is completely destroyed.<sup>2</sup>
- Automated Fingerprint Identification System (AFIS): System to store, search, retrieve and exchange for Fingerprint electronic images. This system requires less manpower.

#### Some Statistical data regarding Fingerprints in India

- CFPB (Central Finger Print Bureau) - Has a database of 12, 07,152 ten-digit Fingerprint slips as on 30/11/2018.<sup>5</sup>
- Scene of Crime Prints cases received in CPFBI during 2018 - 146 cases (748 prints).<sup>5</sup>
- Scene of Crime Print cases disposed in 2018 - 172 cases (529 prints).<sup>5</sup>
- During 2016, Fingerprint Experts visited 54,349 crime scenes and developed chance

prints in 19,450 cases leading to 4,723 identifications.<sup>6</sup>

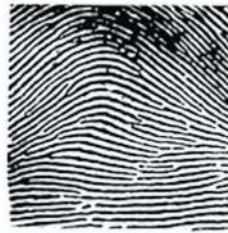
- Tamil Nadu tops the list with 484 cases of detection based on chance prints during the year 2016 followed by 297 cases in Andhra Pradesh.<sup>6</sup>
- With respect to document cases, Uttar Pradesh is highest by giving opinion in 289 cases followed by Punjab in 233 cases.<sup>6</sup>



LOOP



WHORL



ARCH



COMPOSITE

Fig. 1: Various Types of Fingerprints.

both prosecution and defence lawyers, to solve cold cases and exonerate the innocent. As technology changes, it will surely continue to be used in conjunction with other forms of evidence in an effort to develop the best form of human identification and help our police officers and judiciary to convict criminals & provide Justice.

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### Peroration: DNA Fingerprinting or Ink Fingerprinting?

Fingerprints are still the front-line evidence at crime scenes and at trial. With the breadth and depth of existing databases, this form of evidence will remain with us for some time, even if examiners must now testify that they have only found a “likely match.”

The new science of DNA fingerprinting is in its infancy and will continue to evolve. It is used by

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