



### B160 Ridge Drift: The Relevance of a Not-So-Rare Fingermark Aging Phenomenon

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**Learning Overview:** After attending this presentation, attendees will understand that ridge drift is not an uncommon event in processed latent fingermarks and will recognize the variables that correlate to higher incidences of this phenomenon.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by showing the practical implications when detecting ridge drift in processed latent fingermarks. Knowledge of the variables that affect ridge drift will inform attendees as to best practices when processing, comparing, and identifying fingermark evidence to prevent ridge drift from contributing to false negative conclusions.

Latent fingermarks recovered from crime scenes are compared with reference fingerprints to provide circumstantial evidence of the presence of an individual at a location. A limitation of this source attribution approach is the quality and quantity of the friction ridge characteristics, which can contribute potential sources of error to a comparison analysis. Further, the timeframe from occurrence to recovery may account for degradation effects that preclude a true contemporaneous comparison.<sup>1</sup>

A previous study by De Alcaraz-Fossoul et al. described a phenomenon, referred to as fingermark ridge drift, which was characterized as a random modification of aged fingermark patterns at a ridge scale.<sup>2</sup> This event was proven to alter key elements used for identifications, such as the physical appearance of minutiae. Little is currently known of the underlying cause or factors contributing to the occurrence of ridge drift. Currently, the Organization of Scientific Area Committees (OSAC) Friction Ridge Subcommittee documents do not consider fingermark ridge drift in order to account for possible dissimilarities during a comparison process. As a result, an examiner who compares an aged latent fingermark to a reference print (i.e., inked or scanned) without considering ridge drift may erroneously report an inconclusive result where a positive identification may be justified.

The present study was designed to both replicate and expand the variables of the previous ridge drift study by including 672 fingermarks from male and female subjects of similar age; two substrates (tile and plastic); two distinct color powders (carbon black and titanium dioxide–white); three light conditions (direct natural light, shade, and darkness) indoors; and two secretion types (sebaceous- and eccrine-rich). Fingermarks were simultaneously deposited, aged over a period of 2 to 72 days, and powdered for visualization. All developed prints (aged) were compared relative to fresh (day 0) latents to locate ridge drift. For the purpose of the study, ridge drift is collectively defined as either true drift (attributed to ridge movement) or selective degradation (visual modification of ridge patterns). Each processed fingermark was independently examined by three people for the presence of ridge drift. A conservative examination approach was adopted in identifying incidences of drift in that unanimous agreement was required among all three examiners. The number of prints containing drifts was considered rather than the individual counts per print. An inconclusive result was reported when discrepancies occurred among examiners. Further, fingermark images of poor quality (due to degradation effects or artifact inclusions) were also reported as inconclusive results.

Ridge drift was observed in 42 of 672 prints, while 168 prints were reported as inconclusive results. While incidences of ridge drift were detected in multiple fingermark samples across all independent variables, statistical analysis using a multinomial logistics model showed that only powder type, secretion type, and the substrate indicated a significant correlation with increased incidences of ridge drift. There was no significant correlation in the incidence of ridge drift with respect to the subject, time since deposition, or the environmental lighting conditions used. The incidence of ridge drift was significantly higher when black powder was used on plastic. Of note, although the focus of the study was detection of ridge drift, the number of inconclusive samples reported was higher for prints processed with black powder and found to be statistically significant.

The average observation of ridge drift in approximately 6% of samples processed in this study supports that ridge drift is not a rare event, particularly in light of the conservative analysis approach implemented. This is of even greater concern if a fingerprint examiner follows the International Criminal Police Organization (INTERPOL) European Expert Group on Fingerprint Identification II (IEEGFI II) recommendation that single minutiae differences are significant to the conclusion of an identification. Logically, this approach will increase the number of false negative conclusions. Ridge drift can provide useful information that can help reduce misidentifications.

#### Reference(s):

1. Alcaraz-Fossoul J., Mestres Patris C., Balaciart Muntaner A., Barrot Feixat C., Gené Badia M. Determination of latent fingerprint degradation patterns—A real fieldwork study. *International Journal of Legal Medicine*. 2013; 127(4): 857-70.
2. De Alcaraz-Fossoul J., Roberts, K.A., Barrot-Feixat, C., Hogrebe G., and Gené Badia M. Fingermark ridge drift. *Forensic Science International*. 2016; 258: 26–31.

#### Ridge Drift, Environmental Conditions, False Negative