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Article's Subject Matter:

- The European Network of Forensic Science Institutes (ENFSI) completed three fingerprint collaborative exercises (CEs) in 2015 to promote best practices and help inform education and training across Europe. This article presents an overview of the tests and results.

Key Points in Article

- The test samples were provided by the Netherlands Forensic Institute (NFI) and included samples for each of the 3 CEs as outlined:
 - Visualization of fingermarks on porous substrates – 2 pieces of white paper for treatment with a single amino acid reagent & 1 piece of brown paper where the agency selected an amino acid reagent.
 - Image enhancement of captured fingermarks – download links to images of fingermarks on tin can (CA), black cardboard (IND-Zn), white paper with blue text (NIN) and brown wrapping paper (NIN) in RAW, PSD and TIFF format file.
 - Value assessment for comparison including the total number of observed minutiae and final decision as to match, no match or inconclusive with the option of including a probabilistic evaluation – download links to images of 10 fingermarks developed by different techniques on different surfaces (scale included) and 5 complete tenprint and palmprint reference cards (ground truth data).
- Results were compromised by a lack of clear instructions:
 - Visualization of fingermarks on porous substrates – 30% of laboratories treated all samples with sequential treatments rather than a single reagent and many laboratories failed to provide details of the formulations used. No conclusive analysis is possible.
 - Image enhancement of captured fingermarks – 5 different programs used plus a common filter (PhotoShop, DCS4, Amped FIVE, GIMP2, Photofilter, Fast Fourier Transform). No conclusive analysis possible.
 - Value assessment on quality (good, moderate, bad) showed a complete range of variability for 9 out of 10 fingermarks. Assessment of quantity also showed variability in number of minutiae assigned within each mark by each participant. Of the 10 fingermarks 9 had the donor in the reference samples and 1 did not (mark #07). 5 false positives resulted from mark#07 and 22 false negatives were

observed (mark#02, 04, 06, 08 and 09) in 500 comparisons (1.0% erroneous identifications and 4.4% erroneous exclusions). Note these false positive and false negative rates resulted from comparing full reference impressions rather than a single impression as was done in the Black Box study.

Fallacies and or Issues

- Future CEs should include:
 - A pilot study to identify ambiguity in instructions, to verify that test materials are fit for purpose and that every element from receipt of material to return of responses can be accounted for, would have avoided issues.
 - Quality checks during sample preparation to ensure homogeneity.
 - The reference procedure so participants know what the expected results should be for image enhancement.
 - Participants must return images showing what minutiae were marked up.
 - An international Advisory Group to mitigate the impact of unconscious bias, resulting from agency training methods or local operational practices, might have on test design.
 - When Ground Truth data is not available use of specific laboratories to act as referees, in order to establish desired result (common in other areas of proficiency testing and could be valuable for visualization and imaging exercises).

- Whilst proficiency tests provide a mechanism to assure competence in producing consistent results, for ENFSI collaborative exercises are an objective means of collecting and sharing information to strive for best practice. ENFSI will continue to develop CEs.
- Canadian law enforcement agencies are also striving for best practice and we can learn from our European colleagues in this regard. An exhibit retrieved from any Canadian crime scene should be processed in a consistent and standard manner to produce the best evidence for the courts. Do we believe this is the case today?