qPCR ANALYSIS OF ENHANCED FINGERPRINTS DEPOSITED ON BRAZILIAN MILITARY FIREARMS

Alem, L.[1*]; Valentin, E.S.B.[2]; Cunha, M.A.[3]; Santos, O.C.L[2]; Nogueira, T.L.S.[1,2], Carvalho, E.F.[1], Silva, D.A.[1]
[1]State University of Rio de Janeiro
[2]Brazilian Army Institute of Biology
[3]Grande Rio University

Latent fingerprints are an investigative tool used not only by police forces but also by military forensic experts. Most of the forensic investigations conducted within the Brazilian Army are due to property crimes where fingerprint analysis is an efficient way of identifying perpetrators. DNA analysis of smudged or incomplete prints can be a complementary methodology making full use of the evidence. In this study, we aim to assess overall DNA quality of fingerprints found on rifles utilized by the Brazilian Armed Forces after enhancement with Hi-Fi Volcano Latent Fingerprint Powder Brilliant Red (Sirchie®) based on Degradation Index ($DI_{80/207}$ = [short]/[long]) provided by InnoQuant® kit (InnoGenomics Technologies). Therefore, six IMBEL M964 (FAL) rifles were decontaminated with sodium hypochlorite 5% and alcohol 70%. The weapons were manipulated by six volunteers (Brazilian Army personnel) as it would be done in a routine set. In this study, only fingerprints developed in the handgrip and handguard areas were collected since evaluation by military forensic experts concluded that during the service these are the most handled areas. Double swab technique was applied in order to maximize cell collection and DNA yield: a sterile swab moistened with NaCl 0.9% followed by a dry swab collection. DNA was isolated with Lysis Solution methodology and concentration of the extract was accomplished with Amicon® Ultra-0.5 30k column. Quantitative analysis was carried out with the InnoQuant® kit and Rotor-Gene® Q Real-Time PCR cycler. Results showed that handgrip area would be more suitable for DNA collection as it returned slightly higher overall DNA yields. However, considering input DNA estimated by the InnoQuant Long target, the handguard area is more likely to return optimal DNA profiles. Degradation indices for handguard also revealed a tendency to be smaller, which reinforces the likelihood of obtaining informative genetic profiles. Prospect results are corroborated by rifles' features: it is a heavy armament which results in more pressure applied to the surface by the fingers and possibly higher DNA transfer rates, the handguard is a large area for contact and it is usually held by the military for longer periods of time. The continuity of such study with the expansion of sample space and STR profiling will allow the production of statistically robust data and the effective development of guidelines for the improvement of military conduct in criminal investigations.