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ORIGINAL ARTICLE

Effects of human decomposition on test fired bullet – An experimental research

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Class character;
Striae;
Rifling marks

Abstract: The present experimental research was carried out in the year 2011 in Kingston, Jamaica. A total of six firearms were used in this research, each bullet served as its own control. A total of seven sets of bullets were test fired of which one set was embedded in the body (control) and was stored at 2–4 °C and other six sets were embedded in a fresh cadaver and subjected to environment temperature of 26–29 °C, for a period of 12 days. Macroscopic observation indicated complete corrosion of the class characteristic markings (major countable striations) by the 8th day, by the 6th day it was near obscuration. On the 2nd day with the onset of biofilms, corrosive changes on the rifling marks were noted. On the 4th day, biofilm, and bio-corrosion (microbiologically induced corrosion) had obliterated 100% of linear macroscopic striations (microstriae/individual characters) and 50% of class character rifling marks.

The observations through comparison microscope indicated that the individual characteristic (microscopic) markings on the bullet in the form of microstriae showed complete corrosion or obscuring by the 10th day. The surface appeared smooth, onset of corrosion process was noted on the 2nd day and by the 4th day 50% obscuring of the marks was noted. This change in the markings of the metal surface of the bullet was uniform to all the ammunitions used in this study. The control bullets showed no such changes during the period of study. The study confirms the existence of a potential danger in dealing with crime bullets retrieved from putrefied bodies. It also highlights the importance of early retrieval of dead bodies in firearm deaths and the importance of proper storage facilities to deal with cases of firearm deaths.

1. Introduction

When a bullet is fired through a rifled barrel, the lands and groove spirals of the rifling fetch fine grooves called "striations" into the bullet. These can be matched with the barrel through which the bullet was fired. Examiners distinguish

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between striations common to all guns of a particular type (“class characteristics”) and those unique to a particular gun (“individual characteristics”).[1]

The class characteristics (macro striations) depend upon the type of rifling in the barrel, which varies among manufacturers and models in the number and shape of the grooves, twist rate, and direction. Colt, for example, traditionally uses a left-hand twist, while Smith and Wesson, uses a right hand twist; a current production M16 rifle uses a 1 in 7 inch twist. Individual characteristics (microstriations) are caused not only by imperfections in the rifling process and tools, but also by the wear and tear caused by regular use, and can therefore change over time. These changes are unique to the particular weapon along with the make of the weapon. These changes in the Individual character of the weapon help in the identity of the weapon which fired the bullet and thus the assailant is identified.[2,3] These individual characters are microstriations observed under the comparison microscope, hence any alterations in the striations of a crime bullet will result in the identity of a wrong weapon or ruling out the suspected weapon thereby an innocent being held guilty or an assailant being left scot-free. It is not unusual in forensic practice to encounter inevitable delay in recovering the dead due to many factors surrounding the crime; one of those factors is concealing or disposing the body after the crime. In such cases the exposure of the body to the environment leads to decomposition and the presence of injuries on the body will aggravate its process. Hence, the bacterial enzymes and cell enzymes of varying pH derived as a result of putrefaction is most likely to have effects on the metals constituting the ammunition (crime bullet), in the body. The present study is an attempt to confirm these effects on the signature (striations) of the bullet retrieved from the decomposed bodies. It also highlights the importance of early evidence material retrieval from the dead in cases of gunshot wound and the importance of proper storage facilities to deal with cases of firearm deaths. The studies also confirm the alterations of those signatures of the weapon on the bullet and discuss the implications of its alterations in identification of the weapon and the suspect. The present study is an experimental research carried out in the cadaver with the test fired bullets, each bullet acting as its own control. They were inserted into the predetermined sites in the muscular layers of the fresh cadaver and subjected to the natural process of decomposition. The said bullets were retrieved at intervals of 2, 4, 6, 8, 10, and 12 days and studied under the comparison microscope and observed for changes in the markings (striae) of the bullet. One set of the test fired bullet embedded in the cadaver stored at 2–4 °C for a period of 12 days acted as control (Tables 1 and 2).

Table 1 Type of weapon, ammunition and number of bullets used.

Weapon	Ammunition jacketed bullets
Revolver	06
Browning	06
Glock	06
AK47	06
MP5	06
M16	06

2. Materials

Research equipment:

Revolver, Gluck pistol, Browning pistol.
AK47 rifle, MP5 rifle, M16 rifle.
Comparison microscope.
Water tank.
Nikon D90 camera.
Research material.
Ammunition-jacketed bullets made of brass, copper and lead, Semi jacketed bullets, Fully jacketed bullets.
Cadaver.
Packaging and labeling material.
Cold storage.

3. Method and sampling

In this study, two cadavers were used, one subjected to the natural process of decomposition (cadaver A) and another as control (cadaver B). The mean temperature recorded during the study was 26–29 °C with intermittent rainfall. The weapons were test fired with seven sets of immunizations (jacketed) in a water tank and the bullets retrieved from it. Six sets of bullets were inserted in cadaver A, and another set of bullets was inserted in cadaver B (control), at predetermined penetrated wound induced artificially in the cadaver. Cadaver A was exposed to the natural process of decomposition by placing it in an open environment over a cement podium away from the morgue in a protected environment. The bullets from cadaver A were retrieved at 2, 4, 6, 8, 10 and 12 days of putrefaction. The bullets from cadaver B were retrieved at the end of 12 days. All the bullets were marked, labeled and studied under the comparison microscope and naked eye. The changes in the macrostriae and microstriae on the bullet surface were documented both from the control samples and cadaver A samples (Tables 3 and 4).

4. Results

1. Naked eye changes were recorded in the bullet retrieved from the decomposed body. The macrostriae (class characters) were obscured completely (100%) after the 8th day and 100% obliteration of the microstriae (individual characters) on the 4th day and 50% of the small linear striae were obscured on the 2nd day.
2. When observed through the comparison microscope the changes in the microstriae indicated a total obscuring of the microstriae (individual characters) on the bullet surface from those retrieved after the 10th day of decomposition. However, 50% of the microstriae on the bullet surface were obscured from the bullets retrieved on the 4th day of decomposition.
3. Bullets retrieved from the decomposing body demonstrated micro biofilm, biofouling and biocorrosion along with greenish to black discoloration of the metal surface (Table 5).