Title : An Investigation into the Impact of Firearm Storage Condition on Changes in Nitrite ion Level in Gunshot Residue within the Barrel.

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ABSTRACT

Nitrite ion is an important chemical indicator in the examination of gunshot residue (GSR) within firearm barrel, particularly for estimating the elapsed time after firing. The standard analytical method for detecting nitrite ions in GSR is Griess test, which uses Sulfanilic acid and N-(1-Naphthyl)ethylendiamine dihydrochloride (NEDA) to form a pink to red azo dye through Diazotization and Coupling reactions.

This study examined the effect of firearm storage environments on the detectable amount of nitrite ion in GSR. Two semi-automatic pistols, SIG Sauer P226 (9 mm LUGER) and Walther TPH (.22 LR), were used to evaluate nitrite ion variation under three conditions: immediate analysis after firing, sealed storage protected from light and humidity, and open storage exposed to air circulation or carried by an officer during duty for one week, with all experiments performed in triplicate. Colorimetric analysis was performed using the Griess test with Sulfanilic acid in Acetic acid and NEDA in Methanol. The color intensity and brightness of the developed solutions were measured using the Color Identifier application and an online color analysis tool based on CMYK and RGB systems. The Magenta (M) value generally decreased while brightness increased over time compared with immediate analysis, with the largest changes occurring under open storage due to air exposure, humidity, and mechanical disturbance from carrying. These variations reflect differences in the detectable amount of nitrite ion in GSR under different storage conditions, highlighting the relationship between environmental factors and nitrite ion stability.

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