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### **E59 From the RFK Assassination in Los Angeles to the Wuornos Serial Killings in Florida: A Preliminary Examination of .22 Fired Casings**

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After attending this presentation, attendees will be aware of the following information: (1) why .22 fired casings are often found at crime scenes, including the assassination of Robert F. Kennedy (RFK) and the Wuornos serial killings in Florida; (2) some unique features of .22 cartridges; and, (3) how to tell the three types of .22 firearms involved from the .22 fired casing at crime scenes.

This presentation will impact the forensic science community by reporting the results from an empirical study of .22 fired casings (N=100). The results provide a nine-category classification of the .22 fired casings by a pistol, a rifle, or a revolver. The study addresses the challenges from the 2009 National Academy of Sciences (NAS) Report, which states that firearms' examination is "not scientific." It is argued that the study can provide crime scene technicians, police officers, school teachers, and students with tools on how to determine the types of .22 weapons used based on the .22 fired casings recovered at the scene.

Shooting incidents are commonly reported by the news media and often the type of fired casing at the scene is the .22 round. This includes the historical assassination of RFK as well as the female serial killer Aileen Wuornos; however, several questions remain unanswered: (1) Why do so many criminals choose the .22 caliber as a murder weapon?; (2) Why does each shooting incident take so long to get solved?; and, (3) Was the criminal considered "smart" or "stupid" for using a .22 firearm? This empirical study involves the analysis of fired .22 casings (N=100) collected from several indoor shooting ranges with marks indicating weapon type as pistol, rifle, or revolver. Under a stereo microscope, each casing was examined and classified into a nine-category reference in terms of the firing pin shape (2D), the depth (3D), and the sloppiness (3D). From the nine-category reference, a practical table is provided illustrating how to differentiate the types of weapons (.22) involved from the types of firing pin shapes observed. Finally, the table is translated into a forensic reference for crime scene technicians, police officers, school teachers, and students.

The .22 ammunition possesses some unique challenges for firearms examinations. First, the .22 casing is the smallest caliber and the firing pin mark is smaller even under a stereo microscopic examination. Second, the .22 cartridge is the only ammunition using the rim firing mechanism with more irregular patterns as firing pin impressions. Finally, the .22 casing is the only cartridge that can be fired by three possible types of weapons, making the caliber-specific rule useless.

Preliminary results can be summarized as follows: (1) Category A were all fired from a revolver since it has a circular impression without any extractor and ejector marks on the casing; (2) Category B were all fired by a pistol. Most firing pins in pistols have a square tip that leaves a square impression on the edge with extractor and ejector marks on the casing; and, (3) Category C were all fired by a rifle, which has a rectangular firing pin tip and uses a much more powerful gas system, thus producing a firing pin impression that is deeper and much clearer than a pistol with the extractor and ejector marks on the wall of the casing.

A modus operandi analysis becomes the final part of the study to answer the question of why the .22 is one of the most popular weapons used by criminals. First, .22 firearms are less expensive weapons than other firearms. Many gang members choose .22 firearms for drive-by shootings. Therefore, the .22 ammunition is widely used by gang members and criminals due to its low cost. Second, .22 firearms (particularly pistols and revolvers) are small in size and thus easier to conceal, which provides necessary convenience in hiding or so-called "ease of concealment." There are more .22s of various types in circulation than any other caliber of firearm. Finally, the .22 casings are a problem in many cases for the crime scene technicians simply because the casing can be fired by three possible weapons, using more time for examination, exclusion/inclusion, and decision. If investigators are unable to identify the type of weapon used in a timely manner at the crime scene, it may hamper the criminal investigation.

The study of the .22 fired casing has several practical implications: (1) an empirical classification can provide a practical protocol for quick determinations at the scene; (2) a valuable tip in differentiating the three types of casings with three unique characteristics from the three .22 firearms (revolvers, pistols, and rifles) can provide school teachers and students with quick determinations for reporting to the police when .22 weapons are involved; and, (3) by employing a new digital device, a quantifiable measurement is developed, supporting the statistical requirement proposed in the 2009 National Academy of Sciences Report entitled, *Strengthening Forensic Science in the United States: A Path Forward*.

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#### **Firearms Examination, .22 Fired Casings, Digital Measurement**