



Criminalistics Section – 2004

B81 The Interpretation of Projected Gunpowder Particle Deposition and Impact Characteristics

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After attending this presentation, attendees will understand how to evaluate gunpowder deposit and impact characteristics so that more complete scientifically based opinions about where the firearm was, when it discharged on the scene, can be developed and proffered.

This presentation will help those forensic science practitioners faced with interpreting gunpowder deposits understand that all information about the deposit must be thoughtfully developed. This data, keeping in mind the mechanics of deposit, must be considered before reaching a conclusion and offering an expert opinion relating to how the deposit was produced. The more information, the more specific the conclusion can be.

One of the primary points of interest in gunpowder deposition interpretation is distance, commonly referred to as proximity testing. How far was the firearm muzzle from the target at the time of firearm discharge?

When gunpowder particles are present on the fabric target medium, there are four important characteristics to be considered when pondering a conclusion specifying a distance.

1. Type of powder present, specifically, is it typical of the weapon and ammunition suspected of being used.
2. Pattern of distribution. The powder pattern shape and how it is oriented relative to the point of bullet penetration.
3. Density of powder particle deposition.
4. Penetration level. If powder particles have penetrated the surface of the target medium, to what depth are they lodged?

In a recent case where a man had been fatally shot in the groin area, his clothing was examined in the laboratory. The firearm, a Smith and Wesson .357 magnum revolver, was found at the scene and submitted as well. Ammunition remained in the weapon so appropriate ammunition could be purchased and used in testing. The entry hole was in the bottom of the zipper placket in the crotch of the victim's black denim pants. A heavy concentration of unburned gunpowder was deposited around the entry hole and lesser amounts were noted out to distances of two to three inches with individual particles further out. This pattern suggests contamination and transfer during the collection and preservation stages. Since this was a thick area of fabric and the victim fell to, and remained on his back, there was no blood on the exterior surface to help keep the powder particles from migrating, however the heavy concentration at the entry hole indicated a close range discharge. Examination of the victim's white cotton brief underwear revealed the presence of gunpowder at the edge of the bullet penetration hole in the crotch. The hole in the denim pants was through an area made up of seven layers of fabric comprising a seam and folded fabric of the bottom of the zipper placket. Laboratory testing, using seven layers of denim fabric on one layer of white cotton brief fabric on a firm backing, resulted in gunpowder being deposited on the underlying white cotton when the firearm muzzle was within 4 inches, or closer, to the target.

Under other conditions and circumstances, such on hard surface targets, only tiny traces of gunpowder may be present making distance determinations very difficult, if possible at all. On painted surfaces, such as automobiles, the paint may be damaged as a result of the gunpowder particle impact. In the case of plastic surfaces, again the surface may be damaged by gunpowder particle impact and/or exhibit heat associated with the discharge. In another recent case, an assault rifle chambered for 7.62 X 39 mm ammunition was suspected of being fired into the upper corner of the inside surface of a door of a pickup truck. A penetrating bullet defect was found in a painted metal surface in this area. A smoke pattern was noted on the plastic panel adjacent to the metal surface with the bullet hole. Additionally, gunpowder particle impact damage was noted around the bullet entry defect. Test firing into painted metal vehicle panels was conducted until a similar damage pattern was produced which showed that the muzzle of the firearm was within four to six inches of the door when it discharged.

In another unrelated case, bullet damage was noted in the interior front passenger's side door panel of a passenger car. There was speculation that the victim of a fatal through and through shooting was shot while sitting in this vehicle. Examination of the door panel in the laboratory revealed a gunpowder particle attached to the edge of the bullet entry defect in an area down inside the map pocket. This evidence detail

ruled out the possibility of the victim being shot in a position where the fatal bullet exited her body and penetrated the door panel.

Research should be conducted to provide data to help practitioners properly evaluate gunpowder deposit and damage characteristics involving, skin, bone, a variety of wood surfaces, a variety of fabrics, leather surfaces and plastic surfaces, to name a few.

Gunpowder, Proximity, Pattern