B99 Forensic Implications of a New Polymer Bullet

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Learning Overview: After attending this presentation, attendees will have an understanding of the manufacturing process for this non-traditional polymer bullet, its behavior at impact with some common substrates, and its composition and microscopy.

Impact on the Forensic Science Community: This presentation will impact the forensic science community by showing the challenges to correlating a polymer bullet to the firearm using comparison microscopy.

A few years ago, a new entry into environmentally friendly ammunition appeared on the commercial market. PolyCase® Inceptor® ammunition, out of Savannah, GA, has created a new bullet design and construction. PolyCase® Inceptor® ammunition has some novel design features in all of their marketed products, specifically the construction and unique shape of their ARX® Defense bullet. Prior studies have shown that traditional jacketed and hollow point bullets have predictable interactions with many yielding and non-yielding intermediate substrates. The newly marketed ARX® Defense bullet behaves quite differently than previous bullet designs. Not only is the bullet lead free, it is comprised of a metal-polymer matrix, manufactured using an injection molding process. This manufacturing process does not lend itself to a traditional hollow point design; however, the bulletsmiths at PolyCase® Inceptor® ammunition have devised a unique alternative to a cavity in the form of three large "flutes" in the ogive of the bullet. The resulting non-expanding design of the ARX® Defense bullet is lightweight and, thus, travels faster than its lead or jacketed counterpart.

To determine the ingredients of this new line of polymer bullets, samples were deconstructed by dissolving the polymer in a suitable solvent, which allowed the metal spheres to settle to the bottom of the vessel. The metal spheres were assessed with scanning electron microscopy/energy dispersive spectroscopy, which as the manufacturer acknowledges, were found to be copper. Infrared spectroscopy revealed that the polymer is nylon. Nylon is by no means a newcomer to ammunition, as it has been used as a coating in some calibers, notably .38 Special, for decades. However, in the old S&W® and Federal® offerings, whether in .38 Special or their other calibers, the nylon merely encased a lead core. This is where the PolyCase® Inceptor® ammunition differs substantially, as the lead core has been eliminated.

Several calibers and styles of PolyCase® Inceptor® ammunition were test-fired at various barriers, including concrete block, gypsum drywall, paneling, plywood, architectural glass, windshield glass, and sheet metal of different thicknesses or gauges. Automobile sheet metal provided the most characteristic bullet holes when perforated by the fluted ARX® Defense bullets as compared to traditional hollow point or full metal jacket bullets. The fluted ARX® Defense bullets consistently created holes in the sheet metal that were triangular in shape. The larger the caliber, the larger the size of the triangular bullet hole. The results were replicated using firearm barrels with both left-hand and right-hand twist directions, and different barrel lengths, which offered slightly different velocities as measured with a chronograph near the muzzle of the firearm. These variables did not have a visible effect on the shape of the holes created.

In addition to assessing the bullet hole itself, high-speed photography revealed that a piece of metal was being dislodged from the substrate by the bullet's impact. To capture this "punchout" or "plug," ballistic gelatin was placed near the anticipated exit hole of the bullet, which allowed recovery of many of the small metal pieces that were dislodged. Interestingly, these metal pieces were also triangular in shape, whereas punchouts or plugs from traditional hollow point or full metal jacket bullets are rosette or circular, respectively.

Last, comparison microscopy was attempted in an effort to associate a fired bullet to the firearm from which it was fired.

Polymer Bullet, Inceptor® ARX® Ammunition, Microscopy

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