



### A164 The Buffer Zone

Peter J. Diaczuk, BS\*, 445 W 59th Street, New York, NY 10019-2925; and Jack Hietpas, PhD, 24 E 3rd Street, Apt 3, Frederick, MD 21701

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The goal of this presentation is to introduce attendees to the forensic significance of shotgun shell buffer material used by different ammunition manufacturers.

This presentation will impact the forensic science community by showing the discriminating potential of this type of physical evidence if present at a shooting scene.

The multi-projectile shotgun shell is more complex than standard handgun- or rifle sealed-metallic cartridge ammunition. Besides the enclosure, primer, and propellant, the unfired shotgun shell contains a payload that may consist of a single projectile or metallic shot in a variety of sizes. Metallic shot is predominantly made of lead alloys; however, non-lead alloys or metals (e.g., tungsten or bismuth), with specific properties that influence the behavior of the fired pattern, are also common. Many shotgun ammunition manufacturers use a soft additive (buffer) in their product. Buffer materials usually consist of small polymer granules or spheres. These are commonly added to larger-sized shot (e.g., buckshot) and some smaller loads (e.g., turkey shot). The commingling of the softer polymer buffer with the harder metal pellets provides a cushioning effect that reduces deformation of the pellet's spherical shape. This is important because maintaining the uniformity of the pellets during their sudden acceleration and energetic travel down the barrel will allow the pellets to maintain stable, consistent, and predictable aerodynamic properties during flight to the target.<sup>1</sup> When one of these buffered shotgun shells is fired, the numerous polymer granules are also discharged along with the pellets and wading, but being so much lighter and smaller than the pellets, the buffer does not travel as far.<sup>2</sup> Nevertheless, in spite of their light weight, buffer granules can become imbedded in close-range wounds or clothing as well as become scattered several yards downrange of the muzzle.<sup>3</sup> This research was undertaken to determine whether it is possible to differentiate shotgun shell brands and manufacturers on the basis of the physical and chemical properties of their buffer materials. The ability to associate a sample of buffer, recovered from a crime scene, to a specific ammunition manufacturer may provide valuable information to shooting scene reconstructions. For this research, several brands of ammunition were obtained. The buffer material (both pre- and post-discharge) for each brand was characterized using micrometry, micro-melting point, and micro-Fourier Transform Infrared (FTIR) spectroscopy. The comparison of pre- and post-discharge samples revealed that there were no significant changes in the size or shape after firing. Stereomicroscopy revealed morphological differences among the unfired buffer material used by some of the different manufacturers, as did particle micrometry. Infrared (IR) spectroscopy revealed that, within the analyzed samples, Winchester<sup>®</sup> used polyethylene for their buffer while Remington<sup>®</sup> and Federal<sup>®</sup> used polypropylene. Detailed inspection of the IR spectra revealed differences that differentiated Remington<sup>®</sup> and Federal<sup>®</sup> brands.

#### References:

2. Haag, L.C. 2006. *Shooting Incident Reconstruction*. Burlington, MA: Elsevier/ Academic Press. 242 p.
  3. Randall, B. and Newby, P. 1992. Ballistic characteristics of shot shell buffer. *J. Forensic Sci.* Vol. 37, No. 4, pp. 1023-1029.
  4. Haag, L.C. 2013. Range of fire determination from the pseudostippling of skin by shotshell buffer material. *Am. J. Forensic. Med. Path.* Vol. 34, No. 1, pp. 56-62.
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#### Buffer, Shotgun, Reconstruction