



## E15 An Evaluative Look at Shotguns: Pellet Spread

Kimberly Butler-Derose, MFS\*, National University, La Jolla, CA 92037; Ismail M. Sebetan, MD, PhD\*, National University, La Jolla, CA 92037-1011; Paul Stein, PhD\*, National University, La Jolla, CA 92037; Amy Zimmer, MS, San Diego, CA 92101

**Learning Overview:** The objectives of this study were to determine: (1) if shotgun shells from different manufacturers would produce the same pellet count and pellet spread; (2) if those variables could be used to differentiate between 12-gauge and 20-gauge shotguns; (3) if pellet spread (impact area) correlates with firing distance; and (4) test the widely held concept that one inch of pellet spread is equal to one yard in muzzle-to-target firing distance.

**Impact on the Forensic Science Community:** This presentation will impact the forensic science community by establishing more accurate assessment of firing distance and observations of impact area as they relate to possible crime scenes where it is unknown what weapon and ammunition utilized. This could provide important investigation leads as well as corroborate any suspect or eyewitness statements.

At a firing range and target set-up, 12- and 20-gauge shotguns were used. The 12-gauge shotgun was an FNH SLP™ competition semiautomatic shotgun, full choke, 24-inch barrel. The 20-gauge shotgun was a Winchester® Model 12 pump-action, full choke, 24-inch barrel. These were used to test fire various brands of shotgun ammunition: Estate®, Remington®, and Seller-Bellot®. After firing 196 shells, the average values for pellet count, pellet spread area, and correlation with shotgun used and firing distances were analyzed for statistical significance ( $p < 0.05$ ) with an Analysis of Variance (ANOVA) and Regression Analysis tests.

The results indicated that firing distance and shotgun pellet spread were correlated. The data refuted the long-held notion that every inch of pellet spread is equal to a one-yard distance to the shooter. Additionally, it was determined that the pellet pattern alone could not be used to distinguish between the 12- and 20-gauge shotguns. The pellet count is different between gauges; but due to the amount of damage caused by close range shooting (<12 yards), is not an accurate assessment. No significant difference ( $p > 0.05$ ) was observed in the pattern between Estate®, Remington®, and Seller-Bellot® (00 buck). More importantly, when comparing firing distance and pellet spread, a significant difference was observed, ( $p < 0.0002$ ). Regression Analysis of spread at impact area vs. distance gave a  $R^2$  value of 0.97. This indicates a very strong and significant correlation ( $p = 0.01$ ). In conclusion, this study has provided a solid foundation to build upon in future research that will provide a new standard to accurately and quickly judge distance to shooter from pellet spread.

### Crime Scene Reconstruction, Forensic Ballistics, Shotguns