

ANIMAL WELFARE

Title: Determining the efficacy and safety of differing caliber/ammunition combinations for the humane euthanization and subsequent mass depopulation of market weight pigs. **NPB# 20-115** - revised

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Scientific Abstract:

The use of a firearm is generally considered both a safe and efficacious means of euthanizing market weight pigs. That said, there is little to no scientific evidence demonstrating the aforementioned factors when considering the multiple caliber/ammunition combinations that are readily available for use in mass depopulation events. Moreover, no tangible procedural guidelines have been developed in so that proper and consistent assessments of both efficacy and safety can be measured and quantified. Heads of an equal number of barrows and gilts ($n = 64$) were collected from a federally inspected packing facility and randomly assigned to one of four caliber/ammunition combinations consisting of the .22 LR (A), .22 Mag (B), 0.38 Special (C) and 9mm (D). Fully jacketed ammunition was discharged from each of the four unique firearms while ensuring that the distance from the muzzle to the forehead was consistent (5-inches). A hammer block malfunction occurred in the firearm firing the 0.38 Special bullet on day two of assessment lessening the total heads available for assessment ($n = 60$). The MIXED procedure of SAS (SAS Inst. In., Cary, NC) was used to test the fixed effects of sex (barrow, gilt), caliber (.22 LR, .22 Mag, 0.38 Special, 9mm), and a lack of skin at the point of bullet placement (0, 1) while the DIFF option was used to separate differences in LSMEANS. Differences in least squares means were deemed significant at $P \leq 0.05$. Head weight significantly differed among sexes ($P = 0.05$) yet was accounted for via randomization to caliber/ammunition and insignificant when assessing treatment groups ($P = 0.28$). A lack of skin at the point of bullet placement did not significantly influence ($P > 0.10$) any measured variable other than head weight ($P = 0.003$). No differences in skull thickness existed between sex ($P = 0.32$) or caliber/ammunition combination ($P = 0.34$). There was no difference in entrance wound diameter between the .38 Special and the 9mm ($P = 0.15$) yet the entrance wound diameter of the .38 Special and 9mm was significantly

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larger than both the .22 LR and .22 Mag ($P < 0.0001$). There was no difference in the distance the bullet traveled into the head for any caliber/ammunition combination ($P = 0.91$). The 9mm bullets traveled further into the ballistic gel ($P < 0.0001$) and the furthest total distance ($P < 0.0001$). Bullets from the .38 Special traveled further into the ballistic gel and a further total distance than both the .22 LR and .22 Mag ($P < 0.0001$). There was no difference in the surface area of the bifurcated brains when measured in square inches ($P = 0.44$) nor was there a significant difference in the measurable trauma area of the brain for the 9 mm bullets compared to .38 Special bullets ($P = 0.83$). The measurable trauma area of the brain was greater for the 9 mm bullets and the .38 Special bullets when compared to .22 LR or .22 Mag, respectively ($P < 0.0001$). There was no difference in the measurable trauma area of the brain for the .22 LR bullets compared to .22 Mag bullets ($P = 0.12$). The measurable trauma area of the brain was greater in males than females ($P = 0.03$).