

Comparison of bolt penetration depth by low-cost penetrating captive-bolt devices used for cattle euthanasia on the farm

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Introduction

Comparative studies are lacking to guide low-cost penetrating captive-bolt device (PCB) selection for on-farm cattle euthanasia. This study aimed to compare bolt penetration depth (BPD) of 3 such devices available in Canada. We hypothesized that the cheapest PCB would have a lower BPD than the higher cost PCBs tested.

Materials and methods

Three devices, listed by ascending cost (9mm [approximately .35"] Blitz-Kerner/252] red cartridge [BK], .25" Jarvis BA-BOOM/407] red cartridge [JBB], and .25" Matador SS3000/406] red cartridge [MSS]), were fired in random order 7 times into a 20% ballistic gelatin block, then into 10 bovine cadaveric heads each (28 females and 2 males, 7-111 months). BPD was measured with an electronic caliper and by computed tomography, respectively. Data was analyzed with a one-way ANOVA, followed by Tukey's test to compare BPD between PCBs. *P*-value < 0.05 was considered significant.

Results

In gelatin, mean BPDs of both the JBB (6.7 ± 0.7 cm; $P < 0.0001$) and MSS (6.4 ± 0.1 cm; $P < 0.0001$) were significantly deeper than the BK (3.3 ± 0.5 cm). In the cadaveric bovine heads, mean BPD was deeper for the MSS (8.6 ± 0.6 cm) than the JBB (7.8 ± 0.7 cm; $P = 0.016$) and the BK (7.1 ± 0.5 cm; $P < 0.0001$); BPD was also deeper in the JBB group than the BK group ($P = 0.048$). Using cartridges with the kinetic energy recommended for adult cattle, the cheapest PCB (BK) showed less penetrating capacity than the others.

Significance

Though in vivo confirmation is necessary, the higher cost MSS may be preferentially selected over the BK and JBB for on-farm euthanasia of cattle to maximize depth of brain tissue disruption to maximize in vivo cerebral disruption.

