

## ANIMAL WELFARE

**Title:** Effectiveness of non-penetrating captive bolt (Zephyr) and restraint for euthanasia of piglets from birth to 9 kg – **NPB # 09-190**

**Investigator:** Dr. Tina Widowski

**Institution:** University of Guelph

**Co-investigators:** Teresa Casey-Trott, Suzanne Millman, Patricia Turner and Stephanie Nykamp

**Date Submitted:** March 11, 2011

### SCIENTIFIC ABSTRACT

The overall objective of this project is to test the effectiveness of a non-penetrating captive bolt (Zephyr) for the euthanasia of piglets up to 9 kg (20 lbs). The study was completed in two trials. In Trial 1 we tested the effectiveness of the NPCB on 100 low viability piglets < 72 hrs of age ( $1.04 \text{ kg} \pm 0.03 \text{ SE}$ ), Piglets were monitored continuously for rhythmic breathing, neuromuscular leg spasms, and heartbeat until full cardiac arrest (FCA). Brainstem and spinal reflexes were used to assess sensibility from the time of application until the end of leg spasms. Macroscopic scoring was done at necropsy on all 100 piglets. CT scans and microscopic analyses of sectioned and stained brains from a sample of 10 piglets were also used to assess degree of skull fracture and brain hemorrhage. All 100 piglets were immediately rendered insensible without return to consciousness. Leg spasms ceased in 229 sec ( $\pm 9.2 \text{ SE}$ ) and time to FCA was 444 sec ( $\pm 18.7 \text{ SE}$ ). Five piglets required a secondary step (exsanguination) due to a sustained heartbeat for > 10 minutes. Skull fracture displacement (FD) averaged 6.2 mm ( $\pm 0.07 \text{ SE}$ ) and a severe hemorrhage severity (HS) score was observed in 50% of piglets scored from by CT scans. Macroscopic scoring indicated moderate to severe damage in 100% of piglets, and histological analysis found moderate subdural (HSD) and parenchymal (HP) hemorrhage in 70% and 50% of piglets, respectively.

---

These research results were submitted in fulfillment of checkoff-funded research projects. This report is published directly as submitted by the project's principal investigator. This report has not been peer-reviewed.

---

For more information contact:

National Pork Board • PO Box 9114 • Des Moines, IA 50306 USA • 800-456-7675 • Fax: 515-223-2646 • [pork.org](http://pork.org)

---

In Trial 2 we applied the NPCB to five piglets in each of four weight classes (3, 5, 7, and 9 kg) Since this was a novel technique for piglets > 5 kg, the piglets were first anaesthetized with 71.4 mg/ml ketamine, 14.3 mg/ml xylazine and 1.4 mg/ml butorphanol 0.2 mL/kg IM to eliminate pain and distress if the technique was not effective. Only one piglet (at 8.7 kg) required an additional shot due to presence of rhythmic breathing. Breathing was immediately absent in all other piglets. Leg spasms ceased in 148 sec ( $\pm$  12.4 SE). A secondary method (sodium pentobarbital 100 mg/kg) for euthanasia was required for one piglet due to sustained heartbeat. All other piglets reached FCA in 371 sec ( $\pm$  17.9 SE). FD averaged 9.38 mm ( $\pm$  0.84 SE) with mild HS in 65% of piglets scored. Moderate to severe macroscopic damage was reported in  $\geq$  90% of piglets. 50 % of piglets had mild and 50 % had moderate HSD . Only one piglet had no parenchymal HP (5.0 kg) although parenchymal hemorrhage was detected in this same piglet on its CT scan. In comparison to the brain lesions of neonatal piglets, damage was less severe in the anaesthetized piglets (Mann-Whitney test for ordinal data: HS:  $p=$ .001, HSD:  $p=$ 0.007; HP:  $p=$ 0.041) despite greater FD (t-test:  $p=$ .019). Although brain damage in the anaesthetized piglets was less severe than that of the conscious neonates, the Zephyr still caused parenchymal brain lesions and effectively induced cardiac arrest in all but one piglet. The next trial will test the effectiveness of the NPCB on conscious piglets up to 9 kg.