Comparison of CO$_2$, blunt force trauma, and non-penetrating captive bolt euthanasia methods in nursery pigs

David Dykshorn$^1$; Tara Donovan, DVM$^2$
Iowa State University$^1$; $^2$The Hanor Family of Companies

Recently, in the industry, there has been a lot of scrutiny on the euthanasia of nursery pigs with blunt force trauma. The Hanor Family of Companies has addressed this issue by researching alternative methods of euthanasia in their Illinois, two-flow system nurseries. Over a period of eleven weeks (May - August), 381 pigs were euthanized either by CO$_2$ gas, a non-penetrating captive bolt gun (NPCB), or by blunt force trauma. The data from these trials were obtained by one coordinating investigator and then compared as each method was analyzed. The purpose of the study was to explore CO$_2$ and NPCB-gun euthanasia as a safe, practical alternative to the blunt force trauma euthanasia of nursery pigs, and in the process, develop reliable protocols for each of these alternative methods that can be implemented efficiently throughout all the company nurseries.

Beginning in May, the investigator began trials on pigs identified for euthanasia at the four nursery sites. A portable CO$_2$ chamber was primarily used in one flow of pigs located at two different sites. This chamber was made up of an air-tight, plastic box connected to a CO$_2$ tank all upon a movable cart. The data retrieved from use of this chamber included but was not limited to: pig age, weight, total number of pigs in the chamber at one time, respiratory condition of each pig, the amount of time the pigs were exposed to the gas, and the amount of time they spent inside the chamber before death was confirmed. Trials with different number of pigs and different gas exposure times were done until a consistent protocol with sufficient confirmed deaths and minimal gas usage was successfully replicated.

The blunt force trauma and NPCB-gun trials were completed throughout all four nurseries during that same time. A restraint box was used for the NPCB-gun euthanasia for safe holding of the pig during firing. The box was constructed with a lid that will pin the pig down in such a way that its head can stick out of a V-shaped hole. For each, data collection included but was not limited to: pig age, weight, respiratory condition of each pig, and how many strikes or fires it took until death was confirmed.

Using the CO$_2$ unit, 161 total pigs were euthanized. The initial procedure consisted of 1-2 minutes of gas on followed by 3-4 minutes of wait period where pigs were left in the container with gas off and the valve closed. This procedure resulted in 83.9% success. After waiting another 5 minutes but not adding any more gas, this success rate was 91.3%. If the tank was primed for 2 minutes prior to use, the rate went up to 95.83%. Using pig weights, total pigs in container and gas time on, a protocol was written: Prime the container with 100% CO$_2$ gas for 2 minutes. If there are $\geq$ 5 pigs in the container, run the gas for an additional 2 minutes. For < 5 pigs run the gas for an additional 3 minutes.

The results of the NPCB gun were 129 total pigs euthanized with a 97.7% success rate on the first shot. Of the 3 pigs not confirmed dead on the first shot the weights were 12, 17.5 and 45 lbs. The results of blunt force trauma were 60 total pigs euthanized with a 96.7% success rate on first strike. The weights of the two pigs that were not confirmed dead by first strike were: 8.5 and 12.5 lbs.

The CO$_2$ euthanasia in this system was reliable and effective once the protocol was established, and the discussion surrounding ‘quick’ is being debated. Considering CO$_2$ euthanasia, the period of anesthesia should be considered instead of time to confirmed death when comparing to the other “immediate” methods used in this project. NPCB is a quick, effective and reliable alternative to blunt force trauma, and the restraint device is a necessity to avoid injury to the operator. Further study is needed for cost comparison, and reliability of equipment over time.