pork checkoff™ factsheet
Pork Information Gateway

Captive Bolt Considerations when Humanely Euthanizing Pigs

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Background

It is imperative that one understands that the humane euthanization of livestock is at times necessary, yet more importantly, that it be conducted in a manner that quickly renders the animal unconscious and insensible to pain while also considering the safety of personnel. Factors such as human safety, animal welfare, practicality and technical skill requirements, cost, limitations, and aesthetics are all important considerations when determining the most appropriate method of humane euthanization[3]. Refer to the National Pork Board's in-depth brochure entitled: On Farm Euthanasia of Swine- Options for the Producer and the list of Internet sources provided within this fact sheet to ensure that you select the most appropriate method of euthanization for your specific situation.

Stunning Considerations

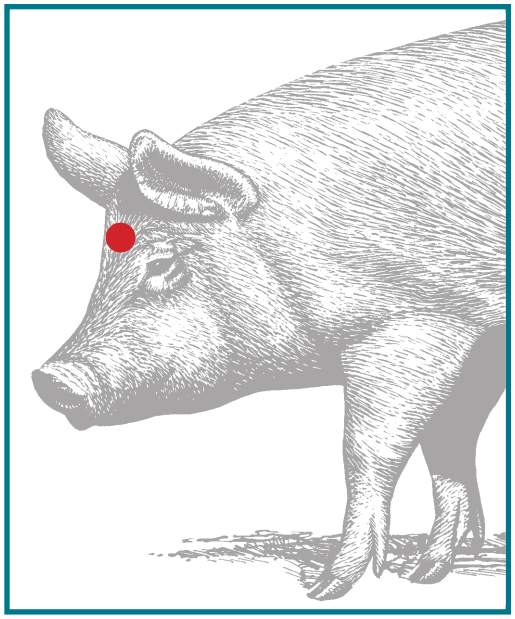
According to information from the American Veterinary Medical Association's Panel on Euthanasia[6] there are 12 general considerations that must be met when euthanizing an animal:

1. ability to induce loss of consciousness and death without causing pain, distress, anxiety, or apprehension
2. time required to induce loss of consciousness
3. reliability
4. safety of personnel
5. irreversibility
6. compatibility with requirement and purpose
7. emotional effect on observers or operators
8. compatibility with subsequent evaluation, examination, or use of tissue
9. drug availability and human abuse potential
10. compatibility with species, age, and health status
11. ability to maintain equipment in proper working order
12. safety for predators/scavengers should the carcass be consumed.

Proper Stunning

Proper stunning is dependant upon a multitude of factors which include but are not limited to 1) the maintenance, repair, and storage of the stunning device, 2) the placement of the stunning device in

the appropriate temporal region (Figure A), and 3) the use of the appropriate grain strength to ensure maximum bolt velocity (See appendix I). A case study conducted by Böck and Willmitzer[5] suggests that of the aforementioned factors, bolt velocity (a factor dependent upon maintenance, repair, storage, and grain strength) is the most important factor in determining the efficacy of a mechanical stun. The findings of Böck and Willmitzer[5] parallel a survey conducted by Grandin[2] which indicated that the most common cause of low captive bolt stunning efficacy was poor gun maintenance. Grandin[7] further suggests that the farm develop a system of verified maintenance procedures to ensure that all efforts are made to maximize bolt velocity and prevent misfiring and (or) partial firing. Refer to the manufacturer's instruction manual(s) for information pertaining to safe operating and cleaning procedures, trouble shooting, and the replacement of parts and repair of your specific stunning mechanism. In most instances, the manufacturer will provide a copy of their instruction manual(s) on the Internet in the event that the original copy has been lost or misplaced (refer to the Internet websites listed on the last page).



Device Placement

If applied in the appropriate manner, euthanasia by means of the captive bolt gun is thought to cause less fear and anxiety and induce a more rapid, painless, and humane death than can be achieved by most other methods[8]. To produce instantaneous unconsciousness, the bolt must penetrate the brain with a high concussive impact[9]. Given that the brain is relatively small and well protected by sinuses[10], proper device placement is critical. This said, it is strongly recommended that only trained personnel operate this stunning device. Refer to the illustration depicted below when determining the appropriate placement of the stunning device. Remember to be certain that the animal is restrained and that the device is held firmly against the surface of the head.

Post Stunning Observations

To ensure that the animal has been effectively rendered unconscious and insensible to pain, look for signs of consciousness such as

1. rhythmic breathing
2. vocalization
3. blinking
4. the eye responding to touch[2].

Gasping, gagging reflexes, and violent convulsions known as grand mal seizures are, however, the animal's normal reaction to proper stunning and signify unconsciousness[2]. Above all, you must confirm the death of the animal prior to disposal. The American Veterinary Medical Association's Panel on Euthanasia[4] suggests that death be confirmed by examining the euthanized animal for cessation of vital signs, giving special consideration to the animal species and method of euthanasia.

Figure A. Pistol stunner, Accles & Schelvoke LTD., Cash Special.

Description of existing captive bolt devices

Penetrative captive bolt stunners are currently manufactured as "pistol" (Figure A) and "cylindrical" (Figure B) shaped trigger operated stunners. Non-penetrating captive bolt stunning devices are available for use in cattle only. See Appendix II for additional details of available equipment. Regardless of the shape and manufacturer of the stunning mechanism, it is imperative that the operator has familiarized themselves with the instruction manual(s) and utilizes the appropriate grain strength. Manufacturers often provide color coded power loads (pink, purple, green, yellow, and black) that are both size and species specific.

Figure B. Cylindrical stunner, Schermer type RS/RX.

Standard Operating Procedures

The Iowa State University College of Veterinary Medicine[4] has developed the following checklist to aid in ensuring the safe and efficient operation of a captive bolt gun:. Checklist for safe operation of a captive bolt gun:

1. The captive bolt gun should only be used by trained operators
2. Never point the captive bolt gun at people.
3. Never leave the captive bolt gun unattended.
4. Take the animal in question to a secure area.
5. Have two people present at all times.
6. Restrain the animal by the use of a snare. The holder of the snare should stand behind the operator of the captive bolt gun.
7. Load captive bolt gun. Keep captive bolt gun pointed towards the ground.
8. Shoot animal - > 100 kg bleed out or pith.
9. Clean and maintain the captive bolt gun.
10. Return the captive bolt gun to a locked cupboard.

Appendix I - Cartridge Sizes and Air Pressures

Recommended cartridges - size, strength & marking (Humane Slaughter Association)

Animals	Model	Caliber	Cartridge	Headstamp
Very large (heavy bulls)	Cash 9000 Magnum	.25	4.0 Grain Black	AS, E or C
	Cash 9000 Magnum	.22	4.5 Grain Black	
	Cash 8000 Bulldozer	.25	4.0 Grain Black	
	Cash 9000 Magnum Knocker	.25	6.0 Grain Red Knocker	
	Cash 8000	.22	4.0 Grain Red	
Large (other large cattle, horses)	Cash 9000 Magnum	.22	4.0 Grain Red	AS, E or C
	Cash 8000 Cowpuncher	.22	3.0 Grain Green	
	Cash Special	.22	3.0 Grain Green	
	Cash 9000 Magnum Knocker	.25	5.0 Grain Green Knocker	
	Cox Mk 9 (obsolete)*	.22	3.0 Grain Green	
Medium (other cattle, deer, rams, goats, and pigs	Cash Special	.22	2.5 Grain Purple	AS, E or C
	Cash 9000 Magnum Knocker	.25	4.0 Grain Black Knocker	
	Cox Mk 10	.22	2.5 Grain Purple	
	Cox Universal	.22	2.5 Grain Purple	
Small (calves, sheep, small deer, lambs, & young goats)	Cash Special	.22	1.25 Grain Pink	AS, E or C
	Short Cash Special	.22	1.25 Grain Pink	
	Cox Mk 10	.22	1.25 Grain Pink	
	Cox Universal	.22	1.25 Grain Pink	
Air Pressures:	Lambs: minimum 85lb per square inch (5.86 bar)			
	Yearling Sheep: minimum 100lb per square inch (6.89 bar)			
	Rams & Large Ewes: minimum 120lb per square inch (8.27 bar)			

Trouble Shooting (Internet Sources)

The following websites will provide extra information on captive bolt usage.

I. General Information
1. pork.org
2. grandin.com
3. animalhandling.org
4. aamp.com

II. Manufacturer Information
1. acclesandshelvoke.com
2. karl-schermer.de/
3. entwistleguns.com

III. University Resources
1. vetmed.iastate.edu/deparments/vdpam/swine/productionmgt/transport/boltgun
2. vetmed.ufl.edu/lacs/HumaneEuthanasia/pref.htm
3. http://mark.asci.ncsu.edu/HealthyHogs/book2000/morrow.htm

References

[1]Grandin, T. 1997. *Good management practices for animal handling and stunning.* American Meat Institute, Washington, D.C.

[2]Grandin, T. Humane Stunning of Cattle and Pigs. *www.grandin.com*. (Accessed February 4, 2004).

[3]National Pork Board. 2001. On Farm Euthanasia For Swine- Options for the Producer.

[4]Iowa State University College of Veterinary Medicine. *www.vetmed.iastate.edu*

[5]Böck, W. and F. Willmitzer. 2000. Case Study: Parts of the community legislation in force of the EU Council Directive 93/119/EC of December 1993 on protection of animals at the time of slaughter or killing.

[6]TAB F SECTION 19: GUIDELINES FOR HUMANE EUTHANASIA OF ANIMALS: Information from the 2000 Report of the AVMA Panel on Euthanasia Excerpted from the Journal of the American Veterinary Association, Vol. 218, No.5, Pages 669-696 ©American Veterinary Medical Association, 2001.

[7]Grandin, T. 1999. *Good Manufacturing Practices for Animal Handling and Stunning. www.grandin.com.* (Accessed February 4, 2004).

[8]Grandin, T. *Captive Bolt Stunning. www.grandin.com.* (Accessed March 27, 2006).

[9]Shearer, J.K. and P. Nicoletti. *Procedures for Humane Euthanasia of Sick, Injured, and/or Debilitated Livestock. http://lacs.vetmed.ufl.edu/HumaneEuthanasia/gun.htm.* (Accessed March 27. 2006).

[10]Shearer, J.K. and P. Nicoletti. *Procedures for Humane Euthanasia of Sick, Injured, and/or Debilitated Livestock.: http://lacs.vetmed.ufl.edu/HumaneEuthanasia/anat.htm.* (Accessed March 27, 2006).

Appendix II - Details of Equipment Available

(Humane Slaughter Association)

Air-Fired		
Model	**Type**	**Use**
Cash Ramrod	Penetrative captive-bolt	Sheep only
Bullfighter	Penetrative captive-bolt	Cattle & sheep
Hatover Knocker	Penetrative captive-bolt	Cattle only
Cartridge-Fired		
Model	**Type**	**Use**
.25 Cash 9000 Magnum Knocker	Non-Penetrative captive bolt	Cattle
.25 Cash 9000 Magnum	Penetrative captive-bolt	Large cattle
.22 Cash Special	Penetrative captive-bolt	All species
.22 Cash 8000 Cowpuncher	Penetrative captive-bolt	Cattle only
.25 Cash 8000 Bulldozer	Penetrative captive-bolt	Large cattle
.22 Cash Magnum S	Penetrative captive-bolt	Large cattle
.22 Cox Universal	Penetrative captive-bolt	All species
.22 Cox Mk 9*	Penetrative captive-bolt	All species
.22 Cox Mk 10	Penetrative captive-bolt	All species
Matador Super Securit .25	Penetrative captive-bolt	Cattle only
Schermer ME	Penetrative captive-bolt	Cattle only
Schermer Knocker	Non-Penetrative captive-bolt	Cattle only
.22/.38 Entwhistle Adler *	Penetrative captive-bolt	All species

This device has interchangeable .22 and .38 breeches, available on request. When stunning very large and/or aged animals, the more powerful >.38 cartridge must be used.