

# Animal Behavior and Well-Being Symposium: Novel Techniques for Euthanasia

**8 Euthanasia—An overview of the AVMA's criteria and recommendations.** G. C. Golab\*, *American Veterinary Medical Association, Schaumburg, IL.*

Since 1963 the AVMA has convened a Panel on Euthanasia to evaluate methods and potential methods of euthanasia for the purpose of creating guidelines for veterinarians who carry out or oversee the euthanasia of animals. More than 70 individuals, including veterinarians and non-veterinarians with expertise across a range of disciplines and species, were engaged to research and create the 2011 update to the Panel's report (its eighth edition) titled the *AVMA Guidelines on Euthanasia*. Euthanasia techniques should result in rapid loss of consciousness followed by cardiac or respiratory arrest and the ultimate loss of brain function. In evaluating methods of euthanasia, the Panel used the following criteria: (1) ability to induce loss of consciousness and death with a minimum of 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; (13) legal requirements; and (14) environmental impacts of methods or carcass disposition. The various sections of the Guidelines address particular euthanasia techniques (e.g., inhalant agents, non-inhalant pharmaceutical agents, and physical methods) and the application of those techniques to various animal types, species, and uses (e.g., companion animals, food animals, laboratory animals, wildlife, aquatics). This edition of the Guidelines has been expanded and includes more detail about the techniques, covers more species, and more comprehensively considers the special needs and challenges posed by the range of environments and conditions under which euthanasia is conducted. This presentation will summarize the creation and content of the 2011 version of the *AVMA Guidelines on Euthanasia*.

**Key words:** euthanasia, *AVMA Guidelines on Euthanasia*

**9 Euthanasia of livestock: Public perception and influence.** S. R. Niekamp\*, *National Pork Board, Clive, IA.*

While livestock producers strive to maintain good health of all animals in their care, it is inevitable that an animal will become ill or injured. Euthanasia may be the best option for the animal's well-being in situations where ill or injured animals cannot be successfully treated. As the US population has become more urbanized, the contemporary consumer has become less familiar with the practices associated with raising livestock. There is currently a trend in the marketplace for certain consumer demographics to proactively learn more about the source of their food and how it was produced. Additionally, consumers have unlimited access to internet resources that depict livestock production practices. These resources often depict the production practice being performed incorrectly which raises more questions than they answer. While surveys indicate that customers do not hold retailers responsible for how animals are raised, consumers often look to their preferred food retailer for assurances and answers to their questions about how animals are treated on the farm. In effort to provide these assurances,

retail and foodservice customers turn to their suppliers for answers regarding on-farm practices. The euthanasia process has increasingly become a topic of interest for customers and consumers. Specifically, their questions focus on the timely application of euthanasia, the effectiveness and the aesthetics of the method used, and the attitude of the caretaker euthanizing the animal. Scientific validation of current methods of euthanasia, identifying and validating new and novel methods that account for aesthetics are 2 key aspects needed to effectively answer customer and consumer questions. Caretaker training is another key aspect as caretakers must know when it is appropriate to euthanize an animal that is ill or injured and how to properly apply the method so to minimize pain and suffering. The ability of livestock producers to effectively answer questions about euthanasia and other on-farm practices will help to build consumer trust in today's food system.

**Key words:** euthanasia, consumer, perception

**10 The signs of unconsciousness and death: How can we recognize them on the farm?** T. M. Widowski\*<sup>1</sup>, T. M. Casey-Trott<sup>1</sup>, and M. A. Erasmus<sup>2</sup>, <sup>1</sup>*Campbell Centre for the Study of Animal Welfare, University of Guelph, Guelph, Ontario, Canada,* <sup>2</sup>*Michigan State University, Lansing.*

All methods for euthanasia should begin with rapid loss of consciousness followed by full loss of brain function, respiratory failure and cardiac arrest. To ensure that death occurs without pain or distress, animals must be monitored for signs of unconsciousness until cardiac arrest is confirmed. The brainstem and cortex are primary brain regions associated with consciousness and arousal; therefore brainstem and nociceptive reflexes, similar to those used to determine effective stunning at slaughter or depth of anesthesia during surgery, are practical measures for determining loss of consciousness on the farm. Brainstem reflexes include corneal, palpebral, and pupillary light reflexes and the nictitating membrane reflex in birds. Unconscious animals do not blink in response to touching the eyelid or cornea and their pupils remain fixed and dilated when exposed to light. However, ocular reflexes are not always reliable indicators of anesthesia (pigs), and corneal reflexes can be observed during unconsciousness even after damage to the cerebral cortex if the brain stem remains intact (e.g., head only electrical stunning). Therefore, using a combination of measures including nociceptive reflexes, such as the pedal and anal reflexes (withdrawal response to a sharp pinch or prick) is most useful. If the animal is not paralyzed and is able to show a motor response, absence of withdrawal responses to painful stimuli indicates that the animal no longer perceives pain. In addition to the sensory reflexes, several types of behavioral observations can be used for assessing effectiveness of euthanasia. These include absence of rhythmic breathing and absence of vocalizations. Collapse and loss of muscle tone occurs with the onset of unconsciousness and a limp jaw or tongue is a reliable indicator of insensibility in pigs and cattle. Clonic muscle spasms (seizures), characterized by kicking, wing flapping or paddling, and tonic muscle spasms, characterized by rigid extension of the limbs, are associated with some euthanasia techniques. These neuromuscular spasms are involuntary, and should not be confused with deliberate movements or escape attempts.

**Key words:** euthanasia, unconsciousness, reflexes

**11 Novel euthanasia technologies for the pig.** S. T. Millman\*, *Veterinary Diagnostic & Production Animal Medicine, Iowa State University, Ames.*

In a systematic review of the scientific literature, there are relatively few studies providing empirical data about on-farm swine euthanasia. Recently, specific calls for research proposals have been issued for swine euthanasia, and several novel technologies are emerging. Furthermore, researchers are refining techniques to measure the aversiveness and efficacy of euthanasia methods. Mechanical methods of euthanasia, including penetrating and non-penetrating captive bolt technologies, are based on disruption of brain function resulting from impact of a solid object with the skull. Postmortem examinations indicate that head injuries are likely to be fatal when there is hemorrhage within the brain stem. The AVMA Guidelines for Euthanasia (2007) states "non-penetrating captive bolt must not be used as a sole method of euthanasia," but recent research results indicate new devices are capable of inducing death without risk of return to consciousness for some weight classes of pig. In the OIE Terrestrial Code, it is recommended that penetrating captive bolt be followed by pithing or bleeding when used for swine, but a new generation of captive bolt device has been shown to be an effective single step euthanasia method for all but the largest weight class of pig. Euthanasia using gases such as carbon dioxide and argon have been developed for the suckling and market weight pig, and present some advantages over mechanical methods. Novel gas delivery systems for on-farm use may provide opportunities to refine flow rates and gas mixtures for more humane induction of insensibility. Novel electrical methods have been explored for suckling pigs and breeding stock. Since all euthanasia techniques have trade offs, there is no Gold Standard for on-farm swine euthanasia and considerations for animal welfare, worker health, carcass disposal and public health must be weighed in each situation. Further research is needed to address challenges associated with swine euthanasia including reliable techniques for the mature sow and boar, methods of restraint, tools for decision making about humane endpoints,

safeguards for safety and psychosocial effects imposed on those performing this task.

**Key words:** animal welfare, euthanasia, swine

**12 Euthanasia techniques for dairy and beef cattle.** J. K. Shearer\*<sup>1</sup>, J. P. Reynolds<sup>2</sup>, D. D. Griffin<sup>3</sup>, and G. Johnson<sup>4</sup>, <sup>1</sup>*Iowa State University, Ames,* <sup>2</sup>*Western Veterinary College, Pomona, CA,* <sup>3</sup>*University of Nebraska, Lincoln,* <sup>4</sup>*Reedsburg, Wisconsin.*

The physical methods for conducting euthanasia in cattle include gunshot and captive bolt. Euthanasia may also be accomplished by the parenteral administration of an anesthetic in an amount capable of causing death. This latter method requires a veterinarian to administer the drug and creates residue problems that limit carcass disposal options. There are few methods as humane as gunshot or penetrating captive bolt combined with a secondary step to ensure death such as exsanguination, the rapid intravenous injection of a saturated solution of potassium chloride or possibly pithing of the brain and upper spinal cord. When properly performed, both gunshot and captive bolt meet the objectives of inducing immediate loss of consciousness and rapid death without pain or distress to the animal. In most circumstances on the farm or ranch, gunshot is the most practical method of euthanasia. A 0.22 long rifle solid point bullet fired from either a pistol or rifle is sufficient for young animals. Higher caliber firearms are required for consistent results with adult animals. Proper placement of the bullet is essential and best achieved by holding the firearm within 12 to 24 inches of the intended target. Firearms should never be held flush with the skull. On the other hand, when penetrating captive bolt is used, the device must be held flush over the intended anatomical site. The preferred anatomical site is on the intersection of 2 lines each drawn from the rear corner of the eye to the base of the opposite horn.

**Key words:** euthanasia, euthanasia techniques, cattle euthanasia