

Xylazine sedation and gunshot for depopulation of cattle

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Abstract

A depopulation protocol utilizing intramuscular sedation with xylazine followed by euthanasia via gunshot was evaluated for effectiveness and practicality in a group of 43 feedlot calves in a commercial feedlot setting. Sedation and euthanasia were successful in all 43 calves. The time required to complete the procedure was 46 minutes from the first xylazine injection to the last gunshot. Utilization of this depopulation method demonstrates that cattle in a commercial feedlot can be euthanized in a rapid manner that is practical and efficient, while also maintaining an acceptable level of animal welfare. Expansion to larger herds, including the total population of a large feedlot, may still be challenging. The use of this depopulation method should be considered for future livestock emergencies.

Key words: depopulate, depopulation, cattle, calves, feedlot, euthanasia

Résumé

Des désastres naturels ou des flambées de maladie peuvent nécessiter une réduction de la population dans les grands troupeaux bovins. Il y a présentement un manque d'information dans la littérature concernant des méthodes pratiques de réduction de la population dans les grands troupeaux bovins commerciaux. Un protocole de réduction de la population incluant la sédation intramusculaire avec de la xylazine suivie de l'euthanasie par coup de feu a été évalué pour son efficacité et son côté pratique dans un groupe de 43 veaux dans un parc d'engraissement commercial. La sédation et l'euthanasie ont été réussies chez tous les veaux. Le temps requis pour compléter la procédure était de 46 minutes du moment de l'injection de xylazine au coup de feu final. L'utilisation de cette méthode de réduction démontre que les bovins dans un parc d'engraissement commercial peuvent être euthanasiés rapidement de façon efficace et pratique tout en maintenant le bien-être animal à un niveau acceptable. Le déploiement à de plus grands troupeaux, incluant toute la population dans un grand parc d'engraissement, pourrait être ardu. L'utilisation de cette procédure de réduction devrait être considérée dans d'éventuels cas d'urgence avec des bovins.

Introduction

The United States has an expansive livestock industry with many operations maintaining very large, concentrated herds, such as in feedlots and dairies. Historically, in the event of an emergency, such as a disease outbreak or a natural disaster, depopulation of some large herds was considered necessary for disease control, food safety, or animal welfare reasons. According to the American Veterinary Medical Association's (AVMA) 2019 Guidelines for the Depopulation of Animals, depopulation is "the rapid destruction of a population of animals in response to urgent circumstances with as much consideration given to the welfare of the animals as practicable. Urgent circumstances may include emergency situations, such as the need for immediate disease control or a response to natural or human-made disasters."³ The AVMA's 2013 Guidelines for the Euthanasia of Animals outlines several methods of euthanasia which are acceptable as depopulation techniques.⁴ However, the urgency of a situation which necessitates depopulation and challenges with carcass disposal often makes the use of many methods of euthanasia, such as intravenous injection of barbiturates, not practical.

Furthermore, few methods for depopulating large herds of livestock in outdoor housing systems have been evaluated. One survey of a panel of experts examined the use of several methods of euthanasia/depopulation including injectable pharmacological agents, ingestible toxic substances, and physical methods of euthanasia, but concluded that depopulation of a large feedlot during a disease outbreak would be difficult to complete in a humane and timely fashion.⁵ Another study evaluated the use of a portable pneumatic captive bolt device on 66 head of steers over 7 days. The method was determined to be an effective single-step method for euthanizing cattle;² however, this method requires a specialized piece of equipment that is not routinely accessible to practicing veterinarians or livestock producers. Further, while the study validated the method was effective for euthanasia, the paper did not address practical issues for quickly euthanizing large numbers of cattle. All current options for depopulating large cattle herds face challenges with carcass disposal, availability of resources and equipment, personnel safety, or animal welfare considerations.

A case of accidental lead exposure in 2 pens of cattle at a commercial Kansas feedlot provided an opportunity to

evaluate a depopulation strategy using an intramuscular injection of xylazine to sedate feedlot cattle prior to euthanasia by gunshot. Forty-three animals had lead residues that would preclude them from being marketed for human consumption or rendered. Upon consultation with the Kansas State Veterinary Diagnostic Laboratory and officials with the Kansas Department of Agriculture, the decision was made to depopulate and dispose of these cattle. The description of the case and depopulation process was provided to the authors to report with the request that the feedlot facility and personnel remain anonymous.

Materials and Methods

The attending veterinarian for the feedlot and a veterinarian with the Kansas Department of Agriculture completed all steps included in the depopulation procedure. Forty-three calves weighing approximately 600 lb (272.7 kg) were calmly moved through the feedlot facility's alley way and chute system. Xylazine (100 mg/mL) was administered intramuscularly to each calf at a dosage of 5 mL per animal or 0.83 mg/lb (1.84 mg/kg) with a 16-gauge, 1.5 inch (3.8 cm) needle. Calves were released from the chute and directed to a 16 foot wide cattle alley. The cattle were allowed to lay down in the alley as the xylazine took effect. After the calves had been injected and laid down they were individually euthanized using a single shot to the brain from a 12-gauge pump-action shotgun with 12-gauge, 2 ¾ inch, #4 shot shotgun shells, which is an appropriate method of euthanasia for this class of cattle.⁴ The anatomic site used for optimal shot entry was the intersection of 2 lines each drawn from the outer corner of the calf's eyes to the base of the opposite horn with the shotgun positioned perpendicular to the skull.¹ The distance of the shotgun muzzle to the target ranged from 1 to 3 feet (0.3 to 0.9 m). For calves in lateral recumbency rather than sternal recumbency, the shotgun operator positioned himself to maintain consistent positioning relative to the target. All calves were recumbent at the time of euthanasia. A single firearm was used to euthanize all calves. Death was confirmed for each calf, and all carcasses were transported to a landfill for disposal.

Results

Approximately 15 minutes were required to complete the process of administering injections to all 43 calves. Each calf became unsteady on its feet and began to lay down about 10 minutes following xylazine administration. Within 10 minutes of the last calf being sedated, the veterinarian was able to enter the alley to begin the euthanasia process. At that time, 3 calves were still standing but unsteady; the remainder were recumbent and unresponsive. Calves did not respond to the sound of the shotgun. Sedation to the point of the calf laying down was successful in all 43 calves, (exact 95% confidence interval for sedation success 0.918 –

1^a). The sedated calves remained unresponsive throughout the time required to complete the euthanasia process. The entire process of sedating and euthanizing the calves was completed in 46 minutes. Time required to bring the cattle to the handling facilities and time required for carcass removal and disposal were not recorded. No shot pass-through was observed for any calf during the euthanasia process. The number of shots fired from the shotgun caused the barrel of the firearm to become hot to the touch by the end of the euthanasia process.

Discussion

The veterinarians administering the protocol noted that calmly handling the cattle allowed the medication to work smoothly and rapidly. They also noted that releasing the cattle into an open pen instead of an alley would have allowed the cattle to spread out and lay down further apart from each other, thus better facilitating and expediting the euthanasia process.

This approach for depopulating cattle in a feedlot setting has some advantages over other depopulation methods, including speed and efficiency compared to euthanizing cattle in a chute with injectable barbiturates. In addition xylazine and shot shells are more accessible than barbiturates, and there are fewer record keeping requirements.

To the authors' knowledge, no other depopulation methods have been evaluated for length of time required to complete euthanasia in a commercial feedlot setting. Despite the lack of comparison studies for the process outlined in this report, the time required to depopulate the cattle utilizing this process is compatible with the speed needed to euthanize animals in most depopulation scenarios.

Resources and equipment used for the method of depopulation described in this report are readily available and reasonably affordable compared to equipment required by other depopulation methods. Xylazine is relatively inexpensive and easily obtained from veterinary supply sources with a veterinarian's prescription. Firearms and ammunition are commonly kept on hand in many commercial feedlots as a practical, appropriate, and reasonably safe means of euthanasia. The AVMA's 2013 Guidelines for the Euthanasia of Animals state that, "Shotguns loaded with shot shells (number 4, 5, or 6) have sufficient energy to traverse the skull but, unlike the possibility of bullets from either a handgun or rifle, rarely exit the skull."³ When the firearm is handled by skilled and appropriately trained personnel, euthanizing sedated feedlot cattle with a shotgun is practical and reliably effective.

Despite the low likelihood of shotgun shot exiting the skull of the animal being euthanized, personnel safety should always be considered when using firearms. The AVMA's 2013 Guidelines for the Euthanasia of Animals recommends the use of penetrating captive bolt over gunshot when possible due to safety considerations;³ however, penetrating captive bolt guns are not as commonly accessible in feedlot facilities.

This depopulation procedure worked effectively and efficiently for the group of cattle on which it was used. While this procedure has the potential to be used effectively for larger groups of animals, several challenges remain. As mentioned above, heating of the firearm barrel was noticed during this procedure. Veterinarians that euthanized the calves in this report recommend that a single firearm be used to fire no more than 50 rounds in short succession, followed by at least an hour of cooling time, therefore the use of this protocol for euthanizing larger groups of cattle would require multiple firearms. Sourcing large quantities of xylazine and other resources, such as ammunition, may be difficult. A feedlot housing 10,000 calves averaging 800 lb in weight would require 66,000 mL or 1320 50 mL bottles of xylazine for sedation before gunshot. Gunshot euthanasia would also require 10,000 12-gauge shotgun shells with appropriate shot size. Sourcing this volume of xylazine and shotgun shells would likely render this method impractical for total depopulation of medium to large feedlots. This process is applicable when dealing with hundreds of animals in good facilities. It may be possible to apply it to thousands of animals; however, supply of xylazine and shotgun shells could quickly become limiting.

This project did not address additional time required to bring the cattle up to the working facility, nor time required to dispose of carcasses. Removal of euthanized animals from an alley way or pen would require time. In reality, carcass disposal using this euthanasia method may not differ from other euthanasia methods.

Conclusion

Overall, this report demonstrates that a subset of cattle in a commercial feedlot with adequate facilities and personnel can be depopulated in a rapid manner that is practical

and efficient while also maintaining an acceptable level of animal welfare. The use of this depopulation method should be considered during future livestock emergencies; however, implementation of this method for large herds is likely not practical.

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Endnote

^a StataCorp. 2011. *Stata Statistical Software: Release 12*. College Station, TX: StataCorp LP

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