Euthanasia decision making in ranches &feedlots

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Abstract

Beef cattle production veterinarianshave a responsibilityto train their clientsand help them make appropriate and timelytreatment, culling/railing,euthanasia, and emergency salvage slaughter decisions. There may be times, though, that veterinariansdo not agree with theirclient'sdecision on the treatment or final disposition of a distressed or compromised animal, which will be frustrating. To be credible production animal veterinarians whom clients trust, and thus,are more likely to follow recommendations, veterinarians mustunderstand beefproduction economics and practical,logistical realities on each beef cattle operation and take these into consideration when providing advice. There are well documentedbeef industry animal health, welfare, and transportationguidelinesfor sick and compromised cattle from the National Cattlemen's Beef Association (NCBA) (14-16), Animal Health Canada (7,10), Canadian Cattlemen's Association (CCA) (22),U.S.(USRSB) and Canadian Roundtables of Sustainable Beef (CRSB) (11,21), and Professional Animal Auditor Certification Organization (PAACO) (8,20). For veterinarians, there are similar guidelines from the American Veterinary Medical Association (AVMA) (5) andAmerican Association of Bovine Practitioners (AABP) (1-3). There may be additional federal or state/provincial regulations for the transport of compromised cattle that veterinarians and producers must be aware of (9). It is our responsibility as veterinarians to be familiar with the most current versions of these animal health and welfare guidelines and regulations, before advising our clients.Armed with current scientific, industry, and regulatory information, veterinarians can help their clients reduce the number of compromised animals in their beef cattle operations through preventive herd health programs and animal husbandry practices. When that fails, veterinarians can then help their beef clientsmake informed, objective, and timely decisions on the final disposition of their compromised cattle,which are in the best interest of the animal andthe client'sfinancial bottom-line.

Key words: euthanasia, emergency salvage slaughter, unfit, compromised, chronic, railer

Role of the beef cattle veterinarian

The AVMA and Canadian Veterinary Medical Association (CVMA) veterinary oaths state that veterinarians must use their scientific knowledge and skills for the protection of animal health and welfare and prevention and relief of animal suffering (6,12). Teaching clientsabout common diseases in their beef cattle operation, and how to accurately diagnoseand manage them with appropriate prevention, treatment, and control practices, is a keyservice thatfood animal veterinariansshould provide their clients. While veterinarians commonly work with theirbeef clients to develop vaccination, parasiticide, implant, and treatment protocols and train them on the use of these protocols, theymay overlookwritten protocols, on-site monitoring, andproducer/staff training in the management of chronics, injuries, non-ambulatory cattle, culls/railers, and those needingtimely shipment to slaughter, emergency salvage slaughter on farm, or euthanasia.

A chronic is an animal that has either undergone all treatments for a condition e.g., chronic bovine respiratory disease (BRD), or it has a chronic conditionwhich has no treatment e.g., founder, congestive heart failure. Typically, in feedlots, most animals with infectious bacterial disease are pulled from their home pen and treated individually at most 3 times for the same disease. If they don't respond to the 3rd treatment, then treatment is typically discontinued, and they are called a chronic. Metaphylaxis treatment on arrival for BRD is usually not included in the count of 3 individual pen pulls for BRD before calling the animal a chronic BRD.A cull or railer is an animal sent to slaughter before its pen mates or contemporaries. The term cull is more commonly usedin cow-calf operationsand the term rail is more commonly used in feedlots, but these terms mean the same thing.

Emergency salvage slaughter is an option some beef cattle producers may have, depending on where they live, what slaughter services are available, and state/provincial regulations. In Alberta, bovine practitioners can be trained and appointed as provincial meat inspectors to conduct emergency ante mortem inspections on farm for animals that are unfit for transport but fit for human consumption. These unfit animals, once approved by the veterinarian based on theirin-person ante mortem inspectionon

farm,or by government staff reviews of producer collected animal videos, are humanely euthanized and bled on farm under the inspection of the veterinarian or by a trained producer if their ante mortem video was approved remotely by a government inspector. Then the carcass is shipped immediately to a provincial slaughter plant for postmortem inspection, either by a provincial meat inspector or a veterinary practitioner that is an appointed meat inspector. This meat is then sold to provincial retailers and food service as inspected meat.

Other options for emergency salvage slaughter onfarm may include animals butchered by producersto either go into their own freezer or those sold direct to a consumeronce slaughtered on farm by the producer, or those slaughtered on farm by a licensed mobile butcher, who then further processes the carcass at his own fabrication facility and gives the meat back to the producer as uninspected meat. Different states/provinces will have different regulations regarding on-farm slaughter and the sale of uninspected meat.It is important thatpracticing veterinarians know if on-farm emergency salvage slaughter options exist in their area, because this may be a more economical option for that producer than simply euthanizing an animal fit for human consumption and putting it on the dead pile for disposal, which will come at an additional costif rendering services are used to remove the carcass.

In feedlots, usually there are better individual animal health records and veterinarians are physically present on the operation more often than on a cow-calf operation. As well, typically there are specialty pens to managing different types of compromised animals, such as sick/hospital pens, chronic pens, injury/arthritis pens, convalescent/recovery pens, railer pens, and buller pens. Veterinarians should monitor specialty pen occupancy reports and processing, treatment, and movementrecords of compromised animals. Veterinariansshould trackhow many animals are in each specialty pen, and when and how long they have been housed there. As well, veterinariansshould review theirtreatment histories to see why these animalswere moved into these pens, because one of our jobs is to figure out how to reduce the number of animals in speciality pens. Prevention is key to reducing economic losses from compromised cattle. Additional records, such as slaughter plant condemnation reports and necropsy

reports, also provide valuable information to help identify areas for continual improvement to reduce the number of compromised cattle and those that need to be euthanized or salvage slaughtered.

Records, however, can be misleading; thus, in feedlots, it is important for veterinarians to regularly walk specialty pens with the manager e.g., foreman, to visually examine the animals in these pens.Veterinarians should actively monitor animals in sick, chronic, injury/arthritis, convalescent/recovery, railer, and buller pens by physically inspecting these cattle on a regular basis and conducting postmortems on farm, so they canidentify in a timely manner, serious animal welfare issues. For example, if veterinarians find emaciated dead cattlein the dead box who died on their own from chronic disease, this suggests these animals were not euthanized in a timely manner. Another example would be finding animals condemned at slaughter from chronic treatable disease, who were never treated for that disease based on the animals' treatment records. Both examples indicate there is a need for improvement in animal health and welfare practices on farm.

Failure to euthanize distressed animals in a timely manner is an egregious act of neglect, and a serious animal welfare issue, resulting in audit failure in both the US and Canadian PAACO certified feedlot audits (8,20). When veterinarians walk specialty pens with feedlot management, they should look for these distressed animals and ensure staff know when to euthanize them, not only to reduce animal pain and suffering, but also production economic losses, as it is a waste of labor and feed to keep these animals alive if they have no hope of recovery or salvage slaughter. Veterinarians should alsoensure thatcattle in specialty pens have sufficientbunk and water space, easily accessible, fresh good quality feed, including an intermediate ration in sufficient quantity,to prevent grain overload from housing cattletogether from home pens that were on different rations. The specialty pen ration should not be medicated with medicated feed additives with drug withdrawal periods, such as chlortetracycline, to reduce the risk of railing cattle from these specialty pens to slaughter with violative drug residues. These specialty pens should haveclean, ample and easily accessiblewater, clean dry bedding for all the cattle to comfortably lay down at once, and shelter from inclement weather, such as windbreak fences for cold winter winds, or pen

shades for heat stress, to improve their chances of recovery. The use of good quality grass hay in hay feedersshould be considered in sick and chronic pens, along with an intermediate fresh grain ration in the feed bunk, to improve feed consumption and recovery.Nonambulatory cattle should be closely monitored because hypothermia and frostbite in the winter, or heat stress in the summer, are a serious concern if they are down more than 24 h. Stocking density should also be evaluated, becauseovercrowded cattle, with little bedding pack, and those in dirty, muddy pens tend to have a poorer chance of recovery.Veterinarians should provide producers and staff advice on goodanimal husbandry practices in these specialty pens, if they are found lacking, because good husbandry practices reduce animal stress, pain, and suffering and improve animal recovery rates.

Ideally, cattle should be segregated in different speciality pens based on their condition i.e., sick and under treatment (sick pen), chronicsno longer treated but needing additional time and TLC, such as less competition at the feed bunk and water trough, to recoverbefore sending back totheir home pen or railing (chronic pen), injured and arthritic cattle (injury/arthritis pen or convalescent pen), bullers (buller pen), and railers (railer pen).If possible, it is ideal to have multiple speciality pens of eachtype, particularly sick and chronic pens if the feedlot feeds calves and yearlings, because their rations are different.Additionally, some diseases are highly transmissible e.g., IBR, Salmonella, suspect persistently infected BVD, and it is best if those animals are housed separately in sick pens, so that these highly contagious diseasesare not spread throughout the yard.

In many feedlots, long-acting broad-spectrum antimicrobials are preferred to daily antimicrobial treatmentsfor infectious bacterial diseases, so that most acutely sick animals can be treated and sent back to their home pen the same day, to reduce disease spread throughout the yard, stress on the cattle from repeated chute runs, and labor costs. Obviously, this is not the case for bullers and injuries, where “rest” in a specialty pen is the treatment. If a yard also feeds bulls, then it is best not to house heifers and bulls together in specialty pens, due to riding and unwanted pregnancies. In some small operations, there may be insufficient penspaceto segregate sick cattle from chronics, and even chronic pneumonias fromchronic

or untreatablelame cattle (e.g., arthritis, founder, injuries),railers, and bullers. Problems that may occur if these distinct types of compromised cattle are not segregated in separatespecialty pens include riding/bulling in the pen, spread of infectious disease from acutely sick animals to chronics, and railing cattle to slaughter with violative drug residues. To improve recovery rates of all types of compromised animals, specialty pen segregation by treatment status/condition, should be encouraged. Feedlot staff should not be running chronics, injuries, arthritis, founders, bullers, or railers through a chute daily if they are not being actively treated or a weight measurement isnot required to objectively monitor recovery, because extra cattle handling is very stressful to the cattle, increasing their chances of further injury anddecreasing their chances of recovery, while increasing labor costs. To improve the recovery of injuries, like toe tip necrosis and arthritic cattle, it is wise to segregate them from chronically sick animalswith BRD, to reduce the spread of infectious disease and to reduce chute runs, which causesthese lame cattle additional pain and stress. My experience with housing chronic BRD feedlot cattle separately from chronic lame cattle e.g., arthritis, toe tip necrosis, and injured cattle, compared to housing them all together, is higher recovery rates of segregated lame cattle, which I believe is due to reducing stress from repeated chute runs for weight measurements.

Founders are another matter, as there is no treatment for these animals and rest will not improve recovery. Founders should be monitored closely in their home pens to ensure they are not losing body weight, and they should berailed to slaughter before they become unfit for transport. If severe founders are small cattle where it is not economical to salvage slaughter them on farm, and they are losing body weight, they should be humanely euthanized in a timely manner,to reduce pain and suffering.

All compromised animals in speciality pens must be monitored daily by producers/staff to ensure that any animals in distress are promptly euthanized or immediately salvage slaughteredif fit for human consumption. Those that have recovered should beeither 1) sent back to their home pen once they are fit, first double checking that their pen's ration hasn't changed significantly,to reduce the risk of grain overload when these cattle are sent home or 2) shipped to slaughter. Once these compromised cattle are

sent home, pen riders should monitor these returned animals closely to ensure they are not ridden by others in the pen, especially if they have not been in that pen for some time, and they shouldencourage and move them to the feed bunk and water trough, ensuring they can compete for feed/water in the pen; else, they should be repulled and housed in a recovery convalescent pen with less feed/water competition. In organized larger yards that own their cattle i.e., not custom fed cattle, chronic injuries andarthritic cattle, and bullers,may behousedand fed in separate specialty pensuntil they are railed from that pen, to avoid bulling issues and to improve their chances of recovery and passing slaughter inspection. It is never wise to house lame cattle with bullers, as bullers often ride lame cattle.

In the next sections, we will review the veterinarian's role in helping producers meet specific requirements in beef industry quality assurance and certificationprograms for compromised cattle, through protocol and record developmentand annual updates, producer/staff training, and on-site monitoring, with a focus on continual improvementof animal health, welfare,and economic sustainability.

Beef industry animal health andwelfare programs

In the USA, the most common animal health and welfare educational program providing industry guidelines and training on good production practices, isNCBA's Beef Quality Assurance (BQA) program (14-16). In Canada, the Verified Beef Production Plus (VBP+) program (22)provides similar industry guidelines and producer training in animal health and welfare, which are based on recommended practices in the Canadian Beef Code of Practice, which is a nationally developed guidelinefor the care and handling of beef cattle (7). Both industry educational programsrequire that producers be provided with training to responsibly manage and care for their animals. Basic training is provided with these industry educational programs through their websites (7,10,14-16,22) or in-person producer meetings, but veterinarians can supplement these industry guidelines andproducer trainingwithdetailed and specific written cow-calf and feedlothealth protocols and training fitted to the needs of each beef operation.

In the feedlot sector in Canada and the US, the National Cattle Feeder's Association (NCFA) and the NCBA, have gone one step further to the BQA educational programs, developing objective and verifiable audit standards to verify that beef operations are conforming to specific animal health and welfare audit criteria. The Canadian audit standard is called the Canadian Feedlot Audit (8), and this audit standard is annually updated and certified by the PAACOas meeting their animal welfare audit standards (17). The Canadian Feedlot Audit standard is also recognized by the National Farm Animal Care Council (NFACC) as meeting the requirements and assessment process for the Canadian Beef Code of Practice (7), and it is recognized by CRSBas meeting their animal health, welfare, and food requirements (11). NCBA's U.S. Cattle Industry Feedyard Audit (20) was developed 5 years after NCFA's feedlot audit standard, and it is also annually updated and certified by PAACO as meeting their audit and welfare standards (17). Both feedlot audit standards are similar in their requirements. They have taken general industry BQA guidelines for animal health and welfare, food safety, and beef quality, and converted them into objective and verifiableaudit criteria, with a standardized audit scoring system, that can be used to determine how well a feedlot is meeting these criteria deemed important by the industry, to ensure animal health and welfare, food safety, and beef quality. Feedlot producers and veterinarians can use the feedlot audit checklists to monitor and continually improve production practices on a feedlot for the benefit of that operation, and to also prepare for a 2^{nd} or 3^{rd} party PAACO feedlot audit from a processor or retailer. These PAACO certified feedlot audits are used by some federal processors, such as Tyson Foods, to meet their retailer demands, verifying that they source their beef from feedlots that are PAACO certified. These audit standards may be also used in other value-chain certification programs to provide good production practice assurances to consumers.

Animal health and welfare protocol requirements in the US and Canadian feedlot audit standards (8,20), which veterinarians are responsible for developing and helping their clients implement, are shown in Table 1. These include written health protocols and supporting records for: processing (vaccination, parasiticides, implants, identification), treatment, abortion, castration, dehorning, branding, chronic pen

management, injury and nonambulatory cattle management, euthanasia, emergency salvage slaughter (Canadian audit only), antimicrobial stewardship, animal product management, and biosecurity. In this article, we will discuss further the veterinaryhealth protocol requirements and industry guidelinesthat canhelp veterinarians and producers make objectiveand timely decisions on the fate of chronics, railers, and those with untreatable conditions, to reduce animal pain and suffering, through timely transport either to slaughter, emergency salvage slaughter on farm, or euthanasia.

Chronic pen, nonambulatory, railer, euthanasia, and emergency salvage slaughter protocols

Veterinary health protocol development and training should include how to prevent and responsibly manage compromised cattle, including acutely sick cattle with treatable and untreatable conditions, chronically sick cattle that have undergone all treatments for the condition or the condition is not treatable, injured ambulatory cattle, nonambulatory cattle, bullers, and railers. Beef industry guidelines and audit programs may specify what specific health conditions should fall within each of these written veterinary health protocols. For example, the Canadian feedlot audit program requires that veterinary treatment protocols discuss what to do for a very specific list of diseases, including what to do if an animal does not respond to initial treatment i.e., how to treat relapses (recurrences), and when to euthanize or cull animals (8). The US feedyard audit standard (20) requires that feedlots have a compromised cattle evaluation protocol, whereas the Canadian feedlot audit standard(8) requires that producers have a chronic pen and railer protocol on how to manage chronically ill cattle and railers.Both audit standards require that feedlots have a written nonambulatory protocol, an acutely injured animal protocol,and aeuthanasia protocol. In the January 2025 version of NCBA's BQA Manual(14), it lists specific requirements on the handling and management of non-ambulatory animals, which should be included in written veterinary nonambulatory protocols. Specifically, nonambulatory should not be dragged unless in some emergency situation for animal and human safety; they should never be dragged

off the trailer; an electric prod should never be used to stimulate an injured or disabled animal to get up;chains, rope or cables should never be used to lift, suspend or move animals unless necessary to prevent further injury or death, if allowed by state/federal regulations; straps should be used under the front legs/chest and hind legs/flank to lift animals;and nonambulatory animals should never remain in any area where they may get walked on or trampled. Additional management requirements in nonambulatory protocols (14) include: 1) promptly diagnose nonambulatory cattle to determine whether they should be humanely euthanized or receive treatment, 2) provide adequate fresh feed/water that is easily/readily accessible at least twice daily, 3) move downed animals using acceptable methods, which include using a sled, low-boy trailer, or in the bucket of a loader by rolling the animal into the bucket with restraint from the caretakers, 4) humanely euthanize animals who refuse to eat/drink and/or are unable to sit up unaided for 24-36 h, and 5) euthanize downed animals that do not respond to treatment and their condition deteriorates. The Canadian audit standard also requires an emergency salvage slaughter protocol with specific written requirements (8). The goal of these written veterinary protocol requirementsdetailing how best to manage compromised cattle isto reduce animal pain and suffering in a timely manner, and to ensure animal and human safety, while protecting the food supply. These protocols should be objective, science-based, practical, and reasonable, and founded on the most currentinformation inveterinary medicine, the beefindustry, and scientific research.

Neither feedlot audit standard (8,20) indicates what should be included in a compromised or chronic pen or railer protocol, but they do specify what should be included in a euthanasia protocol. Both feedlot audit standardslist specific reasons for audit failure due to egregious acts of neglectand wilful acts of abuse related to failure to follow these veterinary protocols for compromised animals.

Specific to compromised and chronic cattle, egregious acts of neglect resulting in immediate audit failure, if observed during an audit include1) failing to follow veterinary protocols related to timely euthanasia (and emergency salvage slaughter – Canadian criteria) of critically ill/distressed or injured animals, 2) failing to euthanize a chronically diseased or injured animal with a BCS < 2 and according to protocols developed in consultation with a veterinarian,3) failing to immediately assist and provide

medical care to a nonambulatory animal, 4) failing to follow veterinary protocols for timely treatment of an injured animal, 5) failing to provide water to a nonambulatory animal, 6) failing to provide immediate medical assistance to a compromised animal unloaded from a livestock truck, as per BQA guidelines (14-16) or CFIA transport regulations (9), and 7) loading a compromised animal without special transport provisions, as per BQAguidelines (14-16) or CFIA transportregulations (9).

In the Canadian feedlot audit, PAACO auditors must walk specialty pens looking for compromised cattle in distress that have not been euthanized or salvage slaughtered in a timely manner as per the veterinarian's written protocols. If these distressed cattle are observed during a PAACO audit and they are not under active veterinary treatment or care as per the veterinarian's written protocol or scheduled for immediate emergency salvage slaughter, the feedlot will fail the audit, because these acts are a serious animal welfare issue, causing unnecessary animal pain and suffering.

Wilful acts of abuse that result in feedlot PAACO audit failure related to these veterinary protocols include1) euthanasia by means other than approved methods documentedinindustryand veterinary guidelines(3,5,7,8,14,16,20,22) during euthanasia by gunshot, 2) failing to immediately deliver additional shots if the first shot does not renderthe animal insensible and then dead (assuming no secondary kill step was used after rendering insensible bygunshot, such as pithing or jugular exsanguination) (3,5,7,14), 3) during euthanasia by gunshot, using a caliber that is not appropriate for the class of animal as per industry and veterinary guidelines (1-3,5,4,7,8,14,20,22), 4) live animal observed on the dead stockpile (8,20), 5) loading cattle unfit for transport as per BQA guidelines (14-16) or CFIA transport regulations (9).

Therefore, when writing and updating at least once annually, compromised cattle or chronic pen and railer protocols, injury and nonambulatory protocols, and euthanasia or emergency salvage slaughter protocols, it is important that veterinarians understand specific requirements in currentindustry BQA programs,veterinary guidelines, PAACO audits,or other certification programs that their beef clients participate, to ensure the inclusion of thesespecific requirements in their written veterinary protocols. It is embarrassing for veterinarians if a feedlot fails an audit or losses audit points because the veterinarian

wasn't knowledgeable or up to date on these programs, and their veterinary health protocols lacked specific industry program and audit requirements.Compromised cattle protocols should includeexamples of specific diseases and conditions that producers may encounter, withcleardirections on when and howeach type of animal should be managed, to ensure 1) that animal suffering/pain and producer economic losses areminimized, and 2) beef operations don't fail an audit due to egregious acts of neglect or wilful acts of abuse which their veterinarian failed to educate them on.

The BQA program (14) lists specific reasons for euthanasia that should be included in written veterinary euthanasia protocols, viz. 1) fractures or paralysis of the legs, hip, or spine that are not repairable and result in immobility or inability to stand, 2) emergency medical conditions that result in excruciating pain that cannot be relieved by treatment, 3) animals that are too weak to be transported due to debilitation from disease or injury or emaciation, 4) paralysis from traumatic injuries or disease that result in immobility, 5) disease conditions where no effective treatment is known, prognosis is terminal, or a significant threat to human health is present, which could include painful congenital or acquired conditions that cannot be managed adequately by medical or management methods. In the Canadian feedlot audit program (8), the euthanasia and emergency salvage slaughter protocols must include the requirement to euthanize or salvage slaughter without delay animals that:1) are severely injured or non-ambulatory with the inability to recover or cannot be salvage slaughtered in a humanemanner without delay e.g. broken leg, unless otherwise recommended by the feedlot veterinarian, 2) are unable to consume feed and water e.g. broken jaw, 3) are non-ambulatory and non-responsive for more than 24 hours, unless otherwise ordered treatment by the feedlot veterinarian, 4) have severe debilitating pain and distress from chronic disease following all treatments and are unlikely to recoverunless otherwise recommended by the feedlot veterinarian e.g. necrotic club foot with open infected wound, chronicbovine respiratory disease that is mouth breathing and emaciated, 5) show continuous weight loss and emaciation (BCS < 2) after following all treatments as per the feedlot veterinarian's treatment protocol, and 6) have no prospect for improvement or are not responding to care and treatment after 2 days of intensive care unlessotherwise recommended by the feedlot veterinarian. Additionally, the Canadian audit standard(8)

requires the veterinarian's euthanasia protocol include a statement not to drag nonambulatory cattle prior to euthanasia, and specific examples of eachof the requirements above, along with a statement to contact your veterinarian if the producer isunsure what to do in an unusual case.

Euthanasia protocols for both the US and Canadian feedlot audits (8,20) require writtendetails on approved methods of euthanasia, approved euthanasia equipment,information on the correct placement of gunshot or captive bolt,and how to confirm death prior to movement, which should be in line with current industry and veterinary guidelines and regulatory requirements (3,5,7,8,14,20,22).Feedlots musthave gun cleaning equipment to clean their guns andhave a written list of staff approved to euthanize animals, with at least 2 people approved per operation, in case one is on days off.The Canadian audit also requiresveterinarians to provide euthanasia training and staff training records (8). In the Canadian feedlot audit, if a feedlot is going to euthanize an animal during an on-farm audit, the auditor must observe this procedureto ensure that proper euthanasia procedureswere followed as specified in the audit criteria, and if these procedures were not followed, e.g., it takes more than 2 shots to render an animal insensible, the feedlot immediately fails the audit (8).

Written veterinary health protocols should include the name of the veterinary practice and the date the protocol was written, because most audit programs require that these protocols are written by the herd veterinarian and reviewed and updated at least once annually with the producer, based on new industry, veterinary or audit requirements, new animal health and welfare research, or issues observed at the beef operation that require improvement. Additionally, veterinary protocols sometimes need to be rewritten for producer clarification to ensure clear directions. If English is not the main language of staff at a beef operation, then ideally, written veterinary protocols and training should also be provided in additional languages that are needed, such as Spanish, to help ensure staff understand the veterinary protocols, improvingconformance to written protocols.

Besides providing written protocols as described above, veterinarians should train beef producers and staff on their written health protocols for the management of compromised, chronic, injured, nonambulatory, and railer cattle, including shipment, euthanasia, and salvage slaughter procedures.

Veterinarians should monitor conformance with their health protocols, viz do producers and staff do what they say they do and follow the vet's protocols. Veterinarians can verify conformance to their protocols for compromised cattle by reviewing related healthrecords and packer condemnation reports, observing cattle in home and specialty pens, conducting postmortems, observing staff in their activities, and interviewing them, to see if they know what to do in various scenarios. These veterinary performance reviews can be objectively and consistentlystructured by using beef industry audit checklists (8,14,20,22). Additionally, veterinarians should take BQA and PAACO auditor training courses when available to ensure they are informed and currentto appropriately advise their clients.

Understanding why producers/staff fail to follow health protocols for compromised cattle and fail to euthanize or salvage animals in a timely matteris important. It may be that the veterinary writtenprotocols are vague and unclear, there may be practical or financial reasons for nonconformance, or staff have not been trained. Sometimes, retraining of existing staff is needed to improve conformance to these protocols, and sometimes, certain staff may need to be fired by the producer if retraining does not work, assuming the producer supports the veterinarian's protocol. Not all producers and staff are empathic to animal pain and suffering, and some producers treat animals as a financial object, and not a living animal which can feel pain and suffer.In the latter case, it can be frustrating for a veterinarian to influence change which is in the best interests of the animal, as well as the producer. If the veterinarian can figure out the producer's or staff's reason for failing to followtheir health protocols, then often they can find a creative way to change their behavior, but it may takepatience andtime. For example, ifa feedlot foreman is paid bonuses based on mortality rates,this may result in the foreman never euthanizing any animals,and just letting chronic nonresponders wither away and die a slow painful death. If the veterinarian can calculate the costs of maintaining these animals who are destined to die,and discuss theissue with the producer, showing him/herobjective data that it is not in their best financial interest to allow this negligent practice to continue, they may encourage positive change.To do this,documented health and production protocols and records are critical in any well managed beef operation, because then decisions can be based on objective herd/feedlot data and not emotion or old beliefs, such as "well, that is

how my dad always did it and he never had an issue". As veterinarians, weshould use producer herd/feedlot records to influence positive changein the best interests of the animal and the producer.

When training producers/staff on veterinary writtencompromised cattle and euthanasia and salvage slaughter protocols, training records should be kept by the veterinarian and provided to the client after the training. These training records should include the date of training, the trainer's name, the topics covered during the training, and the printed name and signature of each person that attended the training. Training records are required in some audit programs (8,20), and these training records help clients and veterinarians know which staff have undergone training and which staff may still need initial training or retraining, as training often improves protocol conformance, reducing animal pain and suffering and production economic losses, and improving staff retention. Producers who fail to address serious animal welfare issues caused by some staff, can lose good, caring staff because they will not tolerate animal abuse and cruelty. It is often those caring individuals that the beef operation should try to retain, because they are often more reliable, showing up to work on time, paying attention to details, and following veterinary health protocols. As well, given that most staff now have a cell phone with a video camera on it, the last thing any beef producerwants to see is a video of animal neglect or abuseon their beef operation whichshows up on YouTube.

Failing to euthanize animals in a timely manner may also be due tolack of staff training onfirearm use,resulting in uncomfortableness using a firearm. In feedlots, for example, if the foreman is not comfortable using a gun or euthanizing cattle, seriously compromised animals may not be dealt with in a timely manner, until the assistant foreman is working and the foreman is on days off. Lack of training in the proper use of firearms is also a human and animal safety matter, which top management at a beef operation should take seriously, as it is their job to ensure properly working equipment and safety training for their staff.

AVMA and AABP euthanasia guidelines

The AVMA and AABP euthanasia guidelines have been available for some time(3,5) and were recently reviewed, presented, and published in the proceedings of the new veterinary graduate conference held in 2023 (13). There have been no updates to these guidelines since then, other than the recentdevelopment of a euthanasia decision tree by the AABP animal welfare committee(2). The AABP euthanasia decision tree in Figure 1 helps veterinarians and producers usea logical process to determine when to euthanize an animal.The first question in the decision tree is whether the animal has a treatable condition. If the answer is no, then the next question is whether the animal is eligible for slaughter. If not, then euthanasia is recommended within 4 h, using an AABP approved method performed by a competent person. If the animal is eligible for slaughter but not fit for transport, then on farm slaughter is recommended. Animals unfit for transport are those listed in the BQA manual or AABP guidelines (4,14,15), or in Canada, those listed in the CFIA transport regulations as unfit for transport (9). Animal conditions meeting the definition of unfit cattle for transport are summarized in Table 2 for quick reference and to show the subtle differences in various industry and veterinary guidelines and regulatory requirements, the latter which should always supersede industry and veterinary guidelines.In AABP's decision tree, if an animal has a condition that is treatable or can be managed, additional questions are asked, that must be all yes, before proceeding further down that tree limb. But, if any of the answers are no, then the next questionin the decision tree is whether the animal is eligible for slaughter.

The5 questions that must all be "yes" include whether the risk to human safety can be managed (behavior or disease risk). An example of this could be that crazy brindle colored cow, with the high whorl on her forehead,and a very large flight zone, that is lame on pasture. The rancher is older and he isn't any good at roping (nor are you), they have tried but just can't get her into the chute because she jumps every fence or charges the horses or 4-wheelers, and neither the producer or you can get close enough to her to use a dart gun to treat her. So, she is left alone with the hope the lesion will heal, but now over time, the foot lesion has turned into a club foot.

The next question is whetherthe pain can be controlled. An example of this could be a chronic hairy heel wart infection in both back feet of a 1350 lb feedlot heifer. The producer could treat the digital dermatitis, but given it is a chronic case, it most likely won't respond to treatment, and because of the heifer's sore feet, she will typically lose body weight over time, because it hurts to walk to the feed bunk and water trough, so the best decision there would be to railher to slaughter as soon as possible, since she is slaughter weight, rather than treatingher and risk losing more body condition.

The next questionsarewhether farm staff can provide timely treatment and care or have the appropriate facilities to provide proper care. An example of this could be a newborn calf in a feedlot where the staff do not have the time or facilities to properly care for the newborn. In this case, it may be best to sell the calfas soon as possible or give it to one of the feedlot staff to take home and care for, pending the feedlot owner's policy on newborn calves. Neonatal management care is required in industry BQA programs (7,14,16,22) and the US and Canadian feedlot audit standards (8,20); therefore, as veterinarian's, your feedlot neonatal management protocol should include directions, after consulting with the feedlot owner, on whether to keep and raise the calf, or sell the calf, with details on how to properly care for the newborn while at the yard. It should be noted that depending on state/provincial regulations, newborn calves may not be allowed to be sold through auctions until 8 days of age or the navel is dry. As well, in Canada, if the feedlot imports US feeder cattle and it is a CFIA restricted feedlot, newborn calves may not leave the feedlot and enter the Canadian herd. They must be raised at the CFIA restricted feedlot they were born, moved to another CFIA approved restricted feedlot to be raised, or euthanized. Therefore, veterinarians need to be aware of localand federal regulations impacting their clients, before developing procedures in their health protocolsfor each client on how best to manage these newborn calves, as these protocols may need to be herd/feedlot specific.

The last "yes" question in the AABP decision tree is whether the animal will tolerate treatment. An example of this could be an animal in very poor body condition score, who is severely dehydrated, and septic, and where the only effective treatment for the condition is a sulfa drug. Given the animal's

dehydration statis, it is unlikely that the animal will tolerate this drug, because the sulfa drug would put the animal in kidney failure; therefore, euthanasia would be the humane decision in this scenario if no other treatment is available.

Another example of a decision tree for euthanasia or salvage slaughter is shown in Figure 2. This decision tree, which the author developed based on her years of experience, was done prior to seeing AABP's euthanasia decision tree. Figure 2 varies a bit from the AABP decision tree, because it focuses initially on making an **accurate** diagnosis, and it has abuilt-in continual feedback loopfromeuthanasia and slaughter to continuallyimprovediagnostic accuracy, based on informationgleaned from historic records. Historic records include necropsy and packer condemnations reports, along with animal treatment histories. While these latter reports are typically few in cow-calf operations, infeedlots, this information should be available and it is very useful, because the veterinarian can review this information to see if the historical diagnoses and decisions make at the feedlot for railing, salvage slaughter, or euthanasia were appropriate, and revise future recommendations, if they were not. If the diagnosis is wrong, then every decision subsequently made in the decision treemay be wrong. Another addition in Figure 2 is a question on economics, because economicsshould always be considered before deciding whether to ship an animal to slaughter, do an on-farm salvage slaughter, or euthanize it. For example, if a feedlot Charolais heifer breaks a leg and she is only 600 lbs, and free of drugs, but she only has a little flesh on her, it is typically not economical to do an emergency salvage slaughter on farm, because there is no meat on her bones. In Alberta, if a veterinarian does an emergency salvage slaughter under the Alberta meat inspection program at a provincial slaughter plant on a feedlot animal under 900-1000 lbs body weight, the bill for the veterinarian's costs for the ante-mortem inspection, and the packer charges for processing,subtracted from what the packer pays the producer for the meat, on a per pound basis on the animal's body weight, which is often 50 cents on the dollar compared to an animal going to a federal slaughter plant, may result in the producer getting a bill from the packing plant for that animal.Additionally, if the wrong decision is made and the animal is unfit for human consumption and it is condemned at slaughter, the producer willalso get

a bill for the disposal of the carcass. So, veterinarians, should ask their beef clients to provide them with carcass condemnation reports from state/provincial and federal slaughter plants, and share with them the carcass value of these compromised animals at variousslaughter establishments, so that this information can be reviewed, along withanimal treatment histories, and necropsy reports, to see if the right decisions were made to ship animals, slaughter them on farm, or euthanize them on farm. The goal of any financially successful, progressive beef operator and veterinarian should be continual improvement, which is aided by using objective information from every case, to determine if the right decisions were made for the herd/feedlot. If not, then health protocols should be updated or producers/staff/vets retrainedto improve disease diagnostics, and thus,final disposition decisions.

One additional factor that producers and veterinarians need to consider, which is not included in either decision tree here, is the ownership of the animals. In a feed yard where the owner of the yard owns all the cattle on feed, it is relatively easier to create and use Figure 1 and 2 decision trees, as the owner has the final say on the disposition of the cattle and all cattle are managed similarly. However, in a custom feed yard, the owner of the cattle may not agree with the decision of that yard's manager or veterinarian,for example, to rail compromised cattle,because it may be logistically difficult to do for a single animaland that owner may not get paid correctly by the packer for his animal. Typically, a single truck load of fed cattlewill hold 43 to 45 head, and these cattle arefrom 1 owner. These cattle will be housed together in 1 holding pen at the federal processing plant, if they were the only load shipped. Segregation of individualfed cattle,froma singletruckload of fed cattle,at a federal slaughter plant, and housing a single animal separately in a holding pen, to ensure the processor's drive schedule for that animal matches the ownership of that single animal, is logistically difficult or impossible to do. Therefore, ownership of cattle may be a factor in final disposition decisions of rail cattle, as well as those salvage slaughtered on farm, if the uninspected meat can only be given to the owner of the cattle, based on state/provincial regulations, and that owner is not interested in the beef.

Given that there are now a few documented euthanasia decision trees available for veterinarians, it would be wise for veterinarians to include a decision treein producerwritten euthanasia and emergency salvage slaughter protocols. Decision trees are a quick and easy way to help beef producers, and their staff, improve their decisions and the timeliness of those decisions, when it comes to the management and fate of compromised animals. However, these decision trees will only work if producers and their staff have been trained by the veterinarian on how to use these decision trees, using real life examples of diseases/conditions they may encounter on farm. But if in doubt, producers should always be encouraged to contact their veterinarian, to help them make an informed and timely decision, to reduce animal pain and suffering and economic losses. Obviously, then, the herd/feedlot veterinarian needs to ensure they or one of their associates are available to respond to these producer calls in a timely manner. All veterinarians in a practice should be trainedon thehealth protocols for various clients. Veterinary training is critical to ensure informed and objective responses to clients, which are consistent with that client's written health protocols, on how best to manage compromised and/or distressed animals; else, this will create confusion and chaos at the beef operation, and raise into question, individual veterinarian's competencies.

Future Research

While it may seem straight forward to write up compromised and chronic pen and railer protocols, nonambulatory protocols, injury protocols, euthanasia and emergency salvage slaughter protocols with decision trees, what we encounter on the farm is not always black and white, and we can't think of every possible scenario that may occur ahead of time to include in written protocols. Questions may arise from producers that not even the best qualified and experiencedfeedlot veterinarian or beef cattle welfare expert can provide objective evidence on what is best to do in thatsituation. For example, will a chronic arthritic feeder calfthat weighs 700 lbs or ayearling with chronic BRD, get better if we give them more time to convalesce? How much time should we leave acompromised animal to convalesce? Will they be salvageable after that time e.g., arthritic 900 lb calf with 3 arthritic joints affected. In Alberta

provincialmeat plants, an arthritic animal will be condemned if 3 or more joints are affected.How economical is it to leave the animal longer and how much weight will it gain or lose over that time? How much pain is that animal experiencingwhen we leave it longer in the chronic pen or railer pen, particularly when we have no long-acting pain medications with short meat withdrawal periods?

Some clinical cases are black and white, and it is easy to decide what to do immediately with a compromised animal e.g., a mature animal witha broken leg that has drug residues. In those cases,veterinarianscan include clear directions in their written protocols on how best to manage these cattle in a timely manner. When it comes to chronic diseases or conditions, we don't always know ifanimalswill recover. It also becomes anethical question as to whether we should leave these compromised cattle longer if they are suffering, but, then again, do we really know how much they are suffering and can they manage the pain themselves? How much money does the producer lose by leaving the animal longer e.g., fat heifer with hairy heel warts or a fat steer with founder? What is best for the animal and the producer'spocketbookin these various scenarios?

Further research is needed in the management and fate of compromised animals. Currently, there is a joint research project between Iowa State University, the Lethbridge Research Station from Agriculture Food Canada, and Telus Agriculture, monitoring animals in chronic pens in feedlots (18,19). The purpose of this research is to try togather additional, field and science-basedinformation, to helppractitionersimprove their compromised/chronic pen, euthanasia and emergency salvage slaughter protocols; thus, helping producers make the best decisions at the right time for these animals and their economic bottom-line. Stay tuned as these researchers share their findingswith us over the next few years.

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