Live Cattle Handling and Chute Side Working Demonstration

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Cattle Handling Pointers

Stockmanship and Low-Stress Handling

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Understanding Cattle Behavior

There are three basic means of communicating with livestock. Very simply they are:

- **Sight**
- **Sound**
- **Touch**

Cattle prefer to communicate through line of sight. Good stockmanship and low-stress handling can only be accomplished when a complete understanding of how a prey animal responds to line of sight and adoption of these in livestock handling are in place. Understanding the link between cattle's eyesight and their movement and behavior is critical in handling and in facility design.

Noise of any kind, but in particular the human voice, is usually stressful and marginally successful in getting the desired result. Sound should be used as a secondary method of communication and preferably only used when sight and position is not adequate. Distracting sounds shift cattle's focus away from the desired direction.

Touch is really only useful in situations where animals are confined and additional stimulus is needed to get cattle to move or respond. Effective touch does not include the use of driving aids such as hotshots or sorting sticks or paddles.

There are five basic principles of cattle behavior that when used properly can improve the ease and speed of working cattle while reducing stress and increasing efficiency. Those principles are:

1. **Cattle want to see you.**
   Understanding vision is foundational to handler positioning and cattle response. Cattle have excellent peripheral vision with the exceptions of blind spots directly behind (large) and in front of (small) them. When working from behind and to keep cattle from turning, it is important to stay in their sight by moving from side to side.

2. **Cattle want to go around you.**
   This is also related to the desire to maintain visual contact allowing the handler to get in a position such that, when cattle do go around them, the cattle are pointed directly at the intended gate or destination. They'll think it was their idea to go there.

3. **Cattle want to be with and will go to other cattle.**
   A herding instinct is natural among 'prey' animals. Stockmen can take advantage of this natural instinct as they work from the front of cattle. Start the front - the back will follow.

4. **Cattle want to remove pressure.**
   The natural instinct of a cow is to return to the last known safe or comfortable place. This behavior is in response to pressure and their desire to remove pressure. Handlers use this to their advantage when sorting and moving cattle from one corral to another. The simple principle of the return box or "Bud Box" takes advantage of this instinct.

5. **Cattle can only process one main thought at a time.**
   If cattle are thinking about anything other than what you are asking them to do, change their focus *before* putting pressure on them.

Handling Cattle In Corrals

Handling cattle in corrals is somewhat different than handling cattle in open pastures or large feeding pens. The main difference is the cattle's inability to remove pressure by moving away from human pressure. Because the entire basis of stockmanship and low-stress handling is pressure and release the handler must be aware that cattle confined in corrals may not be able to move far enough away from the handler to completely remove pressure. If they cannot then the stress level increases in the cattle.

Effective stockmanship skills are based on pressure and release. An animal will quickly learn to tolerate pressure and not develop stress if they perceive a way for pressure to be released. It is critical that cattle are trained while in a pasture setting or at least in a large corral until the flight zone is reduced to a point the cattle can become content while confined in a corral.

Cattle are intelligent and usually do what they are asked to do. However, if asked incorrectly cattle will likely not respond as the handler intended. When this happens we have come to rely on facilities, equipment or manpower to force cattle to do what is needed. This results in increased stress on cattle and handlers and results in cattle becoming more and more difficult to handle. The job of a handler is to teach an animal to tolerate pressure and stress for short periods of time.

The role of a handler in stockmanship is to create movement in cattle and then use position to control and manage that movement to the desired result. When cattle loose movement they become reluctant to work. When movement is lost, excessive pressure, force and driving aids are more likely to be used. Creating and managing movement is key to achieving effective stockmanship.

However, when cattle are confined into crowded corrals there is an inherent loss in movement that makes stockmanship and handling somewhat more difficult. Although working pens are smaller there is more than adequate room to get cattle to establish some movement as a group. It is important to not overcrowd any corral, pen, or crowding area with too many cattle. The key will be to work cattle in smaller groups as you get into smaller pens and processing areas.

Understanding behavior and handler position can make this much less of a problem when moving cattle out of holding pens and to processing and shipping facilities. These same principles apply when pulling one animal from the pen or when sorting cattle out of pens. The entire premise of low-stress handling is keeping stress to a minimum.

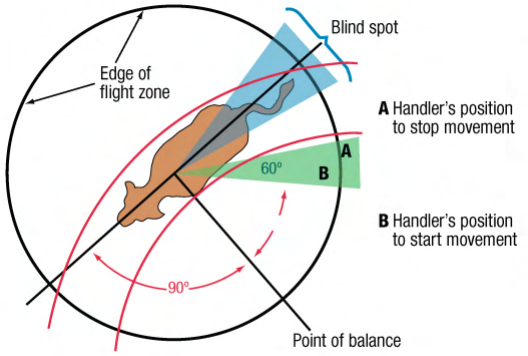
In a very simple explanation of *stress… If you decide to do something it is not stressful; if you are forced to do something it will be stressful*. Sound stockmanship involves convincing an animal the

intended movement is their idea. *Force* is avoided and *stress* is reduced. The handler has to understand behavior before this can work. To understand behavior a sound understanding of flight zone and point of balance is needed.

Flight zone

The flight zone or "pressure zone" refers to the area around an animal where it begins to feel uncomfortable and perceives pressure. Movement by animal or human into that zone will elicit a response away from that intrusion. Use of the zone allows humans to manage movement in cattle. The most common figure depicting the concept of flight zone and point of balance is shown below.

The most important point to remember about the flight zone is not the zone; it is the area immediately outside the flight zone. Stockmen must learn to anticipate, read and manage this 'boundary' area. When approaching an animal it is important to predict the response to your approaching the flight zone. If the desired movement is not going to occur, the handler should retreat, reposition and return from a different angle.



Point of Balance

Another key part of effective stockmanship is understanding and manipulating the point of balance. The diagram above indicates the point of balance to be the point of the shoulder. Point of balance varies greatly among animals and is influenced by pressure from front or behind, draw of cattle ahead, push of cattle behind and whether or not they are comfortable going by the handler.

Suffice it to say that the point of balance on any given animal is not necessarily where it is drawn on the diagram above. The point of balance is not static and is actually related to handler position relative to the animal's eye.

Flight zone and point of balance are not static and can be manipulated and changed by human management. Flight zones need to be reduced on wild or nervous cattle and point of balance needs to be moved forward. Both can and should be done with proper handling.

Handling Pointers

Keeping these behavioral principles and methods of communicating in mind, following is a list of ten handling pointers to keep in mind and a few suggestions that will improve the ease of handling cattle, whether they are being gathered from the pasture or processed through the corrals.

1. **Slow down so you can be fast.** *"Never mistake action for achievement"*
   Patience is a great virtue when moving or working cattle. When handlers get in a hurry, inevitably excessive or incorrect pressure is placed on cattle, which usually results in an unintended reaction from the cattle that must be corrected before work can continue.

   Most handlers have the mind set that as they go to a pen they are going through the gate and to the back of the pen to push the cattle out. Often little attention is paid as they enter the gate or move to the back of the pen. *Nothing could be further from what needs to be done when handling cattle effectively.*

   It is critical that handlers slow down as they approach cattle. Pay attention to cattle's reaction to your presence and use that to set up the next move.

2. **Work from the front to draw cattle to you.**
   This goes back to the basic principle #1. Cattle can be easily controlled from the front if they are not afraid of a human. (If they are afraid you are a long way from being able to handle cattle using low stress principles). Working from the front maintains their focus on the intended direction of movement. By moving in and out of the flight zone and across the point of balance, cattle can be easily drawn forward and past the handler.

   This is a key point in working with cattle in confinement. Pushing cattle out of confinement pens can be difficult and stressful on cattle and handlers. When moving cattle from a pen work from the front and draw the cattle toward the gate or opening. Start flow out into the alleyway and then work from the side of the group to keep flow going out the gate.

3. **Cattle must be comfortable to go by you and stay straight.**
   If cattle are not comfortable going by the handler, they will not work very well. Working from the front requires cattle to be comfortable passing by without balking or spooking. This simple principle facilitates penning, sorting and processing cattle.

   As point of balance moves forward (with training), moving, sorting and working cattle gets easier. Thus using the draw of other cattle makes it easier to work and sort cattle in an alley or from one corral to another.

4. **Apply pressure when cattle have a place to go.**
   Success of handling cattle depends on knowing when and where to apply pressure and how much pressure to apply. The other key component to effective stockmanship is setting the cattle up to go where you want them to go *before* you apply pressure. Equally important is the release of pressure as soon as the desired result is achieved. Low stress livestock handling is not about handling cattle without pressure. I reality it often requires a lot of pressure for a short period of time.

5. **Pressure cattle from behind only when absolutely necessary.**
   Like any 'prey' animal, cattle cannot see directly behind. If you assume a position directly behind cattle (in their blind spot), they will turn to one side or the other in order to see you. To 'drive' cattle in a straight line, assume a position behind their point of balance (shoulder) and off to either side. You can also work in a zigzag fashion behind the cattle causing them to switch eyes and move straight forward.

   Note: Move cattle in smaller groups. Larger groups are difficult to drive behind when motion is lost in the front of the cattle. Excess pressure has to be place on the cattle in the rear in order to force movement to resume throughout the group.

6. **Pressure from the side.**
   This relates back to working from the front and down the side of an animal and not working from directly behind (in their largest blind spot). By working from the side the eye can be manipulated as needed to move an animal in any direction

7. **Going with the flow of cattle slows them down or stops their movement.**
   It's all about that point of balance – as you move in the same direction cattle are traveling, when you approach a position parallel to their point of balance, they will slow down, and as you pass the point of balance they will stop. The important part in this process is to get the cattle to stop without reversing their direction. Teach them to stop and stay pointed in the direction they were headed.

8. **Going against the flow of cattle initiates or accelerates their movement.**
   Using the point of balance as the tool to initiate movement passing from the front to the back signals an animal to move forward. Once movement is initiated it will normally continue until it is stopped by someone passing the point of balance by moving in front of the point of balance. The ability to start and stop movement works whether in a pasture setting or in the confinement of a crowd alley.

9. **When working cattle, move in triangles.**
   Working in an arch pattern around cattle will simulate movements of a predator, which will elicit a response of fight or flight. Move in straight lines when asking for a response from cattle. Move straight toward a point on an animal to get a response. Once movement is initiated the handlers' next movement to reposition needs to be in a straight line at an angle away from the movement. Handler movement in the same direction as cattle flow will stop the movement just gained.

   Once repositioned the handler can then take a straight direct path back to the cattle to change movement. Move into their flight zone to create or correct movement. Retreating straight away from the flight zone slows or stops movement.

10. **Cattle work best when *they* are ready - You have to get them there.**
    Cattle have to be taught, conditioned and prepared to work. Unfortunately, today's cattle owners are short on time and experienced labor, and consequently, don't spend time acclimating cattle to new production settings. It is a process that will pay dividends for those who do spend the time.

Numerous others will handle your cattle after they have left your care. Bad habits and unruly behavior in cattle and humans is learned. Shouting, whistling, poking and prodding cattle is unnecessary and counterproductive. In fact, they distract cattle from the intended movement. Development of effective stockmanship skills improves worker safety, animal performance and potentially increases income on each individual operation.

Facilities

In working cattle in any processing facility it is important to keep the principles of behavior in mind as facilities are designed. Anytime we can **create cattle flow where they can go past where we need them to end up** it will make handling and processing easier. Also remember cattle do not like being moved toward a solid sided or closed in area, as they do not perceive a way out of. If it is necessary or desirable to use closed sided processing areas then the design must be large enough for cattle to go past where they need to come back to without putting too much pressure on the cattle.

Many current designs have short changed that last requirement and simply try to rely on forcing cattle to enter the crowding area and using a forcing gate to push them around to the opening into the processing lead up.

There are two basic designs that allow cattle flow to work correctly into the processing area. One is designed using a forcing pen (see figures 1 and 2) commonly called a circular tub or simply "Tub" design. There are literally dozens of variations of tub designs however few work as smoothly as the two below.

The other design is a "Bud Box" (see figure 3). The Bud Box is the simplest to design but requires the better understanding of cattle behavior because there is no way to force an animal out of the Box and into the crowd alley. If handlers/processors of cattle are unwilling or unable to develop and adopt this understanding they should not build or try to use a Bud Box. They should stick to the more expensive designs that will allow people who do not completely understand behavior to get cattle through the facility.

There is nothing magical or mystical about a Bud Box. It is a facility design that allows the handlers to position themselves correctly to facilitate cattle flow out of the box into either the crowd alley leading to a chute or to a trailer load out. Dimensions are important to successful use of a Box but not as critical as handler position in relation to the stock leaving the Box. Without proper position and attention to detail a Box will only confuse the stock and frustrate the handler.

Always keep in mind that the Tub and Box are a flow- through part of the facility. Cattle should never be stored in a Tub or Box waiting to be sent into the crowd alley or to a trailer. Bring them in and let them flow back out immediately.

The Tub or Box should be large enough to accommodate a volume of cattle adequate to fill the crowd alley or fill a trailer compartment. A crowd alley to a squeeze chute should hold a minimum of 4 cows and might need to hold 20 head depending on the speed of processing. Crowd alleys on cow-calf operations will typically hold 5 to 6 cows. Facilities working calves or yearlings routinely need crowd alleys for 12 to 20 head of cattle.

Remember, the crowd alley will normally not be empty when additional cattle are brought through the Tub or Box. To maintain flow it will be necessary to add additional cattle while one or two still stand in the crowd alley waiting processing. Consequently the length of the crowd alley is important. Ideally the crowd alley would be long enough to hold an adequate number of cattle for processing while more cattle are brought through the Tub or Box - without disrupting flow. A short crowd alley may result in frequent interruptions of cattle flow and processing.

For some reason the industry has migrated toward the crowd alley starting to curve at the entrance from the Tub or Box. The exit from a Tub or a Box and entrance into the crowd alley should be straight for at least two mature cow body lengths. This allows flow to become established without the appearance of entering a dead end crowd alley. Keep it straight for at least 12 feet and then start a curve if warranted (ex. space is limited). Otherwise a long straight crowd alley works very well for processing cattle.

Most operations will need a Box that is **at least** 12 feet wide and 20 feet deep. It can be 14 feet wide and should be if the handler will be horseback. Depending on the size of the cattle being worked it could be 16 feet wide if the handler in the Box will always be horseback. Both the 14 and 16-foot widths are too wide for comfortably working most stock on foot.

A Box can certainly be wider than an alley leading up to it. In fact, going from a 10 or 12-foot alleyway into a wider Box will normally allow the cattle entering the Box to do so faster setting up the transition even better. Do not let the width of an alley dictate the width of the Box.

The length/depth needed is determined by the size of the group handled. Again, group size is dictated by the capacity of the crowd alley or trailer compartment being loaded. The Box needs to be deep enough to allow the cattle to flow to the back of the Box, let the handler close the gate and get in position before the cattle transition out of the back of the Box. Just like a tub system never overfill the Box. Success depends on the flow into, transition, and flow out of the Box.

For most crowd alleys a 20 to 24 foot Box is adequate depth. Any deeper may force the handler working in the Box to move too deep in the Box to initiate flow. As the handler returns to the correct position, their movement with the cattle will stop flow and turn the cattle back. Going with movement slows it or stops it. Neither response is desirable in getting cattle to flow out of the Box.

Other aspects of a Box design that are critical to success relate to whether or not the sides are enclosed. It is absolutely essential to have the end of the Box open sided so cattle are going to light and will build speed as they enter the Box. Entry speed facilitates the transition and correct flow out of the box. Solid (opaque) panels should be limited to the Box's entry gate and the sides of the box closest to the crowd alley and load out exits. Note - solid sides in these areas are not required but may minimize distractions. Load out and crowd alley exit gates must open back flat against the sides of the Box.

A Box used in loading semi-trailers may require additional depth (30 feet maximum) to facilitate filling compartments quickly. If using this same large box for a crowd alley, the addition of a block gate in the Box to shorten it might be a good solution.

In summary, a Box needs to be 12 to 14 feet wide for most operations and 20 to 30 feet deep depending on the number of cattle needed to flow through the system at any given time. Leave the

back open (translucent); cover the sides and entrance gate if necessary. Figure 4. is a corral design utilizing the bud box processing area.

Continually look for ways and opportunities to improve your skills as a stockman. For more information and additional training opportunities go to:

- Hands on and live demonstrations and trainings at http://www.effectivestockmanship.com
- Videos demonstrating these principles found on at:
  - https://www.youtube.com/c/RanchTV/playlists
    - Stockmanship - CattleHandling
  - https://www.youtube.com/user/ronaldjgill
    - on the Stockmanship Playlist.
- Publications can be found on Texas A&M Animal Science:
  - https://animalscience.tamu.edu/livestock-species/beef/publications/
  - Designing a Bud Box
  - Cattle Handling Pointers

Contact information: Ron Gill, Ph.D., Chico, Texas: Email: effectivestockmanship@gmail.com or rgill@tamu.edu; Rick Machen, Ph.D., Kingsville, Texas, Email rick.machen@tamuk.edu

Crowding Area Designs

There are several designs that work well. Below are some that should be considered if designing a facility from scratch or redesigning an existing working facility. The Forcing Pen below was developed by Dr. Temple Grandin.

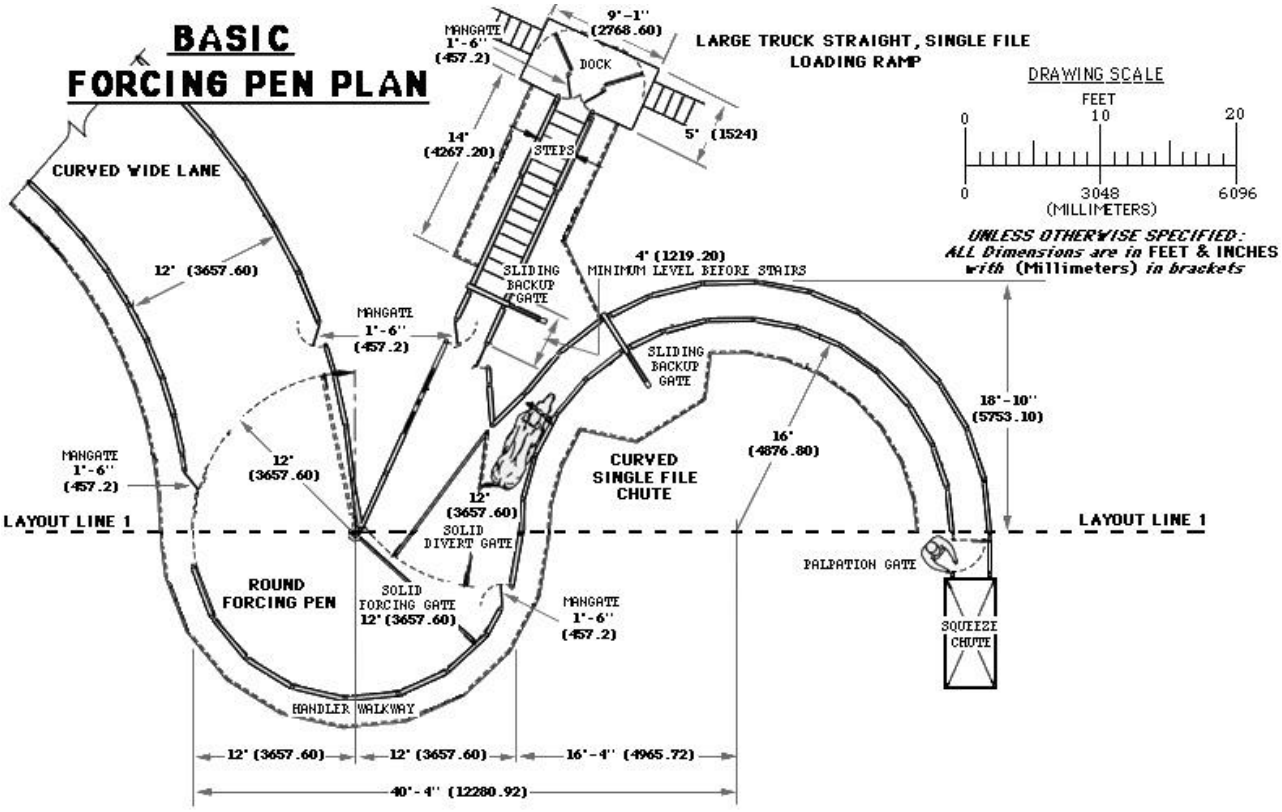


Figure 1. Processing area for handling a large number of cattle.

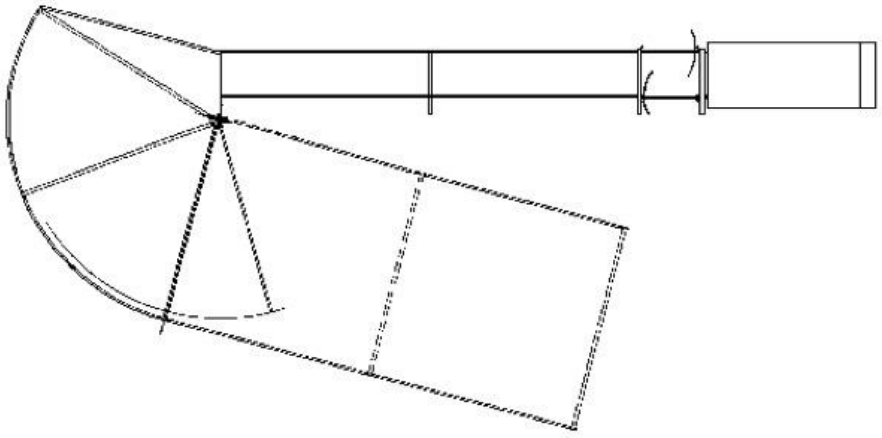
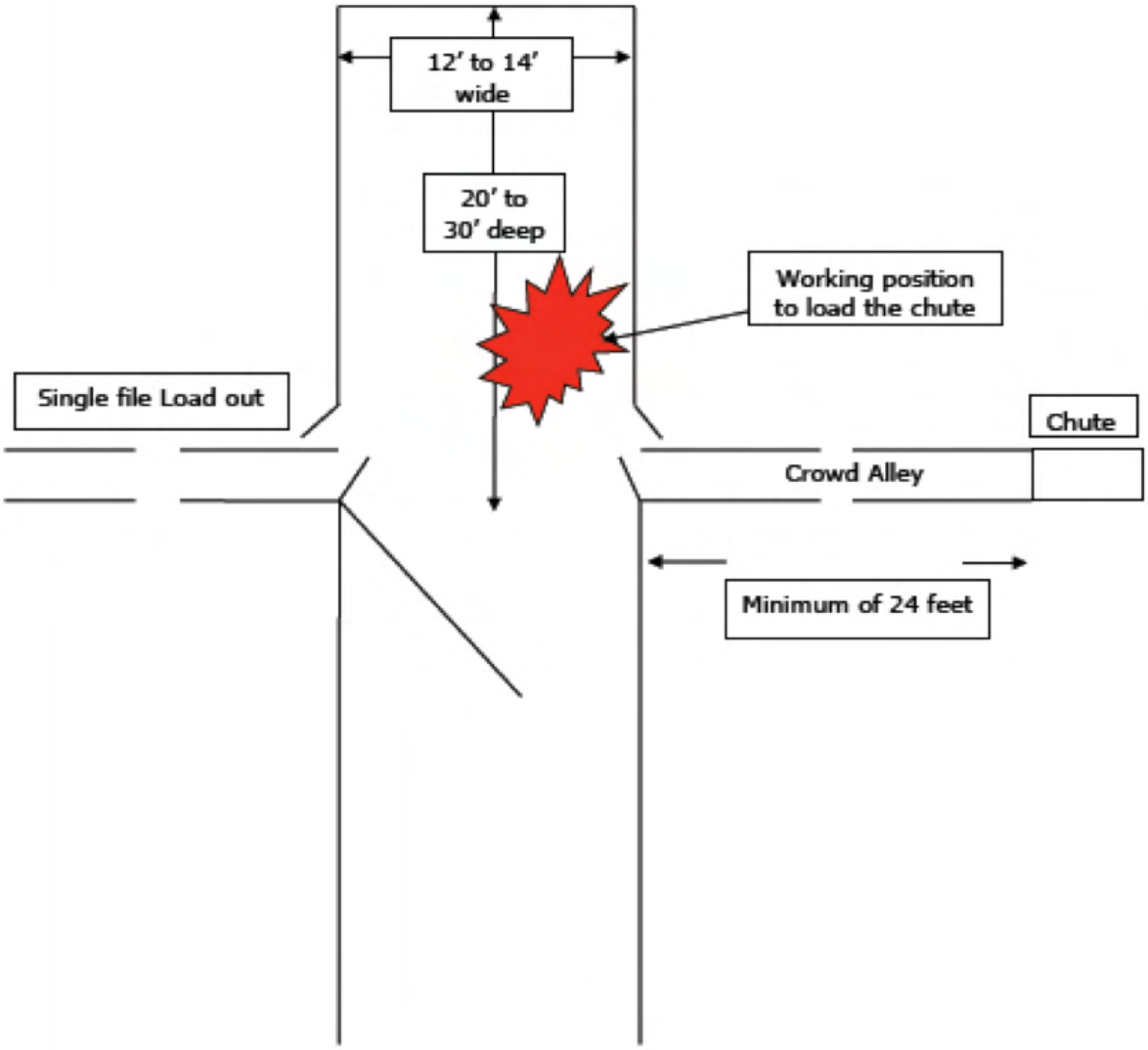


Figure 2. Modified tub design for operations requiring less volume of cattle into the crowd alley. This commonly referred to as a 135° Sweep System. The one shown is available through Priefert Mfg. but is also available through other companies



Bud Box Dimensions		
Handler	Width	Depth*
Always on foot	12′	minimum 20′
Afoot and horseback	14′	20-30′
Always horseback	16′	maximum 30′
*Dictated by size of groups handled.		

Figure 3.
Bud Box design works when the handlers understand cattle behavior and understand how to position themselves inside or outside of the box, depending on cattle disposition, to create flow.

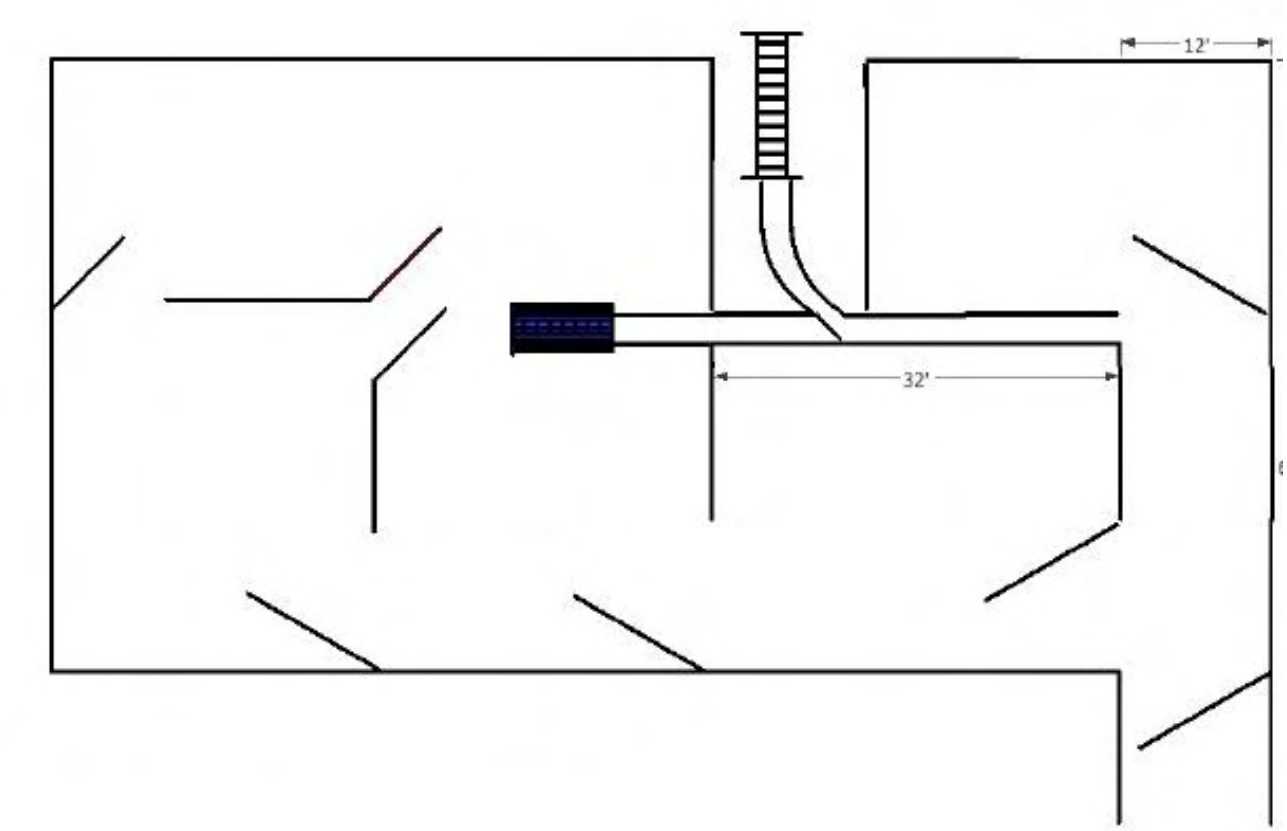


Figure 4. Corral design layout utilizing a Bud Box concept for use in processing cattle and sorting cattle in a confinement feeding operation. Processing areas should not be inside the confinement feeding area but rather located outside the feeding facility.

CHUTE SIDE CATTLE WORKING

Ronald J. Gill[1], Ph.D.

A preventative health plan is essential when preparing weaned calves for the next segment of the industry (as a stocker or feeder). When the plan fails and illness surfaces, the first suspicion is a failure in the vaccination program. There are numerous explanations for these failures: an overwhelming pathogen challenge, stress, immunological immaturity, improper nutrition, genetically limited immunity, poor quality vaccine and improper vaccine handling.

Improper handling or administration renders any vaccine ineffective. Producers too often overlook critical considerations when preparing and administering vaccines. With the increased use of Modified Live Virus (MLV) and chemically-altered (CA) vaccines, many producers need to reevaluate how they handle biological products. Both MLV and CA products must be reconstituted with a sterile diluent prior to being administered to cattle. These products are routinely used in the stocker and feeder segments of our industry with excellent response, where processing speed is considerably faster than on most cow-calf

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operations. Processing facilities are also more likely to be sheltered from exposure to environmental hazards during processing. Most cow-calf operations lack covered or protected working facilities. Therefore, cattlemen must exercise more caution when handling and administering MLV or CA products.

Common handling mistakes can render MLV products inactive and even greatly reduce the effectiveness of Killed (K) vaccines and bacterins. Avoid these common mistakes during procurement, storage, handling and administration of vaccines. *Remember, vaccination alone does not guarantee immunization.*

Select the Best Product:

Purchase vaccine from a reputable supplier. Vaccine will be less than 100% effective if it has ever been unrefrigerated. Left unrefrigerated for an extended period of time (few hours), vaccine loses 100% of its effectiveness. Maintaining a high level of efficacy is critical to establishing immunity in a majority of vaccinated cattle. For example, if the vaccine is only 80% effective and 80% of the cattle respond to the vaccine, only 64% (80% x 80%) of the vaccinated animals are protected against the targeted pathogen. Management practices can increase the percentage of cattle that respond to vaccine and maximum efficacy of the vaccine greatly enhances immune response. Reducing exposure, stress, improved nutritional management, along with proper timing of vaccination, will increase the immune response to vaccine.

Keep it Cold and in the Dark:

When purchasing product, always transport it in a closed, refrigerated container. Refrigerate vaccine and protect it from UV exposure from purchase until administration. Use refreezable cool packs when transporting vaccine. These should be available at the point of purchase.

Protect Vaccine Chute side:

Most beef producers fail to handle vaccines correctly at the time of vaccination. Always keep vaccine and syringes refrigerated while processing cattle. Keep any opened bottle(s) in a cooler with syringes. Store all unopened and unmixed product in a closed refrigerated container until needed. Never mix MLV or CA product before it is needed. Mix only enough to be administered within thirty minutes. Mixed vaccine begins to lose effectiveness in a relatively short period of time (minutes).

Don't Disinfect with Chemical Sterilants:

Do not disinfect syringes or needles used to administer vaccines with chemical sterilants. All sterilants will kill MLV vaccines and damage K products. Sterilizing syringes

with chemical sterilants is a common practice that must be stopped. Only use boiling water to disinfect syringe components. Do not use alcohol, soap, Betadine®, Nolvasan® or Chlorox® to clean or disinfect syringes. Residue left in the syringe compromises the effectiveness of the product. Although this contamination primarily affects the first draw, it could impact the immunization of several animals. A 50cc syringe could impact from 10 to 25 animals depending on whether it was set to dispense a 2 or 5cc dose.

Use Quality Sterile Syringes:

Selecting the appropriate syringe is very important in the implementation of a sound vaccination program. Multiple dose syringes (shown in adjacent picture), or sterile disposable syringes are appropriate for administering sensitive vaccines. Note the different size barrels on multi-dose syringes. Typically the 25 cc capacity syringes (upper left) are better suited for 2 cc doses, while the 50 cc capacity syringes (lower right) work well with 5 cc doses.

Multiple dose syringes need to be completely disassembled after each use. Do not use disinfectants to clean components. Disassemble, boil components to sterilize and store in a clean, dry sealable bag or container.

Many continuous feed syringes (a tube connects syringe to product) cannot be cleaned effectively because they cannot be disassembled and boiled. However, they can have boiling water drawn through them to effectively clean these syringes. Use caution – boiling water often damages this type of syringe. Even if a continuous feed syringe can be disassembled and adequately disinfected, several other problems remain with this type of delivery mechanism (controlling temperature of vaccine in the tube, protecting the vaccine from UV light, etc.).

New disposable syringes are a sterile delivery instrument. These plastic syringes can be very accurate when used for single dose delivery. However, when used for multiple dose delivery, they are often very inaccurate. For example, a 5cc syringe effectively delivers single 2 or 5cc doses, but attempting to administer multiple doses often results in over or under dosing. This problem is magnified when using 10 to 60cc syringes.

One disadvantage of plastic syringes is the tendency for the tip to break while vaccinating an improperly restrained animal. When this happens, discard the exposed and contaminated product with the syringe. Attempting to transfer the exposed vaccine into another syringe increases the chance of contamination and thereby could reduce immunization of subsequently vaccinated animals. Draw a single dose for each individual animal. If syringe damage occurs, only a small amount of product is lost. Leave a sterile needle in the working bottle which is kept in the working cooler. Never enter any bottle of vaccine with a used needle.

When using multi-dose syringes, change needles prior to each filling of the syringe. This practice will prevent contamination of vaccine and help ensure needle integrity and sharpness.

When single dose or disposable syringes are being used, a sterile needle is often left in the stopper of the working bottle. While it is important to not enter a bottle with a used needle the practice of leaving a needle in the working bottle will lead to rapid contamination of the vaccine. After each filling when the working needle is the vacuum is lost and the result is contaminated air particles are drawn into the vaccine. When using single dose or disposable syringes it is best to change needles for every fill just as when using multiple dose syringes.

Quality and accurate calibration of syringes is crucial. Even slight changes in working components can change the volume dispensed. Components can break or bend without being detected. Inspect carefully. Some multi-dose syringes are not accurate enough for low dose (2 cc) products. Always keep spare parts readily available in case something happens to the working syringe. Keep a supply of extra disposable syringes as an excellent backup delivery system.

Lubricate with First Vaccine Draw - No Petroleum-Based Products:

Use the first draw of vaccine to lubricate the syringe. Do not lubricate syringes with petroleum-based lubricants. Prohibited lubricants include silicone, mineral oil, Vaseline®, vegetable oil or any other lubricant, whether petroleum based or not. All of these lubricants can inactivate MLV or CA products. These products may also compromise the efficacy of K products. If the O-ring on the plunger is so difficult to move that lubricant is necessary, replace the O-ring or the syringe.

Protect Vaccine from Heat and Light:

Do not leave vaccine or syringes in direct sunlight, even for a short time. Sunlight and ultraviolet light (UV) will inactivate vaccines. Do not leave syringes on working tables, barrels or pickup tailgates while performing other processing chores at the chute. The pictures right and below demonstrate practical, low-cost methods to keep syringes cool and out of direct sunlight while maintaining easy accessibility. Simply putting a syringe in a cooler while not in use is a satisfactory procedure.

Avoid exposure of vaccine and syringes to heat. Sunlight heats up syringes dramatically. Always cool down syringes before the initial draw of vaccine. Carrying syringes in the cooler while going to the cattle handling facility allows sufficient time for the syringe to cool before drawing up the first vaccine. If the needle/syringe is not in use, put it in a cooler. If any delay occurs in processing, place syringes back in a

cooler immediately. A cooler or bucket as shown keeps syringes from prolonged exposure to UV light throughout processing. Exposure would only occur from the cooler to the chute and back to the cooler.

Proper syringe handling does not appreciably increase processing time. If continuous feed syringes are used, the bottle, hose and syringe must be protected from exposure to UV light. It is very difficult to keep all components of a continuous feed syringe sheltered from exposure to the elements. A better use of these syringes is for administering less heat/light sensitive materials such as anthelmintics, antibiotics or vitamins. Never use a syringe to administer antibiotic or anthelmintic, then subsequently administer MLV, CA or K vaccine. Any residue affects the vaccine.

This brings up another problem with continuous feed syringes. How can the bottle and syringe and supply tube be kept cool and protected while carrying it chute side? Many times these bottles and syringes are suspended chute side in direct sunlight and exposed to heat during processing. This results in deterioration of the vaccine and inadequate immunization.

Take two coolers to the processing area. Keep all unopened vaccines in a tightly closed, refrigerated cooler. The intent is to minimize exposure of unused product to temperature fluctuations and contact with light. Working bottles can be kept in the second cooler with syringes. Label syringes and the cooler box prior to processing to prevent accidental mixing of vaccine when refilling syringes. Accidental mixing of two vaccines will result in under dosing and may render one or both of the vaccines ineffective. Mixing MLV product with a non-water based K product destroys the MLV product immediately. The inadvertent mixing of product (which all too frequently occurs during processing of cattle) can be eliminated by attention to details and proper labeling.

Mixing and Drawing Vaccines:

Mix only as much MLV or CA vaccine as will be used in 30 minutes or less. MLV products must be used immediately after mixing. They cannot be stored for later use. Partially used bottles of killed vaccines can be refrigerated for short periods of time (24 hours), but they should not be kept if anything other than a sterile needle was used to draw vaccine. Use a sterile transfer needle when mixing MLV and CA products (see adjacent picture). Transfer needles can be sterilized and re-used. Transfer needles minimize product contamination during mixing. If a transfer needle is not available, use a sterile syringe to draw the diluent out of the plastic bottle and then insert the needle into the glass vial.

When using a transfer needle, begin by inserting the transfer needle in the stopper of the plastic bottle, invert the needle and diluent and insert the other end of the transfer needle into the stopper of the glass vial containing the freeze-dried MLV. The glass vial has a vacuum drawn on it that will be lost if the transfer needle is inserted into the glass vial first. If the vacuum is lost, the diluent should be drawn (sterile syringe and needle) and pushed into the vial containing the freeze

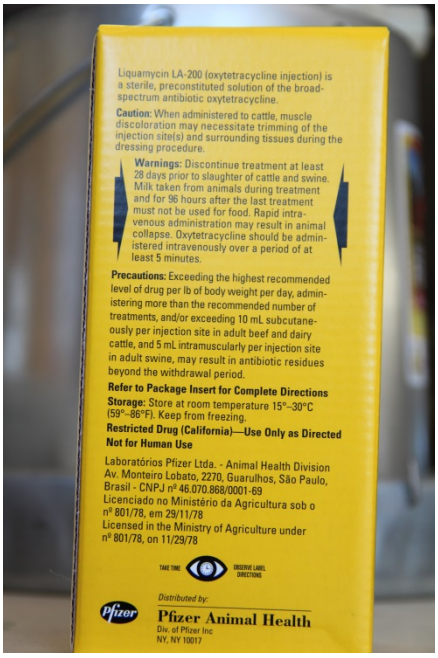
dried MLV fraction.. After proper mixing (gentle agitation, not violent shaking), vaccine can be drawn from the glass vial into the syringe.

Remember - Never draw from a bottle with a working needle that has entered an animal. Though this is a common practice, it likely contaminates the remaining vaccine. Adopt the practice of changing needles before refilling a syringe to keep needles sharp and the vaccine free of contamination.

Inspect and Maintain Equipment:

Good equipment is expensive and should be cared for. If processing cattle in more than one location, keep all equipment together in a readily portable container. Always inspect syringes prior to processing. Check the barrels for chips or cracks which would result in leakage, wasted product and under dosing. Check calibration and dosage setting prior to and continuously throughout the process. Dose setting on some syringes can fluctuate very easily leading to under or over dosing.

Read Labels - Dose Properly:



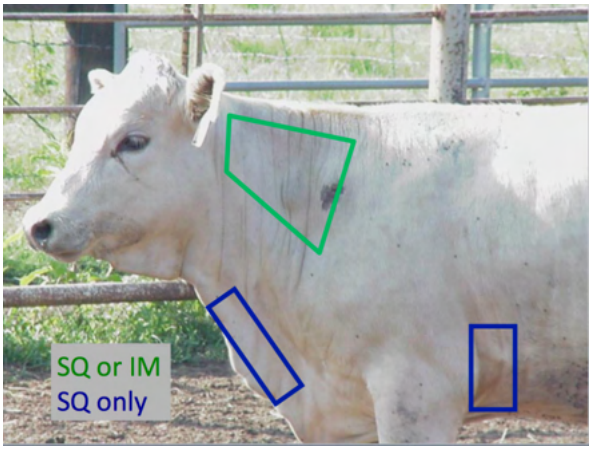
Selecting the most appropriate product and route of administration are fundamental **Beef Quality Assurance** best management practices. **Read the label** to determine dose. Many products are now administered in low dose (2cc) volume to reduce injection site reaction. Some products are still formulated to be delivered in a 5cc dose.

Some products may be 2cc when administered alone, but 5cc when other products are included in the dose. One example is found in the CA products Cattlemaster®4 and Cattlemaster®4-VL5. Cattlemaster®4 is a 2cc product while Cattlemaster®4-VL5 is a 5cc product. **Always read label and dosing instructions prior to processing**. Dose or approved route of administration for some products has changed. Take time to become familiar with the products. Also, check for side effects and treatment should they occur. Should cattle experience a reaction, intervention must occur immediately to prevent death.

Follow label directions for all products. Booster vaccines as specified on the label. To establish immunity, almost all products require a booster vaccination 2 to 4 weeks after the initial immunization. If a booster is required one initial dose will not achieve full immunity. At best, one dose provides a temporary immune response. Sustained levels of immunity capable of preventing illness can only be established by boosting initial vaccinations.

Minimize Injection Site Blemishes:

Select the proper injection site and use the route of administration specified on the label. When possible, administer vaccines in front of the shoulder (see picture below). Intramuscular (IM) injections should be given 2 to 3 inches below the top of the neck and 4 to 6 inches in front of the shoulder. Inject all IM products by inserting the needle perpendicular to the neck. Subcutaneous (Sub-Q) injections should be given in the neck region using the tent method or behind the foreleg in the elbow pocket. For more information on administering vaccine to cattle, refer to Texas A&M Agrilife Extension Service Bulletin *B-5028*, *Administration of Medicine and Vaccine to Cattle*.



Appropriate injection sites for ALL injectable products are shown in this picture. Almost all beef cattle vaccines and antibiotics can be administered with a 1" long 16 or 18 gauge needle. Always use the smallest needle possible when vaccinating (20 gauge and smaller needles should never be used).

Note: The smaller the gauge number, the larger the needle diameter. A 16 gauge is a larger diameter needle than an 18 gauge. Eighteen gauge needles work well for water-based products such as most MLV and CA vaccines. For oil based products such as some antibiotics and a few vaccines, product is more easily dispensed through a 16 gauge needle.

A 5/8th " to 1" needle is sufficient for IM and Sub-Q injections in calves. A 1" needle should be used for IM injections in yearlings and mature cattle. A 5/8th to 1" needle can be used for Sub-Q injections on older cattle.

If label directions offer either Sub-Q or IM, choose the Sub-Q route of administration. It is less intrusive and less damaging to muscle tissue. Research has shown that tenderness is affected in a 2-3 inch radius around the injection site, even when a lesion is not observed. This negative effect on tenderness is reason to avoid injections in the hip (think sirloin) or round. The industry cannot afford bad eating experiences, particularly those so easily prevented.

These are some of the major 'easily remedied' factors associated with the success or failure of immunization programs. All of the above can be rendered ineffective if the nutrition, handling, stress and genetic components of the immune system are not in proper balance.

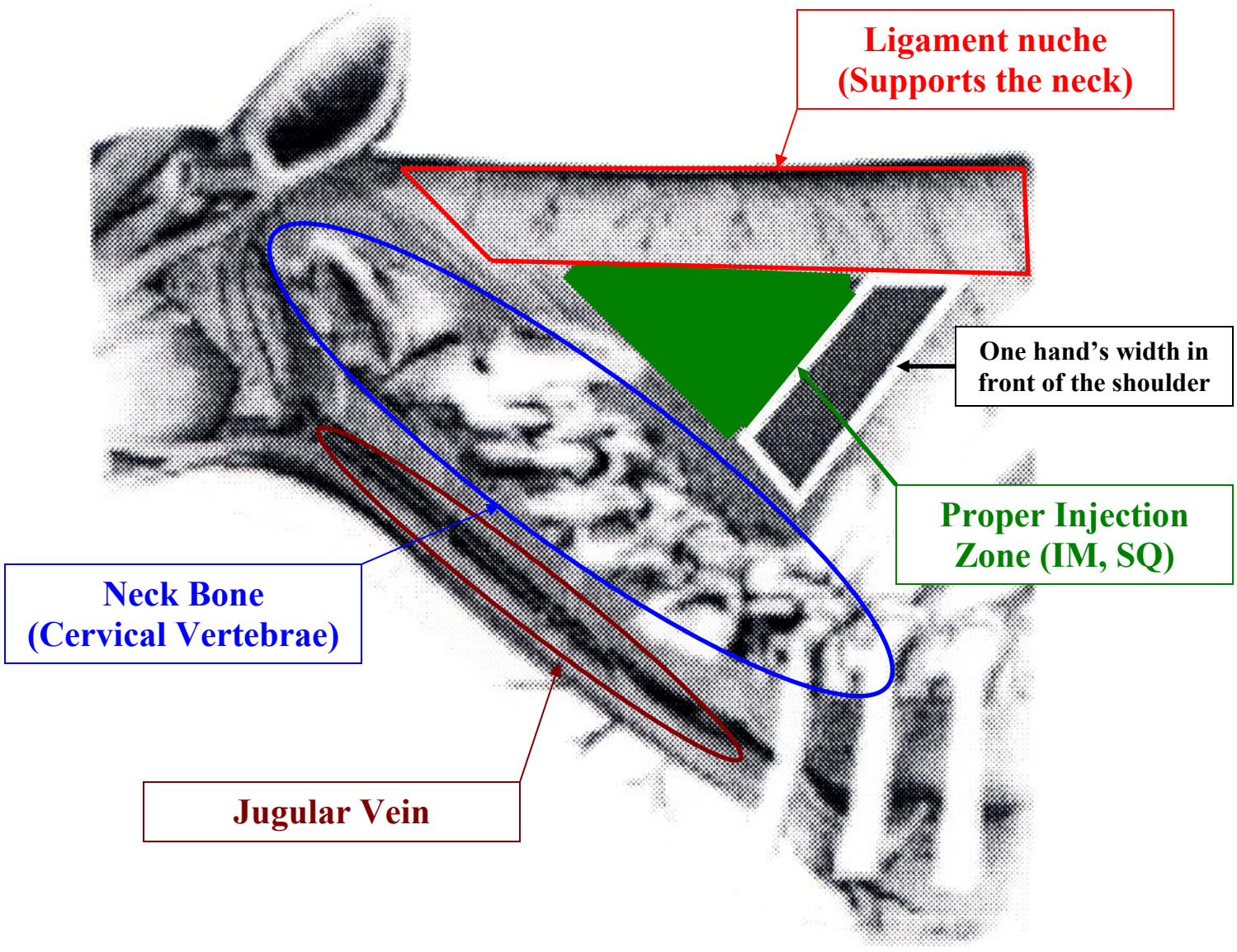
Detailed information on how to manage these additional components of immunity is available. All are dependent upon the effective management of the total production system. There are no easy answers in cattle management. Maximizing production efficiency requires a truly integrated management system. How well it works depends on the beef producer's ability to implement and manage all the components together.

CRITERIA FOR EFFECTIVE VACCINATION
Determine target pathogens
Select the most effective vaccine
Prevent exposure of vaccine to heat and light
Use only sterile needles and syringes
Draw from bottle with sterile needle
Use quality syringes
Inspect and maintain all working components
Administer proper dose
Use proper needle size
Administer recommended route IM or SubQ
Administer in recommended site, neck region
Change needles often to reduce tissue irritation
Always follow label directions
Booster all vaccines when label requires it

NEVER
Leave vaccines in direct sunlight or UV light
Leave vaccines unrefrigerated
Allow vaccines to freeze, especially killed products
Place a used needle in a bottle of vaccine
Place vaccine in hip or upper round
Fail to read directions before starting
Assume anything, always check

Top photo courtesy of Kimberly Brian Photography

Cattle Injection Zone



Outlined area recommended by the NCBA BQA Task Force to be eliminated for injections.

TEXAS A&M AGRILIFE EXTENSION

Vaccination Basics

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1

Components of a herd health plan

- nutrition
- genetics
- biosecurity
- parasite control
- vaccination
- treatment plan

2

Cattle Diseases

- bacterial
- viral
- protozoal
- fungal
- other

3

Bacterial Diseases

clostridial diseases

- *Clostridium chauvoei* (black leg)
- *Clostridium septicum* (malignant edema)
- *Clostridium novyi* (black disease)
- *Clostridium sordellii* (gas-gangrene)
- *Clostridium perfringens type C&D* (enterotoxemia & enteritis)
- *Clostridium haemolyticum* (red water)
- *Clostridium tetani* (tetanus)
  - most clostridial vaccines do not contain tetanus, but a few do

4

Bacterial Diseases

reproductive

- *Campylobacter fetus* (vibrio)
- *Leptospira sp.*, 5 traditional strains (lepto)
- *L. hardjo-bovis* (listed as HB on most vaccines)
- Brucellosis

respiratory

- *Mannheimia hemolytica* *(Pasteurella hemolytica)*
- *Pasteurella multcodia*
- *Histophilus somni* *(Haemophilus somnus)*

5

Viral Diseases

reproductive

- IBR
- BVD

respiratory

- IBR
- BVD
- PI-3
- BRSV

6

Potential Losses Caused by Diseases

7

Can Cause Reproductive Loss

- *L. hardjo-bovis* (listed as HB on most vaccines)
- *Leptospira sp.*, 5 traditional strains (lepto)
- *Campylobacter fetus* (vibrio)
- Brucellosis
- IBR (bovine herpesvirus 1)
- BVD
- Trich

8

Can Cause Respiratory Disease

- *IBR*
- *BVD*
- *PI-3*
- *BRSV*
- *Mannheimia hemolytica* *(Pasteurella hemolytica)*
- *Pasteurella multcodia*
- *Histophilus somni* *(Haemophilus somnus)*

9

Diseases Routinely Vaccinated For

calves
- clostridial diseases
- IBR, BVD, PI-3, BRSV
- lepto

replacement heifers & cows
- clostridial diseases
- IBR, BVD
- lepto & vibrio

consult your cattle veterinarian!!!!!

10

Vaccine Terminology

- 7-way vs 8-way
  - *C. haemolyticum* (i.e. red water)
- Covexin 8 vs Cavalry 9

11

BOVILIS® COVEXIN® 8

Shown to be effective for the vaccination of healthy cattle and sheep against disease caused by Clostridium chauvoei, C. septicum, C. novyi Type B, C. haemolyticum (known also as C. novyi Type D), C. tetani and C. perfringens Types C and D.

S® CAVALRY® 9

Shown to be effective for the vaccination of healthy cattle 3 months of age or older against disease caused by Clostridium chauvoei, Cl. septicum, Cl. novyi Type B, Cl. haemolyticum, Cl. sordellii, Cl. tetani and Cl. perfringens Types C and D.

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tetanus

- toxoid
  - not immediate, longer term protection
- antitoxin
  - immediate protection
  - preparations of antibodies against bacterial toxins
  - not technically a vaccine
  - passively tie up toxins instead of actively stimulating an immune response

(Daly and Price, 2010)

13

- Common Types of Vaccines
  - inactivated (killed)
    - contain organism or subunit of organism
    - have been inactivated so they can't replicate or reproduce
  - toxoids
    - created from inactivated toxins
  - live attenuated (modified-live)
    - able to multiply but not cause disease

(Daly and Price, 2010)

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Vaccine Terminology

- killed vs modified live
- with modified live mainly think about
  - IBR (bovine herpesvirus 1)
  - BVD
  - PI3
  - BRSV
- modified live may have restrictions for breeding animals
- safe for pregnant cows*

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Modified Live Virus

- stockers and feeder cattle vs breeding animals
- modified live IBR and BVD use in breeding age females
  - opinions vary (visit with your veterinarian)
  - appears to be growing amount of concern
    - 1 big studied show numerical reductions even when used according to label directions
- what is level of risk in your herd

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Examples of Basic Vaccine Programs with killed virus components

*these examples would cover the "diseases routinely vaccinate for" with the exception of vibrio; there may be other diseases that are important in your operation so consult with a cattle veterinarian in your area

**these are just a few basic examples to illustrate a vaccine program, there are numerous other products and strategies that could be used in a well-designed vaccination program

17

Elanco

Vira Shield 6 + L5 HB

does not offer a clostridial vaccine

18

BI

Alpha 7
Triangle 10 HB

19

Examples of Basic Vaccine Programs with modified live virus componments

*these examples would cover the "diseases routinely vaccinate for" with the exception of vibrio; there may be other diseases that are important in your operation so consult with a cattle veterinarian in your area

**these are just a few basic examples to illustrate a vaccine program, there are numerous other products and strategies that could be used in a well-designed vaccination program

20

Merck

(new vaccine name Bovilis…)

Vision 8

Vista 5 L5

Label restrictions depending on vaccine history
MLV: IBR, BVD, PI3, BRSV

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Zoetis

Ultrabac 8
CattleMaster Gold FP5
Spirovac L5

modified live (temperature sensitive) IBR & PI3
killed BVD
modified live BRSV

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Vaccine Timing: Calves

initial vaccination: 2-3 months
- clostridial
- IBR, BVD, PI3, BRSV
- lepto

booster vaccination: preweaning or postweaning?
- clostridial
- IBR, BVD, PI3, BRSV
- lepto

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Vaccine Timing: Cows

pre-calving preferred
- clostridial

pre-breeding preferred
- IBR, BVD
- lepto
- vibrio

often all are given when cows are palpated

24

primary vaccination:

- 2 doses
- 2 to 4 weeks apart
- last dose at least 4 weeks before breeding

25

vaccine programs need to be re-assessed yearly

- new research
- changes in available vaccines
- changes in risk level
- label changes
- new products

consult with a cattle veterinarian

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Best management practices and considerations for beef cattle implant programs

J.K. Smith[1], J.P. Banta[2], M.J. Hersom[3], R.L. Stewart, Jr.[4], and J.D. Rhinehart[5]

Growth-promoting hormone implants offer a substantial return on investment to beef cattle producers through increased rate of weight gain and improved feed efficiency. Implants have no withdrawal period and are safe and effective when used in accordance with the product label. Cattle managed on an adequate to high plane of nutrition that are not experiencing significant health challenges are expected to yield the most favorable responses from the implant. The following management practices and guidelines should be followed to maximize implant efficacy.

Preparing to implant

- Read and understand the entire label for any implant product that you plan to use.
- Do not administer an implant to any animal or within a production phase for which the specific product has not been approved, as indicated by the animal or production phase listed on the label.
- Do not administer implants to bulls or heifers to be retained or marketed for breeding purposes.
- Do not use expired implants, and store implants according to the specifications outlined on the label.
- Plan implanting to coincide with other management events that require cattle to be processed.
- Each product line requires its own applicator. Be sure to have the proper equipment that is completely functional prior to implanting. Also have a backup applicator on hand in case one fails or becomes inoperable, as well as extra needles in case one becomes dull or extremely dirty.

Administering the implant

- Wear disposable latex or nitrile gloves while handling implants, handling, and cleaning implanting equipment, and while administering implants to cattle. Gloves will help to keep implants, implanting equipment, and the animal's ear clean, while also reducing the risk of exposure to zoonotic diseases through contact with blood.
- Sanitation of equipment is important to minimize the risk of infection at the site of implant administration. The implant needle should be disinfected between each individual implant administration by wiping the needle across a sponge soaked in disinfectant solution (e.g., chlorhexidine; one ounce per gallon of clean water). Never dip or soak the needle of a loaded applicator in disinfectant solution as the liquid in the needle may cause the implant to begin to dissolve. A paint tray works well to hold a rectangular sponge and approximately ½ to ¾ of an inch of disinfectant solution. The sponge can then be flipped over or replaced as needed.
- The animal's ear should be clean and free of dirt, mud, manure, or other debris. If necessary, clean the ear by first scraping it with a blunt edge, then using a brush to remove any remaining debris, and finally by chemically disinfecting the implant site by scrubbing with a sponge soaked in disinfectant solution. Then dry the ear as best as possible prior to administering the implant.
- The needle on the implant applicator should be clean, sharp, free of burrs, and securely attached to the applicator. Change needles that become dull, develop a burr, or become extremely dirty. The cost of a new needle is far less than the revenue lost by a single implant not being administered correctly due to an issue with the needle.
- The animal's head should be adequately restrained to simplify the implanting process.
- Implants are administered subcutaneously (beneath the skin) in the middle portion of the back of either ear. If necessary, select the ear that contains the fewest number of ear tags, tattoos, or notches.

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[4]Associate Professor and Extension Coordinator, University of Georgia
[5]Professor and Assistant Dean, University of Tennessee Extension

- To administer the implant:
  1) Make sure an implant dose is loaded in the applicator and ready to be administered.
  2) Grasp the ear to be implanted with one hand.
  3) Hold the applicator at an angle that is slightly elevated from parallel to the backside of the ear with the other hand, with the needle point making direct contact with the skin. Some prefer the needle opening pointed out and away from the ear, while others prefer it to be pointed toward the ear.
  4) Pierce the skin with the needle and slightly lift the skin to avoid piercing the cartilage, while also taking care to avoid major blood vessels. If necessary, use your fingers to support the ear.
  5) Decrease the angle of the needle to parallel with the ear while fully inserting the needle beneath the skin of the ear. The needle will form a space for the implant to reside once withdrawn.
  6) Once the needle is fully inserted, withdraw it the approximate length of the complete implant dose if the applicator does not have a self-retracting needle. If the applicator has a self-retracting needle, skip this step. The space created by partially withdrawing the needle or its self-retraction helps to ensure that the entire implant dose is retained in the ear, and not bunched or crushed.
  7) Depress the trigger, then withdraw the needle from the ear. The implant pellet(s) will be deposited in the space created by the needle. Gently feel for the row of pellets or single pellet to ensure that the implant was deployed and placed properly in the ear. Improper implant placement can decrease the efficacy of the implant or increase the likelihood of infection.
  8) Clean and chemically disinfect the applicator needle prior to implanting the next animal.

After implanting

- Store implants in a cool, dry place, but not in a freezer. Avoid locations that will be exposed to freezing or hot temperatures. Only refrigerate opened implant packages if instructed to by the label. Many products should not be refrigerated.
- Clean and allow the implant applicator to dry prior to storage. Soak the needle in a chemical disinfectant solution and allow it to dry. Avoid dulling the needle. Store needles in dedicated containers that will keep them clean, but also prevent them from becoming dull or developing burrs.
- Once clean and dry, store the implant applicator and needle(s) in a clean, sealed, dry plastic bag.

Factors that may reduce or negate implant efficacy

- If the implant applicator was not loaded, or the implant dose was not chambered prior to administration, this would result in no implant being administered to the animal.
- Crushing the implant pellet(s) prior to or during administration may result in the implant not delivering the expected level of hormone(s) over the expected duration.
- Bunching of the implant resulting from not fully inserting the needle into the ear or not partially withdrawing a needle that does not self-retract during implant deployment may result in limited absorption of the hormone(s).
- Pushing the needle through the ear and depressing the trigger results in the implant not being administered to the animal.
- Administering the implant into the cartilage rather than subcutaneously reduces or negates absorption of the hormone(s).
- Local infection (abscess) at the implant site due to the implant needle, implanter's gloves, or the animal's ear not being clean and properly disinfected limits or negates absorption of the hormone(s)

Utilizing growth-promoting hormone implants improve beef cattle growth and feed efficiency in a way that is safe and cost effective. Implanting cattle using these best management practices will help to maximize implant efficacy. Contact your local Extension office for more information or assistance with implementing these practices into your beef cattle operation.

Anesthesia and Pain Management

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Anesthesia

Cattle present the practitioner with a unique set of problems when it comes to anesthesia, especially general anesthesia. A large, heavy rumen and small lungs can complicate an anesthetic event because of the need for increased ventilatory pressures when the rumen is exerting pressure on the thorax, decreased venous return when the patient is in dorsal recumbency and the rumen is pressing on the vena cava, and decreased oxygenation from poor lung perfusion and possible decreased tidal volume for the reasons previously mentioned. When possible, ruminants should be fasted for at least 24 hours (and even 48 hours) prior to an anesthetic event. The exception to this is pre-ruminating calves who basically function as a monogastric. Neonates should not be held off feed because of concerns of intraoperative hypoglycemia.

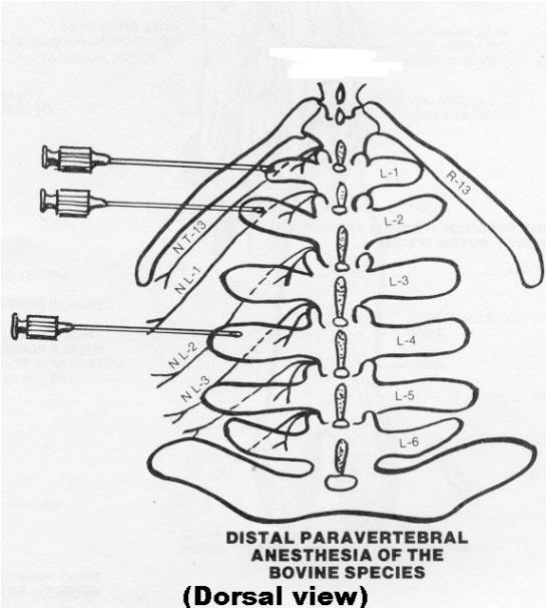
Not many general practices have the necessary equipment, technical help, or facilities to offer gas anesthesia to their large ruminant patients, so much of these proceedings will reflect options other than inhalant anesthetics. Parenteral options for anesthesia should be considered after evaluating the facilities, patient demeanor, and technical assistance available to the practitioner. If administering intravenous anesthetic, an IV catheter should be placed to facilitate fast redosing if necessary. One tip to keeping a jugular catheter patent in adult cattle is to angle the stab incision in the skin through which the catheter is placed. The stab incision in the skin should be placed at the same angle that the catheter will pass through the skin into the jugular vein. Because of the thickness of bovine skin, my recommendation is to make this stab incision at an ~45-60° downward angle. When the catheter is inserted at a 90° angle, as soon as the rigid metal stylet is removed from the catheter and the hub of the catheter is secured to the skin, the catheter makes a 90° kink as it enters the tunnel through the skin and another 90° kink as it exits the dermis internally and enters the vein. Making the tunnel at the same angle as the course of the correctly placed catheter will increase the longevity of the catheter. It is never a bad idea to place an endotracheal tube with an inflatable cuff to protect the airway in ruminants as true regurgitation of ruminal contents during general anesthesia is almost certain to cause asphyxiation of the patient. However, this is not always practical or possible in field settings.

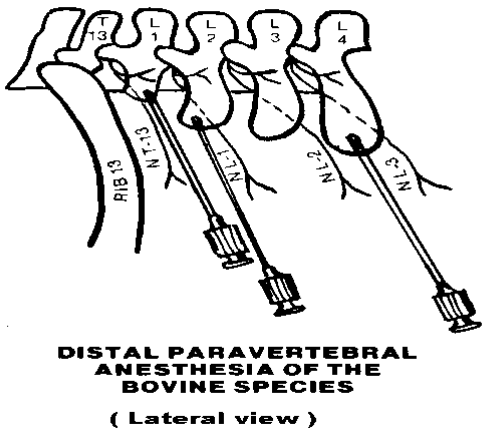
Many short surgical procedures (digit amputation, simple hernia repair, etc.) can be performed with heavy sedation, a casting rope (if necessary), and a local block. The generous use of lidocaine at the site of the surgical incision can prolong the effect of your sedative and/or anesthetic, is inexpensive, and easy to perform.

Options for anesthetic and sedative protocols are many and will be dictated by patient attitude, drug availability, and the procedure being performed. Cattle are very sensitive to the effects of the α-2 agonist, xylazine, and the practitioner can determine the positioning of the patient based on the dose administered. Lower doses of xylazine (0.02-0.03 mg/kg) can be used to sedate a patient, yet remain standing. Larger doses (0.05-0.1 mg/kg) can be used to facilitate recumbency. Xylzine can also be used in combination with ketamine, ketamine and butorphanol, and telazol to increase duration of effect. While these protocols will be presented, the reader is directed elsewhere for more specifics on use of these protocols.[1]

Distal Paravertebral (Cakala) Block

Indications for a Cakala block is any standing surgery involving the flank including C-section, exploratory laparotomy, displaced abomasal correction, surgery of other GI structures (cecum, spiral colon, small intestine, etc.), and ovariectomy. To perform this block the practitioner will need a 1.5" 18 gauge needle and a 60ml syringe with 2% lidocaine. The landmarks are the transverse processes of L1, L2, and L4. The needle is inserted to its hub (in adult cattle) above the transverse processes in the areas of the diagram below (taken from Food Animal Surgery, 3rd ed. John Noordsy) and ~10 ml of lidocaine is injected at each injection site in a fan-like pattern effectively desensitizing nerves T13, L1, and L2. Following injection above each transverse process, the needle should be walked off the bone and readvanced ventral to the process whereby another 10 ml of lidocaine should be injected in a similar manner.





Two situations that may make this technique less desirable include animals that are heavily conditioned and when the practitioner is in a great hurry (such as a C-Section). This technique can take 10-15 minutes to take full effect and if the surgery dictates, an inverted "L" or line block may be a better option. Additionally, in heavily conditioned animals that the transverse processes are not able to be palpated other options for local anesthesia are probably better.

Distal Limb (Bier) Block

The distal limb block is easily performed with the right equipment. A tourniquet, 19 ga. butterfly catheter, and a clippers are required. The type of tourniquet used is important. A Simplex tubing or other rubber hosing will not get tight enough. A 3" or 4" esmarch (blue or green elastic plastic) tourniquet is inexpensive, reusable, and provides the best method of occluding arterial and venous blood flow to the digit. The tourniquet is placed proximal to the fetlock making sure the tourniquet is very tight. The lateral or medial digital vein or dorsal common digital vein are clipped and briefly scrubbed. A 19 gauge butterfly catheter is then inserted into the vein and 25-30 ml of lidocaine is infused into the vein. The digit will effectively be blocked within 1-2 minutes. When removing the catheter needle, a folded gauze and circumferential application of white tape may be needed to provide hemostasis to the distended vein. This block can be difficult to perform in swollen tissue when the landmarks are difficult to palpate. In these cases, the tourniquet can be moved up the limb and the veins accessed more proximally while increasing the volume of lidocaine to accommodate the larger perfusion area.

Figure 1. Location of needle placement for Bier block in the lateral digital vein.

Figure 2. Location of needle placement for Bier block in the dorsal common digital vein.

Pain Management

There are currently no FDA labeled medications for the treatment of pain in ruminant species. Flunixin meglumine (Banamine®) is the only non-steroidal anti-inflammatory labeled for use in cattle for the treatment of pyrexia associated with respiratory disease and metritis and inflammation and pyrexia in cases of endotoxemia. Extralabel drug use in ruminants is allowed only by or under the supervision of a veterinarian, allowed only for FDA-approved animal and human drugs, only permitted when the health of the animal is threatened (not for production purposes), not permitted in feed, and not permitted if it results in a drug residue in food intended for human consumption. (Animal Medicinal Drug Use Clarification Act of 1994 (AMDUCA)). This allows the practitioner to have multiple options for pain control in the ruminant. However, research of the pharmacokinetics and pharmacodynamics of analgesics in the ruminant is still an evolving science that has seen increased activity recently. Along with these options, the practitioner should be aware of the mechanism of action of these medications and the current science so that the best analgesic can be prescribed for a specific patient's needs. Appropriate withdrawal times should also be honored so as to prevent a violative residue in meat and/or milk. When questions arise as to what an appropriate withdrawal time should be, the Food Animal Residue Avoidance Databank (FARAD) should be consulted. Most questions are answered within 24 hours and this is a very good resource for food animal veterinarians. www.farad.org.

Possible analgesics are NSAIDS (flunixin meglumine, phenylbutazone, meloxicam, carprofen, aspirin, and ketoprofen), local anesthetics, opioids, α2 agonists, ketamine, gabapentin, opioids, and tramadol. Of the NSAIDs, flunixin meglumine and meloxicam are the most frequently used. Phenylbutazone is prohibited in female dairy cattle over the age of 20 months and there is a zero tolerance for bute in all meat and milk products, so it is not commonly used. Aspirin is very poorly absorbed from the rumen (estimated at 20%) and is not a good option for analgesia in ruminants. Gabapentin, when used concurrently with meloxicam, appears to have a synergistic effect for pain relief especially when an animal is experiencing hyperalgesia (increased reaction to painful stimulus). Flunixin, a non-COX selective

inhibitor, can cause gastrointestinal ulceration (abomasal ulcers) and renal complications when used long term. Thus, I rarely use flunixin for more than three consecutive days. Meloxicam, however, is a COX-2 selective inhibitor meaning that there are less side effects to its long term use and I have had patients on a 0.5mg/kg dose once daily for up to 3 months with no clinical side effects noted.

It is a generally accepted principle that it is better to prevent pain than it is to treat it. Simple steps such as applying local anesthetic prior to procedures such as dehorning and castration can go a long way in mitigating negative behaviors associated with pain (anorexia, increased time in recumbency, etc.) and is becoming more commonplace. However, this must be balanced with the expectations of field work. When there are large groups of calves to work in a single day, creative measures such as having a chutehand to perform the lidocaine injection prior to the calf reaching the chute or using two chutes to process calves may provide a workable solution. But this could also be an increased expense in the form of additional technical help and equipment. There are many factors to consider when discussing the benefits of pre-emptive local anesthesia when performing on farm processing.

References

1. Seddighi R and Doherty TJ. Field Sedation and Anesthesia of Ruminants. *Vet Clin Food Anim* 32(2016);553-570.

Other Resources

Edmonson MA. Local, Regional, and Spinal Anesthesia in Ruminants. *Vet Clin Food Anim* 32(2016);535-552.

Veterinary Clinics of North America: Food Animal Practice. *Pain Management*. Hans Coetzee, editor. March 2013.