SAFE HANDLING OF LARGE ANIMALS (CATTLE AND HORSES)

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The author has over 25 years of experience handling large animals. This chapter is based on both scientific literature and extensive practical experiences with cattle, bison, antelope, elk, and horse handling on ranches, feedlots, zoos, and slaughter plants throughout the United States, Canada, and other countries. The author has either observed or participated in animal handling in over 300 different places.

An understanding of the behavior of large grazing animals helps prevent injuries to both people and animals. Grazing animals are a prey species, and fear motivates them to escape from perceived danger. When they become agitated during handling, it is usually due to fear. Fear based behavior is likely to be the main cause of accidents due to a horse kicking or a cow or steer becoming agitated in a chute. Some major causes of animal handling accidents are:

1. fearful, agitated animals
2. faulty equipment
3. male dominance aggression
4. maternal aggression

REDUCING FEAR IMPROVES BOTH WELFARE AND SAFETY

Fearful large animals are dangerous animals. They are more likely to injure themselves or their handlers than unafraid animals. Fear is a universal emotion in the animal kingdom: it motivates animals to avoid predators and survive in the wild.[1,2,5] All vertebrates can be fear conditioned.[38,39] The amygdala in the brain is probably the system centrally involved in both fear behavior and the acquisition of conditioned fear.[10] Many studies show that electrical stimulation of the amygdala in animals triggers a complex pattern of behaviors and changes in the autonomic responses that resemble fear in humans.[10] In humans, electrical stimulation of the amygdala elicits feelings of fear.[3] Studies also show that electrical stimulation of the amygdala increases plasma corticosterone in cats.[50] Lesioning of the amygdala blocks both unconditioned and conditioned fear responses[39] and has been shown to have a taming effect on wild rats.[36]

Fear conditioning takes place in a subcortical pathway. A single aversive event can produce a strong conditioned fear response, but extinguishing the fear response is much more difficult because it requires the animal to suppress the fear memory via an active learning process.[39] Observations by the author on cattle ranches have shown that to prevent cattle and sheep from becoming fearful of a new squeeze chute or corral system, painful or highly aversive procedures should be avoided the first time the animals enter the facility.[25] Experiments with rats clearly demonstrate this principle. Rats that receive a strong electrical shock the first time they enter a novel alley will refuse to enter it again.[42] However, if the rat is subjected to a series of shocks of initially low and then gradually increasing intensity, it will continue to enter the alley to get a food reward. Likewise, stress in sheep during routine handling can be reduced if the animals are conditioned gradually to the handling procedures.[35] Less severe procedures, such as sorting or weighing, should be done first.[35] It is unfortunate that many animals learn to fear the veterinarian. This learned response is especially evident in zoos. One zoo veterinarian quit, because it upset him that most of the animals feared him. He was associated with dart guns and other aversive procedures. This association can be avoided if the animals first few experiences with the veterinarian are positive.

Animal Sensory Perception

SIGHT

Contrary to popular belief, horses and cattle can see color,[12] although there is some evidence that horses may have difficulty discriminating green.[46] All grazing animals have wide-angle vision because their eyes are located on the sides of their head. Wide-angle vision enables these animals to check all around themselves for predators while grazing. Their visual field is over 300 degrees,[48] but they have a small blind spot immediately behind them.[48] If a person suddenly walks into a horse's blind spot, for example, the horse probably will be startled, and the person may be kicked. Horses defend themselves from predators by running and kicking. When walking behind a horse, talk to it so that it knows you are there and that it is safe.

Ruminants have depth perception when they are standing still with their heads down.[41] Cattle often stop, put their heads down, and balk at a shadow on the ground. They may have put their heads down to see depth.

HEARING

Horses and cattle are more sensitive to high-pitched sound than people. The auditory sensitivity of cattle is greatest at 8000 Hz, and sheep are most sensitive at 7000 Hz.[1,32] The horse has a wider range of maximum hearing sensitivity, l000-16,000 Hz, than the cow.[32] The human ear is most sensitive at 100-3000 Hz.32

People working around large animals should speak softly with a low tone of voice. High-pitched noise is disturbing to many animals. An 8000 Hz sound was shown to increase a pig's heart rate more than a 500 Hz sound.[53] High-pitched sounds in the wild are used as alarm calls. High-frequency sounds activate the amygdala more effectively than low-pitched sounds.[39] People yelling at an animal may result in the animal becoming fearful, and it may kick, charge, or attempt to escape.

Animal Behavior Patterns

An understanding of fear motivated behavior in cattle and horses helps prevent accidents. A recent survey conducted by researchers at Oklahoma State University indicated that 50% of accidents were caused by human error.[33] The first principle is that herd animals such as cattle and horses often become agitated and fearful when a lone animal is separated from the herd. A single animal that is frantically attempting to rejoin its herdmates can be very dangerous.[18] The author has observed lone bovines left behind in crowd pens or alleys cause several serious accidents by jumping fences or running over people. A person should never get into a confined space with a single, agitated, large animal. Either the animal should be released, or more animals should be put in with it.

FEAR-INDUCING STIMULI

Cattle, horses, and other animals can become extremely fearful and agitated when they are suddenly exposed to a new experience.[9,25] Many accidents with horses occur when they are "spooked" by something new, such as balloons at a fairground. The horse responds the same way he would respond if he had seen a predator. Even a tame, well mannered horse may rear, bolt, or kick if frightened by a suddenly occurring novel sight or sound.

Examples are:

- the sound of a power tool
- the sight of a piece of paper blowing in the wind

- or the sight of a reflection off a puddle.

The horse may refuse to walk over a shadow, puddle, or bright spot of sunlight. Quick, sudden movements of people and objects are more likely to scare the animal than slow, steady movements. Cattle and horses can be trained to remain calm by gradually and gently introducing them to things that may scare them. Careful, gentle habituation of the animal to strange sights and sounds can help prevent accidents.

FLIGHT ZONE

Both veterinarians and animal handlers need to understand the flight zone.[18,24,28] The flight zone is the animal's safety zone, and its size varies depending on the animal's degree of wildness or tameness. A show steer or a riding horse has no flight zone, but cattle that seldom see people have a large flight zone, varying from a few feet to 100 yards or more.[15] When a person enters the flight zone, the animal will turn away. If a person is outside the animal's flight zone, it will turn and look at him or her. The size of the flight zone is determined by three interacting factors:

- genetic traits (excitable versus calm),
- amount of contact with people (see them everyday or only twice a year)
- and the quality of the contact with people (negative versus positive).

Grazing animals with large flight zones may become fearful and agitated when a person deeply penetrates their flight zone, especially when they are in a confined space and unable to move away. Cattle rearing up in squeeze chutes or single file chutes have caused many accidents. Wild cattle may do this because they are attempting to escape from a person who is deep in their flight zone. If an animal rears, people should back up and remove themselves from the animal's flight zone. When the people back away, the animal often settles back down. Handlers should never attempt to push a rearing animal back down; this is likely to increase its agitation and may cause an accident.

MOVEMENT PATTERNS

Handling is safer when animals are moved quietly. Handlers should not yell or flap their arms, because this may agitate the animals. Excessive use of electric prods increases animal agitation, as well as hazards to handlers. When cattle become agitated and fearful, up to 20 minutes is required for their heart rate to return to normal.[52] Agitated large animals are easier and safer to move if they are given an opportunity to calm down, perhaps while handlers are on a lunch or coffee break.

Grazing animals that have a large flight zone move more quietly and with less agitation when the handler works on the edge of the flight zone (Fig. I). The handler penetrates the edge of the flight zone to make the animal move and retreats outside the flight zone to induce the animal to

stop moving. Excited, agitated animals have a larger flight zone than calm animals.

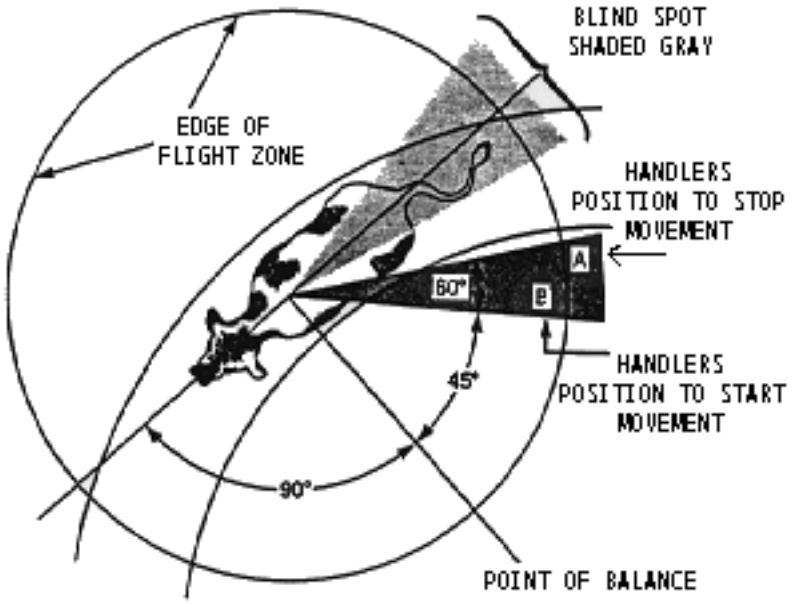

FIGURE 1. Large grazing animals that are not completely tame remain calmer if the handler works on the edge of the flight zone (circle). A handler must be behind the point of balance (line at animal's shoulder) to make an animal go forward.

Both veterinarians and handlers also need to understand **the point of balance**. The point of balance is an imaginary line at the animal's shoulders. To induce the animal to move forward, the handler must be behind the point of balance. To make the animal move backward, the handler must be in front of the point of balance. Grazing animals move forward when a handler walks past the point of balance in the opposite direction of desired movement (Figs. 2 and 3).[27,37]

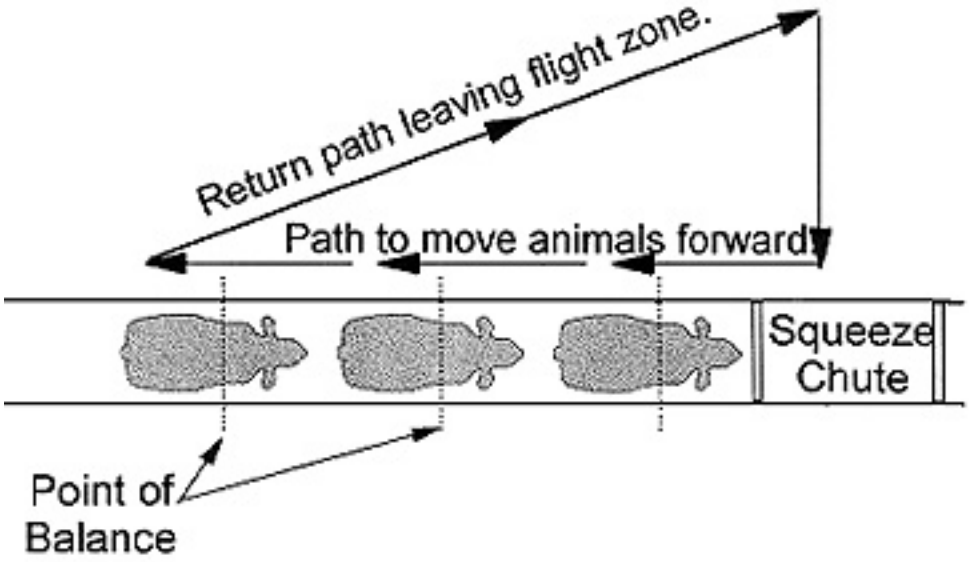

FIGURE 2. This movement pattern can be used to induce an animal to move into a squeeze chute. The handler walks inside the flight zone in the opposite direction of desired movement. The animal moves forward when the handler crosses the point of balance.

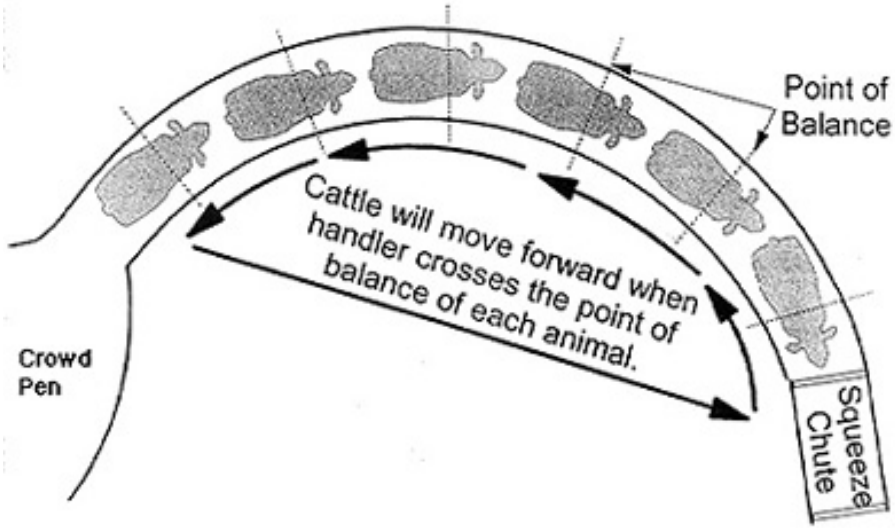

FIGURE 3. Handler movement pattern for use in a curved chute system. The techniques here and in Figure 2 make it possible to greatly reduce or eliminate electric prods.

Taking advantage of these movement patterns can greatly reduce electric prod usage.[27] Progressive feedlot managers have been able to almost eliminate electric prods by using these movement patterns. On most ranches and feedlots, 99% of the cattle can be moved quietly and efficiently without electric prods. In large slaughter plants, 15 minutes of instruction on flight zone and movement patterns resulted in a reduction of electric prodding of beef cattle from 83% of the animals to 17%.[26] The workers were able to keep up with the slaughter line with reduced prodding. The very best plants with good equipment had to use an electric prod on only 5% of the cattle to keep up with the slaughter line.[26] For both welfare and safety reasons, the use of electric prods should be avoided as much as possible. Non-electric driving aids, such as plastic paddles and flags or streamers (affixed to long handles) shoud be used to quietly guide and turn the animals (Fig. 4). Handlers should be careful not to scare the animals.

FIGURE 4. A stick with plastic streamers on the end can be used to guide and turn cattle in a crowd pen.

CROWD PENS

The number one mistake made by handlers is putting too many animals in the crowding pen that leads to the single file chute. Animals need room to turn. When cattle are handled, the crowd pen should be one half to three quarters full. For bison and wild horses, the crowd pen should be less than half full. Cattle, pigs, elk, bison, deer, and wild horses should be moved in small groups to help keep them calm. The only exception to this rule is sheep. Sheep have such a strong following instinct that they can be moved in one continuous mob.

A single lone bovine in a small crowd pen can be very dangerous and may charge a handler. The handler should never get in a crowd pen with one or two frightened animals. However, it is safe for experienced handlers to be in a larger pen or alley with a group of cattle. In this situation, there is sufficient room so that the handler is not constantly invading the animal's flight zone. The animals also have space to move away.

Animal Habituation and Temperament

Domestic animals such as cattle usually habituate to being quietly moved through a squeeze chute.[28] If a bovine is moved through a squeeze chute everyday for several days, it usually becomes calmer on each successive day, because it learns that going in the squeeze chute will not hurt. Animals with calm temperaments habituate to a series of forced, nonpainful procedures.[2,8,44] Cortisol levels in cattle decreased after they were moved through the squeeze chute a number of times.

However, extremely flighty and excitable animals, such as bison and antelope, may not habituate. Instead, they often react explosively to a forced handling procedure and severely injure themselves. Rather than becoming less and less fearful with each successive pass through the chute, they tend to become increasingly fearful. This characteristic makes them very hazardous to people, because they may rear, jump out of a facility, or violently struggle. In one experiment, some pigs habituated to a series of forced swimming tasks and others responded with increasing fear.[40]

The basic principle is that flighty, excitable animals are less likely to habituate to a series of forced, nonpainful restraint and handling procedures. Most animals, regardless of temperament, do not habituate to painful procedures.

Effects of Previous Handling

Previous experiences affect how animals behave during handling. Cattle and sheep have excellent memories. They remember painful or aversive experiences, and they will be more reluctant to re-enter a facility where an aversive event occurred.[30,34,43,49] The author has observed that cattle previously handled in a rough manner have bigger flight zones and become more agitated during restraint than usual.

Calves that have been reared in close, quiet association with people usually are easier to handle and have a smaller flight zone when they mature. The author also has observed that cattle reared in the colder parts of the U.S., where they are fed every day during the winter, have a smaller flight zone than cattle raised in southern states. Some southern cattle are handled only a few times each year, and they are not fed during the winter, because grass grows year round. There

is a tendency for southern cattle to become more agitated in squeeze chutes compared to northern cattle, which are exposed to people feeding them all winter.

Australian researchers conducted some of the first training experiments in beef calves. These experiments were conducted to determine if training calves would make the animals easier to handle when they matured. They found that walking quietly among them and moving them quietly through the chutes produced calmer adult animals.[4,11] Extensively reared Zebu calves handled ten times at 1-2 months of age were calmer and less likely to jump fences when handled in the future.[3] The calves were placed in a single-file chute and petted. Observations by the author indicated that cattle originating from ranches where they had become accustomed to people both on foot and on horseback were calmer and easier to handle after they were shipped to a feedlot. It is important to train the calves to be handled both on foot and on horseback. Cattle that have never seen a person on foot may become fearful when they see a person walking in a pen. Early gentle handling and contact with people also reduces cortisol levels and stress associated with restraint in both cattle and deer.[5,31] Training young cattle to the quiet presence of people walking among them produces calmer adult animals.

Animals that have been abused can be dangerous. Pork producers have reported that boars beaten by their handlers have been known to turn on them. Nervous, high-strung horses that have been subjected to overly rough training methods are more likely to suddenly spook, kick, or rear. Abuse of animals is unethical and detrimental to animal welfare. The author has observed that a previously abused animal is likely to panic when it sees a person who looks similar to the abuser. For example, an abused animal may fear men with beards. An elephant at a zoo became agitated when it saw a new keeper with a beard. The elephant accepted the keeper after the beard was shaved off.

TRAINING ANIMALS

Training animals to cooperate with handling procedures helps reduce stress and accidents. Sheep can be trained to voluntarily enter a restraint device.[17] At the Denver Zoo, antelope were trained to voluntarily cooperate with veterinary procedures such as blood sampling and injections.[29] Training Bongo and Nyala antelope to enter a wooden crate and stand still while they were given injections improved safety for both people and animals. Bongo are large, flighty animals, and when they become scared they are an extreme safety hazard. Training also greatly reduced stress on the animal. The cortisol levels in crate-conditioned Bongo were only 2-9 ng/ml,[45] which is close to resting baseline levels in cattle.[2,25] Creatine phosphokinase levels for four trained Bongo averaged 71 IU/L in trained animals and 288 IU/L in animals immobilized with a dart or pole syringe. Glucose levels were 61 mg/dl in trained and 166 mg/dl in immobilized Bongo.[45]

Since antelope are animals that survive in the wild by flight, they are highly vigilant and aware of any new sight or sound. If they are suddenly confronted with something new, they are likely

to panic. The antelope had to be gradually habituated to each new procedure. Ten days were required to habituate the animals to the sound of the sliding door moving on the handling crate. The first day, the door was moved only one inch. The instant the animal turned its head toward the sound, movement was stopped. Flighty animals must never be pushed beyond this orienting response. It is important to avoid triggering a massive flight reaction during early training. If the antelope has a scary experience associated with the handling crate, they may become impossible to train.

The animals were gradually habituated to all the sights and sounds associated with the crate. They were enticed into entering the crate by the placement of highly palatable treats (yams or spinach), which were not part of their regular diet, at the entrance. The food was gradually moved further and further into the crate. The crate had to be long enough so that the animal had to completely enter to get the food. The animals were then habituated to being locked in the crate for increasing lengths of time, starting with 1 second.

There is a critical point during training when the purpose of the treats changes from being an enticement to enter the crate, to a reward for standing still during blood sampling from the rear leg. To entice the animal into the crate, the treats were continuously available. After the animal was fully trained to enter the crate, the treats were withheld until it kept its leg still. Each animal was then trained using operant conditioning to stand still when its leg was touched. If it stood still after its leg was touched, a treat was given immediately. Timing of giving the treat is critical. It must be given the instant the animal stands still so that it will associate the treat with standing still. The antelope was then conditioned to tolerate increasingly hard pinches to simulate a needle. Early in the training procedure, great care was taken to avoid triggering a massive flight and panic reaction. Later on in the training program, operant conditioning had to be applied to some animals to prevent learned avoidance behavior. These particular animals were continuously fed treats, and they learned that they could avoid a needle stick by moving their leg. The treat had to be understood by the animal to be a reward for not moving.

The trained antelopes still feared the veterinarian who had previously shot them with a tranquilizer or dart. He was the only person who was not able to handle the trained animals. However, a new veterinarian was able to handle the animals. For training to be successful, it must be done by people who are not associated with aversive previous experiences. Research has shown that cattle can differentiate between different people.[6] Dairy cattle are able to identify the handler and/or the location connected to an aversive event, and thus predict the type of handling they will receive.[49] Practical experience has shown that animals can easily recognize a familiar person by their voice.

Training Time and Temperament

A basic principle is that animals with a flighty, excitable temperament must be trained and habituated slowly, in small steps over many days, whereas animals with a placid temperament can be trained more quickly and in bigger steps.[25] It is advisable to keep training periods short:

I0-l5 minutes per day is ideal. Repeatedly forcing an animal to do something over and over on the same day can cause increasing fear and agitation. Even for calm animals, such as cattle, it is advisable to limit the length of a training session. Cattle can be easily trained to voluntarily enter a squeeze chute, but making the animal go through it many times in one day may cause increasing agitation. Animals need time to calm down between training sessions.

Bison Training

Bison are not domestic cattle. They may react very violently when they are moved through a handling facility. Bison producers report that even though they try to handle their animals carefully, horns are often broken, and bison gore each other in squeeze chutes. Frightened bison in a small pen may attack both people and each other. My student, Jennifer Lanier, is working on methods to train bison to handling procedures. Young calves can be trained to enter the squeeze chute. Initial trials indicate that bison yearlings trained to walk through and stand in a squeeze chute are less agitated when they are locked in the head gate.

GENETIC EFFECTS ON HANDLING

As mentioned, flighty animals are more likely to panic when suddenly confronted with a new experience than calm, placid animals. However, even cattle and horses known to be calm and well-mannered at home have gone berserk at shows. Sudden exposure to a new thing often is the cause of these animals injuring people by running through crowds or jumping arena fences and leaping into the stands. Ranchers, show managers, and feedlot operators have reported that cattle and horse breeds with excitable temperaments are more likely to be difficult to handle in new surroundings. It appears that excitable animals have no tolerance for sudden new experiences. At a slaughter plant, the author observed nervous saler cross heifers kicking at handlers with both back feet when prodded. Calmer breeds of cattle at the same plant walked quietly up the chute.

Dangerous incidents with excitable animals can be reduced by culling cattle that become highly agitated in the squeeze chute. Some cattle become extremely agitated every time they are handled.[20] Genetic selection of cattle for temperament produces calmer animals that are less likely to become agitated when handled in new surroundings.

Another approach is to train excitable animals to tolerate the sights and sounds of a new place. A flighty horse can be gradually introduced - on the home farm or ranch - to flags, balloons, horns, public address systems, and other stimuli that it would be exposed to at a show. Gradual introduction is critical because if a horse is severely frightened by a flag the first time he sees one, he may have a fear of flags for the rest of his life. The author has observed that flighty, nervous animals are more likely to develop permanent fears. For example, it is important that a colt's first experience with a trailer be a positive one. Accidents during loading and unloading of horse trailers can be reduced by gently training colts to load into a trailer.

HANDLING OF ESCAPED ANIMALS

If horses, cattle, or other large animals escape from an auction ring, show ring, or slaughter plant, they must never be chased. The author has observed several incidents where chasing escaped cattle caused them to run wildly through crowds of people and resulted in injured people and extensive property damage. If an escaped bovine or horse is located where it is not an immediate threat to people, it is usually best to leave it alone for 30 minutes to allow it to calm down. Twenty minutes is required for the animal's heart rate to return to normal.[52] When it has calmed down, it can be quietly moved. Interestingly, a lone animal often returns of its own volition to other horses and cattle.

A panicked bovine or horse may crash through a chain link fence, because it does not see the thin mesh. The author has observed escaped cattle knocking over a chain link fence when people chased them. Chain link fences hold a calm bovine, but a frightened bovine may either knock it over or go under the bottom edge of the mesh. Fences that present a visual barrier, such as a board fence, are less likely to be broken down by charging animals.

Allow experienced livestock people to handle an escaped animal. A panicked horse, steer, or bull can sometimes be calmed when it hears its owner's familiar voice. Some of the most dangerous incidents with escaped animals have occurred when security guards or the police became involved. In one incident, a security guard almost shot a person instead of an escaped steer. Some officers make the mistake of chasing animals and making the situation worse. There was a bad incident on our own campus where campus police chased a tame, halter-broke steer and caused him to panic. He ran through a glass door into one of the dormitories and ended up in a student's room. The room was completely trashed. Fortunately, nobody was hurt.

At zoos, escaped animals often can be coaxed back into their enclosures by a familiar keeper. If a dangerous animal escapes, visitors should be quietly evacuated. The "John Wayne" approach (loud and aggressive) may make the situation worse and result in the animal escaping from the zoo property. A better approach is for an experienced person to calmly shoot the animal with a tranquilizer dart. Zoos should develop plans for dealing with escaped animals.

FACILITIES

Squeeze Chutes and Restraint Devices

Many accidents that occur during handling of cattle, bison, and other large grazing animals are related to the squeeze chute. One survey showed that 20% of injuries to people occurred around the headgate or squeeze chute.[33] Animals with a large flight zone remain calmer in a squeeze chute if the sides are covered, preventing the incoming animal from seeing the operator standing next to the chute. Fastening cardboard to the sides helps keep wild animals quieter and reduces

lunging at the headgate (Fig. 5).[27] Wild cattle and bison also remain quieter if there is a solid enclosure around their head so that they do not see people standing too close to them. Grazing animals with a large flight zone remain calmer if there is a solid barrier between themselves and a person. The barrier makes the animal feel safe. When bison, deer, or antelope are handled, the restraining chutes should have a completely solid top in addition to solid sides. The solid top prevents rearing, because the animal cannot see through it. Even a piece of cardboard prevents rearing. This is an example of using **behavioral** principles to control the animal, instead of force. Solid siding around animals is especially recommended for keeping cattle calm in slaughter plants.[22] Tame dairy cows or show steers that are accustomed to close contact with people usually can be handled easily in chutes with open barred sides.

Figure 5 Under Construction

FIGURE 5. Installing a solid side on a squeeze chute keeps wild cattle calmer. Here, cardboard was used to cover the open, barred side and demonstrate the calming effect of blocking the animal's vision.

An animal must never be left unattended in a restraint device. Even a tame animal can panic and get itself tangled up and injured. This author knows of a tame show steer that severely injured its leg when it was left alone in a grooming chute. In addition, squeeze chutes should have non-slip flooring. When animals slip they are more likely to panic and become agitated.

Animals remain calmer if the parts pf a restraint device that press against its body move slowly and steadily.[19,21] Sudden bumping of the animal often causes struggling. People also should avoid sudden jerky movements. Another behavioral principle is optimal pressure. A restraint device must supply sufficient pressure, to provide a sensation of being held, but not excessive pressure. Excessive pressure can cause struggling. Some people make the mistake of trying to hold an animal too tightly.

Hydraulic Restraint Equipment

Hydraulically powered restraint equipment often is safer for both people and animals, because protruding lever arms are eliminated. However, the pressure relief valve must be set correctly. Excessive pressure can cause severe injuries to both people and animals. At one feedlot, a person sustained a severe, permanent shoulder injury when he was accidently caught in the tailgate of an overpowered hydraulic squeeze chute while performing a veterinary procedure. In another case, a person was accidentally caught in the headgate of a hydraulic squeeze chute when he attempted to prevent a calf from escaping. In this case, the pressure was set correctly, and the person quickly recovered from a bruised shoulder.

A hydraulic squeeze chute should automatically stop squeezing at the correct pressure. Observe the animal carefully. When the lever is held down, and the hydraulic fluid bypasses back to the

reservoir, the animal should be able to breathe normally. There must be no vocalizations induced by pressure from the squeeze sides or other parts of the apparatus. On most hydraulic chutes for cattle, the correct hydraulic pressure setting is approximately 500 psi; this will vary depending on the design of the mechanical linkage. Veterinarians and managers must make sure the pressure setting is not too tight.

Manual Squeeze Chutes

There have been several fatalities caused by being struck under the chin by a protruding lever arm on a manually operated squeeze chute. These incidents occurred when the ratchet latch on either the headgate or the squeeze sides slipped loose, and the lever flew up and broke the person's neck. This type of accident can be avoided by choosing a squeeze chute that does not have long protruding levers. It is essential to keep all latching devices well maintained. Failure of a ratchet or latch is the major cause of a lever flying up or an animal being unexpectedly released. If a ratchet latch breaks, it should be replaced by a factory built part from the manufacturer of the chute. Homemade fixes, such as replacing a spring with a rubber bungee cord, should be avoided.

Some squeeze chutes have friction latches instead of ratchet latches. The latches are quieter, but they must be replaced when they become worn, or they are likely to come unfastened unexpectedly. Friction latches consist of a rod sliding through a spring-loaded metal plate. They must never be oiled.

Another cause of accidents around squeeze chutes is attempting to treat an animal that is caught around its hips by the headgate. To reduce the temptation of working on an animal that is half out of the squeeze chute, install a sorting gate in front of the squeeze chute. The animal can then be diverted into a separate holding pen and easily moved back through the squeeze chute. If it is allowed to mix in with the other cattle, it may be difficult to separate it for reworking.

Veterinarians performing palpation may be injured if a cow lays down and jams his or her arm against the chute. Use a restraining method that helps circumvent this problem. If a squeeze chute is used primarily for tasks such as palpation and pregnancy testing, a headgate with straight vertical neck bars is recommended because it greatly reduces the chance of the bovine choking in the headgate and going down.[14] Other types of headgates are more likely to choke the animal, but they provide the advantage of restricting head movement, which is desirable for procedures such as ear tagging or ear implanting.

Metal pipes behind cattle or other animals in squeeze chutes or in the single file chute may contribute to accidents. Animals can become tangled up in the pipes and agitated, knocking the pipes into people. In the single file chute, use either sliding gates or antiback-up gates instead of pipes slid behind animals.

Tips to Improve Facility Safety

1. **Solid Sides.** For cattle, horses, and other animals with large flight zones, use solid-sided loading ramps and a single file chute to the squeeze and crowd pen.[15] The crowd gate in the crowd pen also should be solid to prevent animals from turning back. Solid sides should be installed on all facilities where wild ungulates are handled in a small confined area.
2. **Man-Gates.** Install numerous man-gates so that people can easily escape. This is especially important in confined areas with solid fences where the handler may be deep in the animal's flight zone. In areas with solid fences, another option is a toe slot that makes it easy to climb a solid fence (Fig. 6). A grab rail should be used in addition to a toe slot or toe rail if the top of the fence is over 6 feet high.

Figure 6 Under Construction

FIGURE 6. Seven-foot-high solid fence equipped with a toe slot and grab rail to enable handlers to escape from charging bison. Handlers can easily climb over the fence.

3. **Nonslip Flooring.** It is impossible to handle large animals safely when they are slipping on the floor or panicked because they are losing their footing. In existing facilities, slick concrete floors in high traffic areas, such as at the scales or in front of the squeeze chute, can be covered with a grating of 1 inch diameter steel bars (Fig. 7). The rods must be welded flush with the floor. Overlapping of the bars will damage hooves. Old, smooth concrete floors can be regrooved with a concrete grooving machine, which can be rented from a concrete supply company. New facilities should have a nonslip floor surface.

Figure 7 Under Construction

FIGURE 7. A grating constructed from steel rods provides a nonslip floor in high-traffic areas, such as around stunning boxes and scales and at the exit area of a squeeze chute.

4. **Noise Reduction.** Facilities should be constructed to minimize noise. Excessive noise is one cause of animal agitation. It is especially important to reduce high pitched noise. Pad gates with rubber stops to prevent clanging and banging. Hydraulic equipment should be engineered for low noise.
5. **Repairs.** Keep gates and gate latches well maintained. Accidents are more likely to happen in poorly maintained facilities with broken gates and fences.
6. **Distraction Removal.** Distractions can cause animals to balk and refuse to move through a chute or corral.[23] Balking animals that back up or turn back can be hazardous to handlers. After all the animals have been removed, locate distractions by crouching

down and walking through the chute. The chute should be observed at a cow's eye height. Some of the things to look for are: a loose end of a dangling, moving chain, shining reflections off metal, sparkling water puddles, people up ahead, dripping water, a coat hung on a fence, a coffee cup on the ground, shadows, a change in flooring type or texture, a drain grate. Listen for air hissing. In slaughter plants, air blowing down the chutes into the faces of approaching animals causes balking. Distractions that make animals balk should be removed.

7. **Handrails.** Catwalks and walkways that are more than 24 inches (60 cm) off the ground should be equipped with handrails to help prevent falls.
8. **Pen Design.** Small crowd pens that lead up to loading ramps or a single file chute should be designed so that after the crowd gate is closed, cattle or other hoofed animals can be moved by a person standing outside the pen.
9. **Antiback-up Gates.** These are a safer alternative to pipes placed behind animals in the single file chute. However, too many backstop gates may cause balking. Animals in the crowd pen enter the single file chute more easily if the backstop gate at the entrance is either tied open or equipped with a remote control rope so it can be held open as the animals enter.
10. **Lighting.** Animals may refuse to enter a dark place.[16,55] Bright, diffuse lighting facilitates animal movement. Lamps can be used to attract animals into chutes, but the light should not glare directly into their eyes. When handling facilities are located inside a building, translucent plastic panels can be installed to admit diffuse, shadow-free light.

AGGRESSION IN GRAZING ANIMALS

Male Aggression

Most of the hazards discussed previously are caused by fearful animals. Bulls are involved in many animal fatalities, and when they are agitated in squeeze chutes, it is likely that their behavior is motivated by fear. However, in some cases, aggression causes a bull to attack a person because he perceives the person as a conspecific (herdmate), and he attempts to dominate.

Dairy bulls are notorious for attacking people. Why is the dairy bull more dangerous than most beef bulls? The difference in beef and dairy bull behavior may be explained by the difference in rearing methods. Beef bull calves are reared on the mother cow, whereas most dairy bull calves are bucket fed by people. Research by Edward Price and his associates at the University of California found that Hereford bulls reared in groups were less likely to attack people than bulls bucket fed in individual pens.[47] Seventy five percent of the individually reared bulls threatened handiers.[47] In 1000 dam-reared bulls, only one bull attacked.[47]

Bulls that grow up with other cattle learn that they are bulls. Individually reared bulls may think they are people, and when they become mature, they may challenge a person to exert dominance. Bull calves reared with other cattle usually direct their challenges toward other bulls

instead of people.

To reduce risk on beef cattle operations, an orphan bull calf should either be castrated or placed on a nurse cow. Castration at a young age reduces aggression toward people. Practical experience in dairies indicates that bull calves reared together in large groups are less likely to attack people. After a short period of individual rearing, 6-week-old bull calves are penned together. Orphan male calves, lamas,[54] and buck deer also have been known to attack people. A basic principle is that most grazing animals reared by their own species have less of a tendency to attack people. Same-species rearing is especially important very early in life.

There is a fundamental difference between grazing animals and carnivores such as dogs. The owner of a dog may become, in effect, leader of the pack, and there is no risk involved in this transference. However, the owner of grazing animals may be perceived as a herdmate, and there is risk from a mature, intact bull.

Maternal Aggression

In many species the mother animal is dangerously aggressive when she has newborn babies. Producers have observed that sows with newborn piglets are more aggressive toward handlers than a sow with slightly older piglets. Ranchers and pork producers have both observed that sometimes the gentle cow with a small flight zone or the 'pet" sow is one of the most aggressive animals when she has a newborn.

INHERENT DANGER OF LARGE ANIMALS

People who work with large animals must realize that it is impossible to make horse or cattle handling completely safe. There are certain inherent dangers when working with large animals. Even when all precautions are taken, accidents may happen. A well trained, normally calm horse or cow can spook unexpectedly. Recently, this author was called by an attorney about an accident at a fairground. A team of draft horses had run through a parking lot and injured a person. The horses had been scared by an electric garage door. They had seen the door opening many times, but on this day it scared them. Possibly the sun shined on the moving door at just the right angle to create a flashing reflection that was new and scary. Even well trained animals may panic if they suddenly see something new. The lawyer was informed that it is almost impossible to prevent this type of accident. Training and habituation of horses to many different sights and sounds reduces the risk, but the risk can never be totally eliminated.

Even the Denver Zoo's trained antelopes (see "Training Animals," page 201), which are accustomed to being handled and seeing people every day, crashed into a fence the first time they saw people on a roof. When liability for a livestock accident is being determined, ask "Was the accident caused by true negligence or was it caused by the inherent risk of working with large animals?" It is this author's opinion that an accident caused by broken or poorly

maintained equipment may be rightfully called negligent. However, if a horse spooks at a backhoe or a cement truck, a riding stable should not be held liable for the inherent dangers of riding horses.

CATTLE AND CAR ACCIDENTS

Every year the author receives about ten telephone calls after people in a car have been injured by hitting cattle on a road. The cattle are either bulls looking for cows to breed, or new arrivals attempting to return to their previous home. Bulls are the biggest culprits. Bulls that have learned to break fences are very difficult to keep in. One bull tore out five new barbed wire fences in one afternoon. He had learned to push over the posts to avoid getting cut.

Sometimes the only way to solve a fence-busting problem is to sell the bull. These animals can sometimes be stopped with an electric fence. To make all types of cattle respect an electric fence, it is essential that their first contact with the fence result in a big shock.[51] Some animals learn that they can break an electric fence and that it only hurts until the wire snaps.

There is no pasture fence that is strong enough to keep a bull in if he has learned to break fences. Fences are successful because cattle never learn that they are capable of breaking them. When calves are small they learn to respect fences, because they are either pricked by a barb or shocked. After they mature, most cattle are unaware that they have grown big enough to easily knock over a fence. Only the heaviest wood, steel, or concrete corrals are strong enough to withstand a charging bull; building such pasture fences is too expensive to be practical. A good pasture fence for cattle is a psychological barrier that works over 99% of the time.

HANDLING TIPS TO IMPROVE SAFETY

1. **Lead Rope.** A boy in Colorado was killed by dragging when he tied his steer's lead rope to himself. The lead rope on a horse or steer should **never** be wrapped around a person's hand or tied in any way to a person.
2. **Slow Movements** Move slowly and deliberately around animals. Sudden movements may cause horses or cattle to "spook."
3. **Gentle Handling.** Managers must properly train and supervise employees. Rough or abusive treatment of animals must never be tolerated. Accidents are more likely to occur when animals are agitated. The use of electric prods should be minimized. In feedlots or slaughter plants, 95% or more of the cattle can be moved without electric prods.
4. **Well-Trained Horses.** Well-trained, quiet horses should be used for feedlot and ranch work. Cattle feeders have learned from experience that partially trained or flighty horses increase accidents.
5. **Calf Table.** One major ranching company reported that accidents occurring while roping calves for branding were the number one cause of Workers' Compensation

claims. Replacing roping with a calf table reduced accidents.

6. **Proper Shoes.** Wear shoes with heels when riding to prevent your foot from going all the way through the stirrup. People have been killed when they fell off a horse and their foot hung up in the stirrup. Wear sturdy shoes to reduce injuries caused by animals stepping on your foot.

CONCLUSION

An understanding of the behavioral principles of animal handling helps reduce accidents. Calm, quiet handling also makes animal handling safer. It is essential to keep facilities well maintained and to have nonslip flooring. There are certain inherent dangers when handling large animals. Applying the information in this chapter can help make animal handling safer, but it is impossible to eliminate risk.

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