13 Animal Behavior

Key Terms

Aggressive behavior
Animal welfare
Anorexia
Applied ethology
Artificial insemination
Auditory
Aversive event
Behavioral ecology
Charles Darwin
Classical conditioning
Comparative method of study
Comparative psychology
Conditioning
Cortisol
Cribbing
Critical period
Dichromat
Dominance
Electric prods
Ethogram
Ethology
Extensive rearing systems
Flight zone
Flighty
Flocking instinct
Habituation learning
Handling
Imprint learning
Nose tongs
Novelty
Olfactory
Operant or instrumental conditioning
Pacifier cow
Palatability
Phobia
Pica
Sensitive periods
Shelter-seeking behavior
Social structure
Sociobiology
Squeeze chute
Stereotyped behavior
Stress
Submissive behavior
Temperament
Wool chewing
Wool sucking

Learning Objectives

After you have studied this chapter, you should be able to:

- Describe the overall field of animal behavior and explain why it is important.
- Explain the individual areas of study in animal behavior.
- Cite the general effects of handling on livestock production.
- Discuss how animal temperament and handling interact.
- Describe the role of fear and fear memories in handling.
- List the benefits of training animals to be handled and to accept restraint.
- Cite the effects of novelty, vision, noise, and shadows on livestock movement.
- Discuss the concept of flight zone.
- Identify the role of genetics in handling.
- Outline the basics of handling facility layout.

INTRODUCTION

Humanity's interest in animal behavior no doubt dates back tens of thousands of years. Understanding the predator–prey relationship was important to early humans, who occupied both roles. Ample archeological evidence suggests that early humans had a good practical knowledge of the behavior of certain species. It is also clear that behaviors have been important in humans' development and selection of domestic animals. The flocking instinct of some breeds of sheep and the herding and hunting behaviors of different breeds of dogs serve to illustrate this. Countless other examples could be cited. However, animal behavior did not emerge as a science until the last half of the 19th century. The most

notable stimulus was the work of **Charles Darwin** and others who proposed the theory of evolution by natural selection. This was followed by the development of the **comparative method of study**, which was a method of comparing the behavior of two or more species systematically. The final piece was the work of Gregor Mendel and others on genetics. From these roots have evolved four major approaches to the study of animal behavior:

1. **Comparative psychology** is the study of the mechanisms controlling behavior, learning, sensation, perception, and behavior genetics. Animal behavior has been studied for many decades by psychologists, physiologists, and cognitive scientists.
2. **Sociobiology** is the study of the biological basis of social behavior. Of special interest is behavior that helps pass on the gene pool to the next generation.
3. **Behavioral ecology** is the study of the relationships between a species' behavior and its environment.
4. **Ethology** is the study of behavior of animals in their natural surroundings, with its focus on instinctive or innate behavior. Originally ethology was the study of wild animals, but domestic species are now also studied in their surroundings. Associated with ethology is the **ethogram**, which is a cataloging of all the behaviors an animal exhibits in its natural environment.

Charles Darwin An English naturalist (1809–1882). Among other contributions, he proposed the theory of evolution by natural selection.

Comparative method of study A systematic method of comparing the behavior of two or more species as a way of discovering the mechanism of behavior.

Comparative psychology The study of the mechanisms controlling behavior, learning, sensation, perception, and behavior genetics in animals and making extrapolations to humans or other animals.

Sociobiology The study of the biological basis of social behavior. Of particular interest is behavior that helps pass the gene pool on to the next generation.

Behavioral ecology The study of the relationships between a species' behavior and its environment.

Ethology The study of behavior of animals in their natural surroundings, focusing on instinctive or innate behavior.

Ethogram A catalog or inventory of all the behaviors an animal exhibits in its natural environment.

Applied ethology The term generally used to refer to the study of domestic animal behavior. Usually directed at companion species and livestock.

Handling In this context, refers to any manipulation necessary to care for animals.

Animal welfare Dealing with the animal's well-being and care.

Obviously these areas are not traditional areas of interest for production animal scientists or veterinarians. Rather, they have been studied by psychologists, zoologists, and cognitive scientists as a very basic science rather than an applied science. However, sometime around the middle of the 20th century, interest grew in the study of livestock behavior. Reproductive physiologists began studying reproductive behavior and nutritionists began documenting eating behaviors and patterns. The tools of ethology were adapted, and **applied ethology** was born as a field of study. The first major text on animal behavior, which contained substantial, credible information on livestock, was edited by E. S. E. Hafez and published in 1962. Until that time, most of the behavioral study had been directed at feeding and sexual behavior, and only for a few species. In the preface to the second edition, published in 1969, Dr. Hafez commented that "progress in many areas of research is hindered by insufficient knowledge of animal behavior." He also bemoaned the fact that "literature on animal behavior is widely scattered in many different journals and known only to specialists." After the three editions of Dr. Hafez's text, the last in 1975, several other texts and journals came to prominence. The study of domestic animal behavior was launched as a branch of study, with some focusing on companion species and others on livestock.

Behavior of livestock, as a key to **handling** them, received added attention after the development of large intensive systems of concentrated livestock production. The topic received even more attention after emphasis was given to **animal welfare** issues. The decade of the 1990s saw a flurry of activity. Hundreds of scientific papers have been published, several good textbooks written, and research has escalated. The USDA opened the Livestock Behavior Research Unit at Purdue University in 1997 with the mission "to determine behavioral and physiological indicators of stress and/or well-being in food-producing animals and to develop management systems that maximize well-being in farm animals." This center has brought together ethologists, physiologists, immunologists, and others to work in cooperation. The work of Dr. Temple Grandin of Colorado State University has received wide attention. Several universities across the nation have added faculty positions in animal behavior and

well-being. Perhaps yours is one of them. The veterinary profession has become more interested and involved, as evidenced by the American Veterinary Medical Association's creation of the American College of Veterinary Behaviorists. Much of the interest has been stimulated in the veterinary profession by problem behaviors in pets and companion animals.

The remainder of this chapter gives a brief overview of the general types of animal behavior and then focuses on behavior and handling as it pertains to the food species. This is not meant to imply that other species and other types of behavior are not important. However, this is a timely, relevant approach to behavior that has large economic importance to the livestock industries and it is often an overlooked area. A list of references and suggested readings is found at the end of the chapter. For those with a special interest in this area of study and who wish to explore it further, three of those references are recommended as the best place to start. These works have the status of being classics in the area. They are Lorenz (1981), Tinbergen (1951), and Skinner (1958).

AREAS OF STUDY IN ANIMAL BEHAVIOR

Communication

Animals communicate in a variety of ways. They send a wide range of messages as well as receive communication and interpret signals in a variety of ways. Understanding all of this can be an important part of animal management. Perhaps you've known someone who had "dog sense," "cow sense," or "horse sense." When we apply these terms to people in the context of dealing with animals, we are just acknowledging their ability to correctly interpret the communication that animals send and to reply in a way that animals understand. Animals give and receive communication through visual, **auditory**, and **olfactory** means. A full study of the communication of a species necessarily means considering all three. Understanding animal communication means understanding such signals as the position of the ears and tail, general posture, hypervocalization, marking behavior, and the behaviors associated with the elimination of body wastes.

Auditory Related to hearing.

Olfactory Relating to the sense of smell.

Aggression and Social Structure

All animals have some form of **aggressive behaviors** whose purposes may revolve around obtaining food, acquiring mates, or securing a place in a social hierarchy. Thus, from a survival perspective, aggressive behavior can be the key to survival. In domestic species, this type of behavior can still have a place. Once a pecking order is established, serious aggression can be replaced with threats and injuries. Disruptions to the herd or flock are minimized. However, problems with aggression and **social structure** arise when humans and animals are forced to vie for **dominance**, such as becoming established as the alpha individual in a dog–human pack. Some dogs are definitely the alpha individual in their household, which leads to inappropriate aggression and an unacceptable and potentially dangerous social structure. Categories of aggression include dominance-related, territorial, pain-induced, fear-induced, maternal, and predatory aggression.

Aggressive behavior Threatening or harmful behavior toward others of the same or different species.

Social structure The organization of a group; the patterns of the relationships to each other.

Dominance Refers to an animal's place in the social ranking. The most dominant animal in the group exerts the major influence over other animals. A term often used to describe this is *pecking order.*

Biological Rhythms and Sleep

Detecting abnormal sleep and activity levels in domestic animals can be difficult. This is especially so in light of the changes that confinement and modern nutrition have brought to animals. A stabled horse fed twice daily acts very differently from a

free-ranging one. Understanding circadian (24-hour cycles) and other rhythms helps us understand animal activity, sexual cycles, and physiological responses. In addition to circadian rhythms, other areas of study include high-frequency (less than 30 minutes), ultradian (more frequent than 24 hours), infradian (less than 24 hours), annual, and circatrigentian (30-day) cycles. These cycles are influenced by light, barometric pressure, the endocrine system, drugs, feeding, and a variety of other factors. Obviously, knowing what is normal is the first step in knowing what is abnormal.

Sexual Behavior

The study of sexual behavior in animals involves the wide range from development and maintenance of good mating behaviors in breeding animals to dealing with the unwanted sexual behaviors that may be exhibited in neutered animals, especially pets. Sexual behavior is greatly influenced in domestic animals by such factors as genetic selection for other traits, management practices, confinement rearing, and association with other species, especially humans. Study of sexual behavior requires a study of the physiological basis of sexual behavior, including endocrine and central nervous system influences. It also entails study of social and sexual experiences and environmental influences to promote normal mating behavior and to correct abnormal mating behavior.

Maternal Behavior

Obviously the ability of a female to care for her young is an important part of successful production of most livestock and companion species. Factors that affect that success include environmental effects, previous experiences, endocrine and nervous system effects, heredity, and human intervention. Study of maternal behavior includes a study of bonding behavior between the female and her offspring, mutual recognition, negligence or neglect by the female, nest-building, nursing, weaning and learned behavior. Study of maternal behavior also includes studying such aberrant behaviors as cannibalism, refusal to nurse, mis-mothering, and rejection of the offspring. Understanding maternal behavior is the key to preventing mother hamster from eating their young, understanding why all the farm cats have their kittens in one big nest, and preventing a ewe from rejecting one of her twins.

Development of Behavior

A particularly important area of study for those who wish to be veterinarians or wor in some other area of animal science is the study of normal development of behavio From a practical perspective, animals are only capable of responding to certain typ of training at developmentally appropriate times. Issues of proper socialization wi people and other animals become important in willingness and ability to mate adults. From the study of behavioral development has come the concept of **sensiti periods** and **critical periods**. This concept refers to the developmental stage wh experience, or lack of it, has an influence on later behavior. A good example is w farm cats that cannot be petted and handled. To create tame farm cats, the kitte must be handled at a very early age. This study has led to better understandings such factors as the critical nature of play and socialization with people and otl animals. It has also led to the development of temperament tests for various specie

Sensitive periods Times in an animal's life when certain types of learning are more easily accomplished.

Critical period Similar to sensitive periods but with a more definite beginning and end.

Classical conditioning The type of conditioning the Russian physiologist Ivan Pavlov demonstrated (hence the name Pavlovian conditioning), in which a reflex-like response can be stimulated by a neutral stimulus.

Learning

The study of learning behavior has implications for all species. Later in the chap some implications of learned behaviors are discussed relative to handling livest Thus far, the greatest attention to learning behavior has been with the comp ion species and horses. Learning is broken down into different types. **Class conditioning** is what Pavlov demonstrated when he showed how to make a dog sali

by ringing a bell. Understanding classical conditioning has implications for milk letdown in dairies and for dogs who hate going into a vet clinic. **Habituation learning** occurs when an animal learns to ignore something like a collar or a train that passes by the pasture. **Operant** or **instrumental conditioning** occurs when an animal can be taught to ring a bell for a food reward or open an automatic feeder door. This is often thought of as trial-and-error learning. **Imprint learning** helps young find their mothers and individuals recognize their own kind. Other areas of study of learning behavior in animals include discrimination learning, conceptual learning, imitation, and several other types. Some practical applications for each of these areas of learning can generally be found in all species. Anyone who wishes to be an animal trainer needs a keen understanding of animal learning.

Habituation learning A type of operant conditioning. An animal's ability to come to ignore something that occurs often enough.

Operant or instrumental conditioning Learning that is primarily influenced by its effects.

Imprint learning Learning that has restrictive conditions and time periods.

Ingestive Behavior: Food and Water Intake

Studying the way animals consume feed and water has implications in production systems and in day-to-day management of pets and companions. Many factors are at work, including hormonal, physiological, and psychological factors. In most livestock species, we are interested in maximizing consumption to improve rate of gain and increase efficiency. Animals that are fed *ad libitum* (i.e., food available at all times) usually need less feed trough space compared to animals that are limit fed. Limit-fed animals must have sufficient space so dominant animals cannot chase the weaker animals away from their portion of the limited feed. However, that is not the case for a horse or a companion animal that will be kept for a much longer period of time and for a different purpose. Studying ingestive behavior requires study of what controls feed intake, such as the influence of herd or flock behavior, **palatability**, environment, hormones, and meal patterns. An understanding of ingestive behaviors can help in dealing with problems such as underperformance owing to insufficient feed consumption in livestock, obesity, **anorexia** and **pica** in all species, grass eating in dogs, and **cribbing** in horses.

Palatability A measure of the acceptability of feedstuffs.

Anorexia Inappetence or unwillingness to eat.

Pica A craving for and willingness to eat unnatural feedstuffs.

Cribbing A behavior in horses in which they bite or hold on to objects such as posts.

Behavioral Disorders

This is perhaps the area of behavioral study that has captured the greatest hold on public imagination. Many behavioral disorders are tied to the previously discussed types of behavior, but others are not. Helping owners and animals overcome behavioral disorders can be especially rewarding for veterinarians and trainers, and it often means the difference between keeping an animal or having it destroyed. The study of behavioral disorders includes determining the reasons why the disorder has developed or exists, and then instituting a treatment of the problem. Environment, early history, training, and related problems must all be assessed. Types of behavioral disorders in dogs include destructiveness, self-mutilation, tail chasing, **phobias**, car chasing, digging, jumping up on people, and vomiting. In cats, clawing, **wool sucking**, and plant eating most frequently need to be addressed. Horse behavioral problems frequently include **stereotyped behaviors** like stall kicking, trailering problems, head shyness, and phobias. Livestock behavioral disorders include kicking in cattle, bar biting in sows, and **wool chewing** in sheep.

In the big picture, finding the causes of behavioral disorders allows emphasis on preventing them. Socializing young animals with their own species enables animals to learn social interactions with other animals. Colts or puppies reared in isolation away from other animals are often vicious fighters against other animals. This occurs because they never learned that after they became dominant they no longer have to keep fighting to maintain their dominance. Many dog attacks on young children could be prevented by socializing young puppies to babies and toddlers so they learn the difference between children and prey. Young animals have to learn who they can socialize with and what they can attack.

Phobia Excessive and unwarranted fear.

Wool sucking A *prolonged sucking syndrome* most frequently observed in cats where they continue to suck on objects and perhaps knead with the forepaws long after weaning.

Stereotyped behavior A nonfunctional, repetitive, intentional, and often rhythmic behavior.

Wool chewing Often referred to as *wool pulling.* Sheep nibble at their fleece and make bald spots.

LIVESTOCK BEHAVIOR

An understanding of the behavior of livestock can facilitate handling and can improve both handler safety and animal welfare. Animals can seriously injure handlers and/or themselves if they become excited or agitated. Poor handling procedures can also cause animals to become stressed. Several studies have shown the adverse effects of **stress** on animals; reducing stress on animals has been demonstrated to improve productivity. Restraint, electric prods, transportation, inconsistent handling, other handling stresses, and abuse can cause lowered conception rates, reduced immune function, reduced digestive function, and early embryonic losses. However, studies with numerous species have shown that animals learn and adapt to stresses. Therefore, handling and management strategies can be implemented that increase productivity and maintain meat quality. Calm animals are easier to handle. Stressed, agitated animals are more difficult to sort because they bunch tightly together. Excited, fearful animals will be easier to handle if they are allowed to calm down for 20 to 30 minutes. Keeping animals calm will improve both productivity and safety for handlers.

Stress A physical, emotional, or chemical factor causing body or mental strain or tension.

Temperament

An animal's **temperament** is one determinant of how it will react during handling Temperament is determined by an interaction between a substantial genetic effect an environmental factors. In cattle, temperament is highly heritable. The heritability esti mate of temperament in cattle has been figured at 0.40, 0.53, and 0.45. Several studie have shown that cattle with Brahman genetics (*Bos indicus*) are more excitable than *B taurus* breeds when evaluated by observing their behavior in a **squeeze chute.**

Temperament Characteristic behavior or mode of response.

Squeeze chute A restraining device used to handle livestock.

Cattle temperament can be rated on a numerical rating scale, measured while the are held in a squeeze chute, or by flight zone testing in a pen. To rate cattle temper ment in a squeeze chute, the most common rating system is a four-digit scale. Cattle a scored as follows:

1. They stand calmly in the squeeze chute.
2. They are restless.
3. They vigorously shake the chute.
4. They violently shake the chute and try to escape (berserk).

Chute scoring may be more likely to assess the animal's genetic reactivity becau restraint in a squeeze chute is a sudden **aversive event**, and the animal is forced enter the squeeze chute. Another good method for measuring temperament is speed that the animal exits from the squeeze chute. Animals with a faster exit sp are more flighty. The flight zone is the distance at which an animal will appro a person. Completely tame animals have no flight zone and allow people to to them. When the flight zone test is used, a person stands in a pen and measures h closely individuals or groups of cattle approach them. Flight zone size is affected both genetics and learning.

Aversive event A negative experience that may be painful, frightening, or nauseating.

Cortisol A hormone produced by the adrenal cortex. It is elevated during stress and has been used as a gauge for the degree of stress an animal is under.

Novelty Anything new or sudden in an animal's environment.

Extensive rearing systems Usually associated with range conditions in which hardy animals such as beef cattle receive little individual attention. They may be handled only once or twice per year.

A major component of temperament is fearfulness. Fear is a universal emo that motivates animals to avoid predators. It is a natural reaction to being hand Fear is a very strong stressor to the animal's body and as such can affect health performance. Measuring blood **cortisol** levels is a means of measuring an animal' sponse to a stress. Fear caused by exposure to **novelty** elevates levels of cortisol hi than many husbandry procedures. For example, in beef cattle raised in **exten rearing systems** not accustomed to being handled in a squeeze chute, the psycho cal stress of restraint raised cortisol levels almost as high as branding did. In sh fear stress can elevate cortisol levels higher than handling procedures such as s ing. Even nonpainful handling or restraint can induce very high cortisol lev both sheep and cattle. The amount of stress caused by a handling procedure

as restraint in a squeeze chute is determined by how the animal perceives the event and how much it is frightened. Research indicates that when cattle become stressed, the whites of their eyes show. The following behaviors are indicators that cattle are becoming stressed. They will often show these behaviors before they kick or lash out.

Behavioral Signs of Fear and Agitation in Cattle:
Tail switching
Whites of the eyes show
Quivering skin
Defecation

Although temperament has a strong genetic component, it is also influenced by previous experiences and handling. All vertebrates can be fear conditioned. It follows that animals can also be desensitized to factors that would otherwise cause fear through training and habituating livestock to handling. Animals with a genetically **flighty** temperament can be trained to a handling procedure and may appear behaviorally calm. They can learn to behave calmly when they are with familiar people or are in a familiar handling facility, but they can suddenly panic when left alone in a strange place or exposed to the novelty of a noisy auction or a new farm.

Flighty The tendency of an animal to take sudden flight when alarmed. Also called *mobile alarm.*

An animal's previous experience with handling affects its reaction to future handling. This can be especially true if the experience produced fear because animals can develop fear memories that are difficult to eradicate. Fear memories form a subcortical circuit in the brain that allows an animal to flee quickly if it sees or hears the same frightening stimulus. These memories can be suppressed by learning but are never completely erased from the brain's subcortical circuits. For ease and safety of handling, it is best to prevent fear memories from ever developing.

On farms, ranches, and feedlots, observations indicate that an animal's first experience with a handling facility, a new corral, a person, or pieces of equipment should be made as positive as possible. Farm animals can be very frightened in these novel situations. If a procedure is painful or very aversive the first time it is done, it may become difficult to persuade the animal to reenter the facility. First experiences are critical in how animals form future responses to similar situations. Some practical applications include the following:

- Train cattle by walking them through a squeeze chute a few times and giving them a feed reward, which should make future handling in the squeeze chute easier.
- Provide feed rewards to sheep to improve handling and movement through a handling facility.
- Accustom calves to regular gentle handling so no injuries occur during marketing.
- Avoid the use of dogs in a confined space where animals are unable to move away.
- Use **electric prods** sparingly on cattle and never use them on breeding pigs.
- Do not allow cattle to rush out of corrals back to pasture. Cattle should become accustomed to walking slowly past a handler when they exit corrals. In many intensive grazing systems, handlers quietly lead cows to new pasture.

Electric prods Small handheld devices designed to give a small electrical shock.

Training and Habituating Livestock to Handling and Restraint

The idea of training an animal to accept restraint voluntarily is a new concept to some people. Animals that are handled gently can be trained to accept restraint voluntarily in a comfortable device. This has many advantages for breeding animals or animals used in long-term research studies:

- Stress on both animals and people is reduced.
- One person can easily handle large animals that are trained to walk into a restraint device.
- Cooperative large animals are less likely to injure people or themselves.

Feed rewards can be used to facilitate animal movement through a facility. Sheep have been trained to enter a squeeze tilt table voluntarily for a grain reward in only one afternoon. The sheep were squeezed and tilted to a horizontal position nine times in one day. After being released from the squeeze tilt table, the animals ran rapidly into the crowd pen and lined up in the chute.

Training a group of cattle, a species that is somewhat more excitable than sheep, may take up to 10 days. Training sessions should be spaced 24 hours apart to give the animals an opportunity to calm down. A series of training trials in 1 day may result in increased agitation and excitement. Practical experience on ranches and feedlots shows that making cattle accustomed to people on foot and on horseback produces calmer and easier-to-handle cattle at the slaughter plant.

To train animals to accept restraint voluntarily, the restraint device must be introduced gradually and gently with feed rewards. At first, the animal is allowed to walk through the restrainer several times. The next step is to allow the animal to stand in the restrainer without being squeezed. On the fourth to fifth pass through the squeeze is applied gently. During each step the animal is given a food reward. A relatively tame animal can be trained to voluntarily enter a restrainer in less than an hour. Animals do not voluntarily accept restraint if the restraint device causes pain. Selection of the right type of squeeze chute and headgate to fit the specific handling requirements is important.

Training animals to enter a restraint device voluntarily is easier and less stressful if the animal is tame and has little or no flight zone. If a wild animal is being trained, it is important to catch it correctly on the first attempt. Fumbling and failing to restrain an animal on the first attempt results in increased excitement. If an animal resists and struggles; it must not be released until it stops struggling; otherwise it will be rewarded for resisting. Animals that are released while resisting are more likely to resist in the future. The animal should be stroked and talked to gently until it calms down.

Nose tongs Small clamp-like restraining device put in an animal's nose.

Cattle restrained with **nose tongs** become more difficult to restrain in the future. However, when a halter is used to hold the animal's head for blood testing, restraining the head becomes easier with successive tests. Cattle blood-tested with halter have restraint learn to turn their head and expose their jugular. Cattle that have had experience with nose tongs often fling their head about to avoid attachment of the tongs.

Some of the lean hybrid pig strains are more excitable and difficult to handle and they are more likely to panic and pile up when driven through a high-speed slaughter plant. However, pigs balk less and drive more easily at the slaughter plant if the producer walks through the pens every day during finishing for as little as 10 to 15 seconds. This trains pigs to get up in an orderly manner and calmly move around the person. It is important to teach the pigs to flow around the person. If the handler stands still and allows the pigs to approach him and chew on his coveralls, they will become more difficult to drive at the slaughter plant because they tend to follow the handler, instead of allowing themselves to be driven. To avoid frightening the pigs, the handler must never kick or slap them. Walking in the pens with the pigs, or walking pigs in the aisles during finishing, helps produce calmer animals.

A review of many studies and practical experience has shown that animals with a more placid temperament habituate more easily to a forced, nonpainful handling procedure than animals with a flighty temperament. However, some animals do not habituate easily. In one group of cattle, some individuals violently shook the squeeze chute and never habituated to being restrained when they were handled every 30 days. Even though the cattle were handled quietly, they still struggled violently and became behaviorally agitated every time they were put in the squeeze chute. Research at Texas A & M University indicated that some pigs habituated when they were forced to swim. Other pigs remained fearful and never habituated during a series of swims

Extremely flighty, excitable animals such as elk, bison, and antelope are less likely to habituate to a forced handling procedure. Bison are highly reactive and flighty and often injured during handling. Bison ranchers are concerned because it is difficult to handle their mature animals safely. These animals may be so excitable that the only way to handle them in a low-stress manner is to train them to cooperate voluntarily from an early age.

Effects of Novelty

Novelty, anything new or sudden in an animal's environment, is a very strong stressor of animals. Examples of sudden novel stimuli include a stamping foot, a train passing a pen where newly arrived calves are received, or an auction ring. A sudden novel event, such as a person stamping his or her foot in a pen of commercial pigs, is one of the best tests for determining genetic differences in the reactivity of pigs reared under identical conditions. This test is superior to other tests, such as willingness to leave a pen or ease of movement through a hallway. The paradox of novelty is that it causes an intense behavioral and physiological reaction when suddenly introduced to an animal with a flighty, excitable temperament, but the same flighty animal may be the most attracted to a novel object when allowed to approach it voluntarily. In cattle, breeds with the largest flight zone generally have the greatest tendency to approach novel objects. Cattle approach and manipulate a piece of paper lying on the ground when allowed to approach it voluntarily, but balk and jump away if someone attempts to drive them over it. Numerous studies with many species have shown that animals raised in a variable environment are less likely to be stressed when confronted with novelty.

Vision

Livestock have wide-angle vision. Cattle, pigs, and sheep have a visual field in excess of 300 degrees. This means that objects in over 80% of the space around them can distract them. Loading ramps and handling chutes should have solid side walls to prevent animals from seeing distractions outside the chute with their wide-angle vision. Moving objects and people seen through the sides of a chute can cause balking or can frighten livestock. Solid side walls are especially important when there are lots of people and other activity outside the fence. If the sides of the facility are open, all people and distractions, such as vehicles, must be kept away from the fences. When the animals need to be moved, a single skillful handler can move near the fence to move the animals. Blocking vision stops escape attempts. This is why a solid portable panel is so effective for handling pigs. Sight restriction also lowers stress levels. The wildest cow remains calm in a darkened artificial insemination box that completely blocks vision.

Even though ruminant animals have depth perception, their ability to perceive depth at ground level while moving with their heads up is probably poor. This would explain why livestock often lower their heads and stop to look at strange things on the ground. Cattle, pigs, sheep, and horses often balk and refuse to walk over a drain grate, hose, puddle, shadow, or change in flooring surface or texture. For this reason, drains should be located outside of the areas where animals walk. Drains or metal plates running across alleys should be eliminated.

Lighting can help alleviate some problems. In areas where animals are handled, illumination should be uniform and diffuse. Shadows and bright spots should be minimized. Pigs, sheep, and cattle have a tendency to move from a dimly illuminated area to a more brightly illuminated area, provided the light does not glare in their eyes. A spotlight directed onto a ramp or other apparatus often facilitates entry. The light must not shine directly into the eyes of approaching animals. Moving or flapping objects can also disrupt handling. Fan blades or a flapping cloth or coat on a fence can cause balking. Animals may refuse to walk through a chute if they can see motion up ahead.

Dichromat Ability to perceive only two colors.

Numerous investigators have now confirmed that cattle, pigs, sheep, and goats possess color vision, but they are apparently **dichromats**, and the cones in their eyes are more sensitive to blue-green and yellowish green. Handling facilities should be painted one uniform color. All species of livestock are more likely to balk at a sudden change in color or texture.

Noise

Cattle and sheep are more sensitive than people to high-frequency noises. The auditory sensitivity of cattle is greatest at 8,000 hertz (Hz), and sheep at 7,000 Hz. The human ear is most sensitive at 1,000 to 3,000 Hz. Unexpected loud or novel noises can be highly stressful to livestock. Continuous exposure to sounds over 100 decibels (dB) reduced daily weight gain in sheep and would likely affect other animals the same way. However, animals readily adapt to reasonable levels of continuous sound such as white noise, instrumental music, and miscellaneous sounds. Continuous background sound has been shown to improve weight gain in some cases. Continuous playing of a radio with a variety of talk and music reduces the reaction of pigs to sudden noises and may help prevent weight loss caused by unexpected noises.

In facilities where livestock are handled, loud or novel noises should be avoided as much as possible. The sound of clanging metal can cause balking and agitation. Rubber stops on gates and squeeze chutes help reduce noise. The pump and motor on a hydraulic squeeze chute should be located away from the squeeze. Exhausts on pneumatic powered equipment should be piped away from the handling area. Noise can also be useful. Small amounts of noise can be used to move livestock. Cattle and sheep move away from a rustling piece of plastic. Observers of superior livestock handlers notice that even the sound of finger snapping can be used effectively to direct livestock. Shouting and yelling at animals is stressful to them and should be avoided if at all possible. Loud shouting may be as stressful as an electric prod.

Flight Zone

Flight zone The distance that an animal is caused to flee from an intruder.

An important concept of livestock handling is **flight zone**. Understanding the flight zone can reduce animal stress and can help prevent accidents to handlers. The flight zone is the animal's safety zone. When a person enters an animal's flight zone, the animal moves away. The size of the flight zone varies depending on the tameness or wildness of the livestock. The flight zone of extensively raised cattle may be as much as 50 m (164 ft), whereas the flight zone of feedlot cattle may be 2 m (6 ft) to 8 m (26

Several factors can influence the flight zone:

- The size of the enclosure the livestock are confined in may affect flight zone size. Sheep experiments indicate that animals confined in a narrow alley had a small flight zone compared to animals confined in a wider alley.
- Approaching an animal at its head seems to increase flight zone size.
- The size of the flight zone slowly diminishes when animals receive frequent, gentle handling. Extremely tame livestock may be difficult or even impossible to drive because they no longer have a flight zone. These animals should be led with a halter bucket or halter. Excited animals have a larger flight zone.

Understanding the flight zone and how to use it is important in handling livestock. If the handler penetrates the flight zone too deeply, the animal either bolts runs away, or turns back and runs past the person. The best place for the person work is on the edge of the flight zone. This causes the animals to move away in orderly manner. The animals stop moving when the handler retreats from the flight zone. To make an animal move forward, the handler should stand in the shaded marked in the flight zone diagram (Figure 13–1). To cause the animal to back

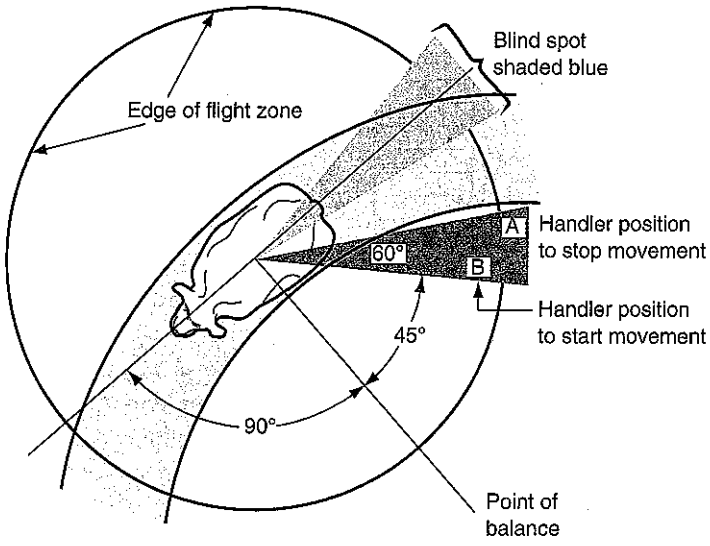

Figure 13–1
Cattle flight zone. Standing outside the flight zone causes the animal to stop moving (A). Standing in the shaded area within the flight zone causes the animal to start moving (B). Moving in front of the point of balance causes the animal to back up. When cattle are handled in a chute, the point of balance will be at the shoulders. However, when cattle are being moved in larger open spaces, the point of balance is often just past the eye. Source: Grandin, 1989. Used with permission.

the handler should stand in front of the point of balance. A flag on the end of a stick can be used to sort cattle by moving it back and forth across the point of balance. Many people make the mistake of deeply invading the flight zone when cattle are being driven down an alley or into an enclosed area such as a crowd pen. If the handler deeply penetrates the flight zone, the cattle may turn back and run over him or her. If the cattle attempt to turn back, the person should back up and retreat from inside the flight zone. The livestock attempt to turn back because they are trying to escape from the person who is deep inside their flight zone.

Cattle sometimes rear up and become agitated while waiting in a single-file chute. A common cause of this problem is a person leaning over the chute and deeply penetrating the flight zone. The animal usually settles back down if the person backs up and retreats from the flight zone. Inexperienced handlers sometimes make the mistake of attempting to push a rearing animal back down into a chute. The animal often reacts by becoming increasingly agitated, and both the handler and the animal have a greater likelihood of being injured. This also explains why livestock balk if they see people standing in front of the squeeze chute. The use of shields for handlers to stand behind improves animal movement.

Herd Animals

All livestock are herd animals, and they are likely to become highly agitated and stressed when they are separated from their herd mates. Productivity is affected by the physiological changes that occur during isolation. In addition, large animals that become agitated and excited are likely to injure handlers. If an isolated animal becomes agitated, other animals should be put in with it.

The desire to be with the herd can be used to help move animals. Cattle and sheep are motivated to maintain visual contact with each other and readily "follow the leader." If animals bunch up, handlers should concentrate on moving the leaders instead of pushing a group of animals from the rear. Trained animals can be used to lead others through a handling facility.

Groups of animals that have body contact remain calmer. A tame **pacifier cow** calms a wild cow during **artificial insemination**. The wild cow stands quietly while maintaining tactile contact with the tame cow. A loading ramp for pigs or sheep that has a see-through center partition takes advantage of natural following behavior

Pacifier cow A cow that has been trained to accept moving, restraint, and other types of management.

Artificial insemination The procedure for placing semen in the reproductive tract of a female animal through means other than the natural mating act in the hopes of causing a pregnancy.

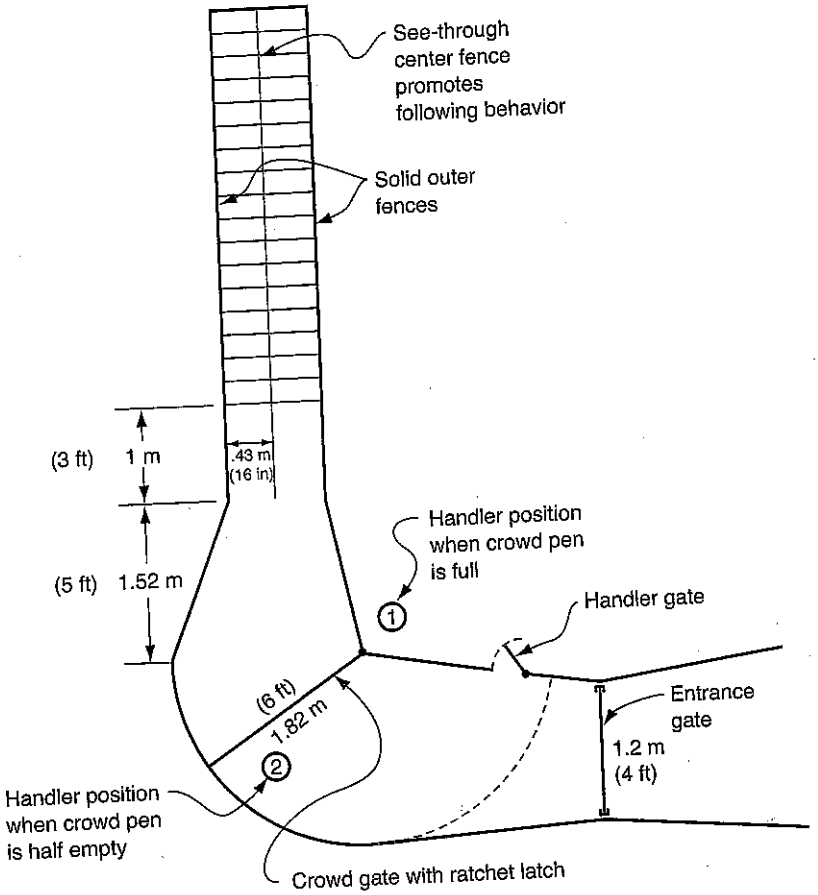

Figure 13–2
A loading ramp design for pigs and sheep. This design takes advantage of natural following behavior by allowing the animals to see each other through a see-through center fence. Source: Grandin, 1989. Used with permission.

(Figure 13–2). As the animals walk up the twin single-file chutes, they can see each other through the center partition. This works better if solid outer walls block outside distractions.

Genetic Differences

Genetic factors affect an animal's reaction to handling. Brahman and Brahman cross-bred cattle are more excitable and harder to handle than English breeds. Angus cattle are more excitable than Herefords, and Holsteins move more slowly than Angus or Herefords. When Brahman or Brahman cross cattle become excited, they are more difficult to block at fences. Visually substantial fences built with planks or a wide belly rail should be used with these breeds. Brahman cattle seldom run into a fence that appears to be a solid barrier. Highly excited Brahman cattle may lie down and become immobile if they are repeatedly prodded with an electric prod. Continuous electric prodding of Brahman or Brahman cross cattle can result in death. If the animal is left alone for a few minutes, it usually gets up. English or European cattle seldom become immobile. Even though Brahman cattle are more excitable than the British breeds, they can become extremely docile when they are handled gently. Brahman are inquisitive, sensitive cattle that respond well to quiet, gentle handling, and they respond poorly and may become agitated if they are treated roughly. Because Brahman have a more reactive nervous system, they may become easily frightened when subjected to sudden novel experiences, for example, going through an auction ring. Brahmans often remain calm if they have a familiar person who can handle them when they are in a novel, strange situation. British cattle, however, are less likely to become fearful or agitated when subjected to sudden novelty.

In pigs, Yorkshires move more slowly during loading than Pietrians. Other breed differences likely exist. Observations at farms and slaughter plants indicate that certain types of hybrid pigs are difficult to drive. They have extreme **shelter-seeking behavior** (flocking together) and they refuse to move forward up a chute. They are also very excitable. This problem is most evident in some hybrid lines of pigs selected for high productivity. Pig breeders should select for temperament to avoid serious meat quality and animal welfare problems at the slaughter plant. Different breeds of sheep also react differently to handling. The **flocking instinct** of sheep is very evident when they are being handled. The Rambouillet breed and a few others, for example, tend to flock tightly together and remain in the group, whereas other breeds are more independent.

Shelter-seeking behavior Behaviors that an animal exhibits to escape from weather, insects, or danger.

Flocking instinct A type of shelter-seeking behavior that has been selected for sheep. At the least hint of danger, they move close together and move as a group.

Observations of thousands of cattle and pigs in large slaughter plants indicate that some animals that have been bred for extreme leanness are very excitable and difficult to handle when they are brought to a new place. They become highly agitated when they are subjected to the noise and novelty of a large slaughter plant. It appears that the most excitable pigs, cattle, and dogs have long, slender, smooth bodies and fine bones. Animals bred for leanness with heavy bones and bulging muscles tend to be calmer. Genes are linked in ways that are not fully understood, as evidenced by the following example. In long-term selection experiments, Russian scientists selected foxes for temperament. For 20 years, they bred the calmest and easiest-to-handle foxes. Selection for the single trait of calm temperament resulted in a fox that looked and behaved like a Border Collie dog. Its coat color changed from gray to black and white. However, continued selection for the very calmest fox-dogs resulted in bitches that ate their puppies and in neurological problems such as epilepsy.

The previous example illustrates a challenge in breeding animals for temperament. To reduce stress and to improve both productivity and welfare, it is important to breed animals with a calm temperament. However, one must not make the mistake of overselecting for any single trait. Excessive selection for calmness may result in other problems, such as lack of mothering ability. To prevent handling and stress problems, it is advisable to cull the most flighty animals that become extremely frenzied and agitated when they are restrained, but it is probably a bad idea to select only for the very calmest animals.

Handler Dominance

Handlers can often control animals more efficiently if they exert dominance over the animal. Exerting dominance is not beating an animal into submission; it is using the animal's natural behavior to exert dominance. The handler becomes the "boss animal." Nomadic tribespeople in Africa control their cattle by entering the dominance hierarchy and becoming the dominant herd member.

Limited experience suggests that dominance can be achieved over a group of pigs. Slapping a dominant pig has little effect on its behavior. The aggressive behavior can be stopped by pushing the pig against a fence with a board pressed against its neck. The board against the neck simulates another pig to push and bite. Pigs exert dominance over each other by biting and pushing against the neck. It is often advisable to handle the dominant pig first. The odor of the dominant pig on the handler may make the other pigs demonstrate more **submissive behavior**. More research is needed to develop simple methods of exerting dominance that will enable handlers to control boars and other large animals with a minimum of force and greater safety.

Submissive behavior Behaviors a less-dominant animal exhibits toward a more-dominant animal to prevent being subjected to aggression.

Handling Facility Layout

An animal's stress reaction to a handling procedure depends on genetics, individual differences, and previous experiences. Facility design can have a strong influence on the type of quality of the animal's previous experiences and can influence the ease

with which the animal can be handled in the future. Handling facilities that utilize behavioral principles thus make handling easier in the present and future.

Curved Chutes and Solid Fences Curved single-file chutes are especially recommended for handling cattle (Figure 13–3). A curved chute is more efficient for two reasons. First, it prevents the animal from seeing what is at the other end of the chute until it is almost there. Second, it takes advantage of the animal's natural tendency to circle around a handler moving along the inner radius. A curved chute provides the greatest benefit when animals have to wait in line for vaccinations or other procedures. A curved chute with an inside radius 3.5 m (12 ft) to 5 m (16 ft) works well for handling cattle. The curve must be laid out as shown in Figure 13–3. If the chute is bent too sharply at the junction between the single-file chute and the crowd pen, it appears as a dead end. This causes livestock to balk. If space is restricted, short 1.5-m (5-ft) bends can be used. If bends with a radius smaller than 3.5 m (12 ft) are used, there must be a 3-m (10-ft) straight single-file section at the junction between the crowd pen and chute to prevent the chute from appearing to be a dead end. Handler walkways should run alongside the chute and crowd pen. The use of overhead walkways should be avoided.

Livestock often balk when they have to move from an outdoor pen into a building. Animals enter a building more easily if they are lined up in a single-file chute

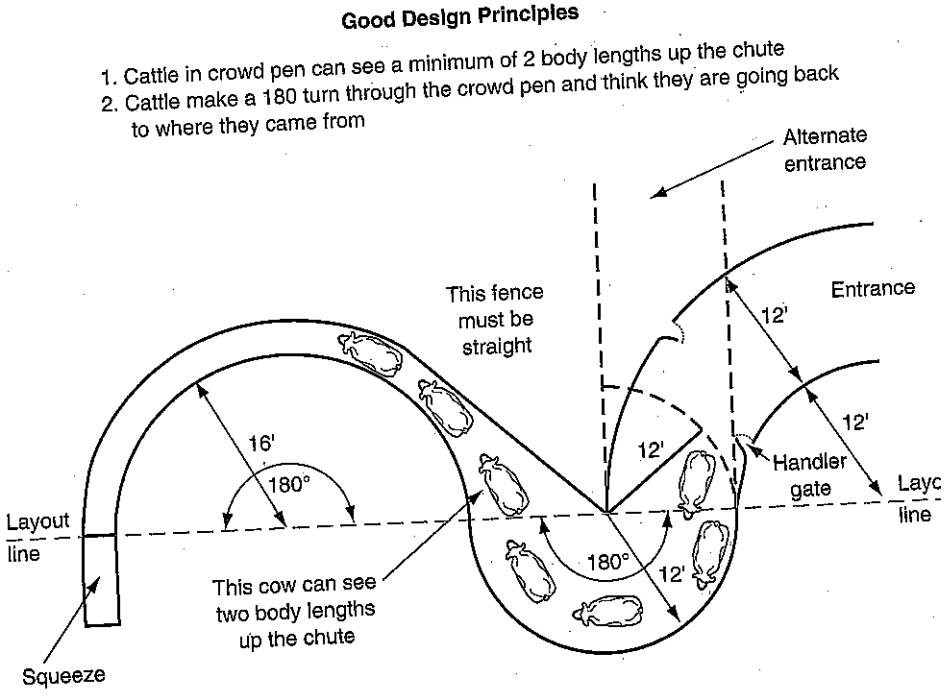

Figure 13–3
Layout of a curved cattle handling facility. A curved chute is very effective for cattle because i prevents the animal from seeing what is at the other end of the chute until it is almost there, and it takes advantage of the animal's natural tendency to circle around a handler moving along the inner radius. A curved chute with an inside radius of 3.5 m (12 ft) to 5 m (16 ft) work well for handling cattle. If the chute is bent too sharply at the junction between the single-file chute and the crowd pen, it appears as a dead end and cows balk. If space is restricted, short 1.5-m (5-ft) bends can be used. If bends with a radius smaller than 3.5 m (12 ft) are used there must be a 3-m (10-ft) straight, single-file section at the junction between the crowd pen and chute to prevent the chute from appearing to be a dead end. Handler walkways should run alongside the chute and crowd pen and never overhead. A full-circle, round crowd pen i shown. This works best because it takes advantage of the animal's natural tendency to go ba to where it came from. Source: Grandin. Used with permission.

before they enter the building. Conversely, pigs reared indoors are often reluctant to move out into bright daylight. A pig loading ramp should be designed so that the pigs are lined up in single file in an area where they cannot turn around before they leave the building (Figure 13–4). For all species, solid sides are recommended on both the chute and the crowd pen that leads to a squeeze chute or loading ramp. For operator safety, handler gates must be constructed so that people can escape charging animals. The crowd gate should also be solid to prevent animals from turning back. Wild animals tend to be calmer in facilities with solid sides. In holding pens, solid pen gates along the main drive alley facilitate animal movement.

Crowd Pen Design The crowd pen used to direct animals into a single-file or double-file chute must never be built on a ramp. A sloped crowd pen causes livestock to pile up against the crowd gate. Round crowd pens are very efficient for all species. In cattle facilities, a circular crowd pen and a curved chute reduced the time spent moving cattle by up to 50%. Practical experience has shown that the recommended radius for round crowd pens is 3.5 m (12 ft) for cattle, 1.83 to 2.5 m for pigs (6 to 8 ft), and 2.5 m (8 ft) for sheep.

Cattle and sheep crowd pens should have one straight fence, and the other fence should be on a 30-degree angle. This layout should not be used with pigs. They jam at the chute entrance, which is very stressful for pigs. A single offset step equal to the width of one pig should be used to prevent jamming at the entrance of a single-file ramp (Figure 13–4). Another good design is two single-file chutes side by side (Figure 13–2). Jamming can be further prevented by installing an entrance restricter at single-file race entrances. The entrance of the single-file chute should provide only 1/2 cm of space on each side of each pig.

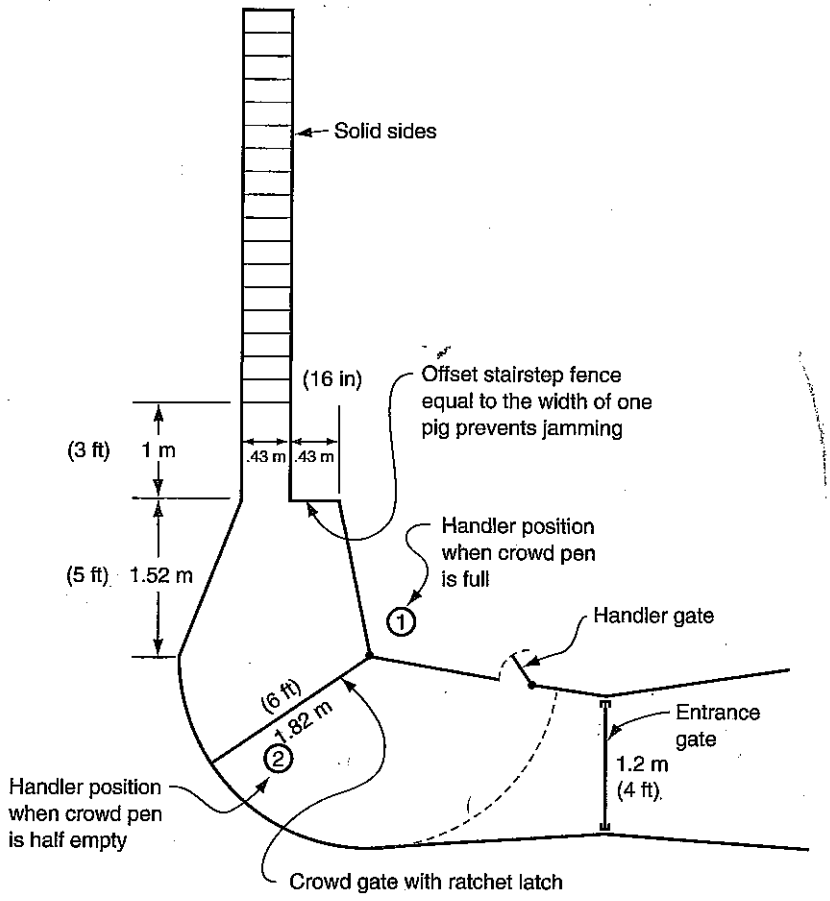

Figure 13–4
Layout of a pig loading ramp with a single offset step to prevent jamming. The ramp is designed so that the pigs are lined up in single file, where they cannot turn around. For all species, solid sides are recommended on both the chute and the crowd pen, which leads to a squeeze chute or loading ramp. The solid crowd gate prevents animals from turning back. In holding pens, solid pen gates along the main drive alley facilitate animal movement. Handler gates allow people to escape charging animals. Source: Grandin, 1989. Used with permission.

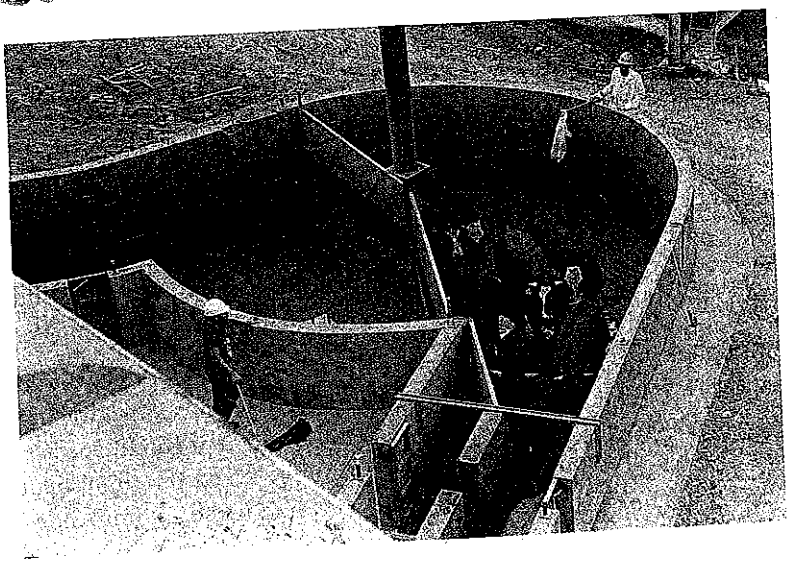

Figure 13–5
Crowd pen design. This crowd pen design is efficient because the cattle go around the bend and think they are going back to where they came from. The handlers are quietly moving small groups by waving plastic flags. The crowd pen for pigs or cattle should be filled only half to three-quarters full. It is important to avoid using the crowd gate if possible. On a round crowd pen, the crowd gate should be closed and set on the first notch and left there if possible. It should not be used to push animals. Cattle and pigs need room to turn and should be handled in small discrete bunches, with space in between the bunches. For sheep, the crowd pen may be filled completely, as long as the sheep are not too tightly packed. Sheep should be moved in one continuous stream, never breaking the flow, to maintain following behavior. (Photo courtesy of Temple Grandin, Grandin Livestock Handling Systems, Inc.)

The crowd pen for pigs or cattle should be only half to three-quarters full; half full is best. It is important to avoid using the crowd gate if possible. On a round crowd pen, the crowd gate should be closed and set on the first notch and left there. It should not be used to push animals. Cattle and pigs need room to turn and should be handled in small discrete bunches, with space in between the bunches. For sheep, the crowd pen may be filled completely, as long as the sheep are not too tightly packed. Sheep should be moved in one continuous stream, never breaking the flow to maintain following behavior (Figure 13–5).

Ramp Steepness and Flooring Excessively steep ramps may injure animals. The maximum recommended steepness for a stationary cattle or pig ramp is 20 degrees for market-weight animals. If space permits, a 15-degree slope is recommended for pigs. Stair steps are recommended on concrete ramps because they provide good footing even when they are dirty or worn.

Improved Handling Practices

Many present facilities are not necessarily designed well, but, of necessity, are still in use. But facilities are only part of the equation. How animals react to being handled depends largely on the methods of the handlers. Several strategies can be used to improve handling practices in all types of facilities:

Move small bunches. Move finishing pigs in small bunches of three to six during truck loading. On ranches and feedlots, move small bunches of cattle that can be easily handled. The staging alley leading to the truck loading ramp or processing area should be only half full.

Eliminate electric prods. Use other driving aids, such as plastic paddles or sticks with plastic streamers or flags tied on them. Use these devices to work the animal

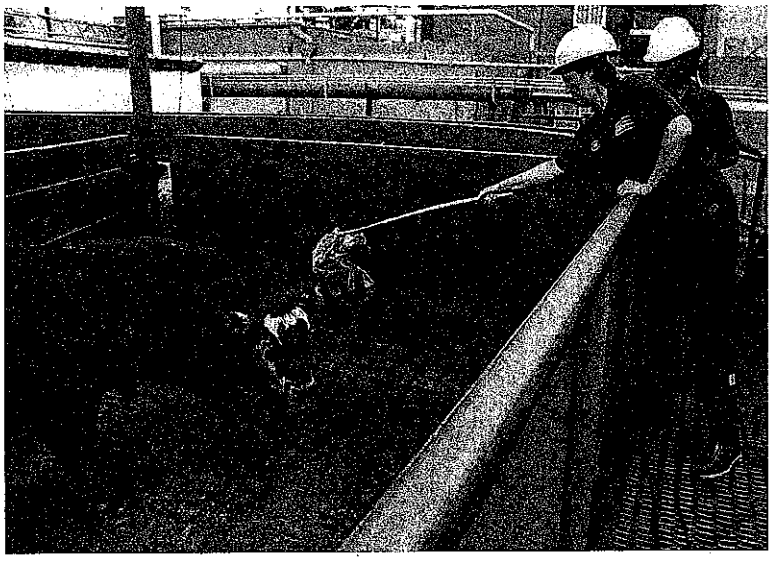

Figure 13–6
Dr. Temple Grandin demonstrates using a stick with plastic streamers to turn an animal. The streamers are gently moved alongside the animal's head to induce it to turn. A calm animal can be moved with small, slow movements of the stick. Do not vigorously shake the streamers. (Photo courtesy of Temple Grandin, Grandin Livestock Handling Systems, Inc.)

flight zone and to turn the animals. These devices work better than plain sorting sticks because the animals can see them more easily (Figure 13–6).

Open anti-back gates. Many chute facilities have too many anti-back gates. Movement often improves if most are tied open. The only place an anti-backup gate may be needed is up close to the squeeze chute. Cattle handled calmly and quietly are less likely to back up. The anti-back gate at the single-file chute entrance can be equipped with a remote control rope so it can be held open by a person standing by the crowd pen. This facilitates entry of the cattle into the chute.

Eliminate visual distractions. Distractions and lighting problems may ruin the performance of even a well-designed facility and should be removed. To locate distractions that impede animal movement and need removing, handlers should get in the chute and crouch down to visualize the area from the animal's eye level. If pigs or cattle balk or refuse to enter the single-file chute, look for distractions such as shiny reflections, a dangling end of a chain, water puddles, drain gratings, a coat hanging on a fence, or people visible up ahead. Pigs and cattle often refuse to enter a chute that is dark. When new feedlot processing areas are built, skylights are recommended to provide diffuse, shadow-free light because shadows that fall across a chute can make animals balk. However, animals will not approach blinding light and will not walk directly into the sun. Another distraction that may impede animal movement is air blowing in their faces.

Reduce noise. Avoid yelling at animals, whistling, or whip cracking. Clanging noises on steel should be silenced, and hydraulic systems should be quiet and designed to avoid the sound frequencies for which cattle have maximum sensitivity. On squeeze chutes, the clatter of the side bars should be quieted with rubber pads. Reducing the high-pitched whine in a hydraulic system can result in calmer cattle. In a pork slaughter plant, engineering conveyor equipment for reduced noise combined with quiet handling results in reduced squealing and pig pile-ups.

Handler movement patterns. Use the patterns shown in Figures 13–7 and 13–8 to move cattle and pigs through chutes. The use of these movement patterns enables handlers to eliminate electric prods in the processing area. Animals move forward in a chute when a handler walks past them in the direction opposite the desired movement. The handler must pass the point of balance at the shoulder to induce the animal

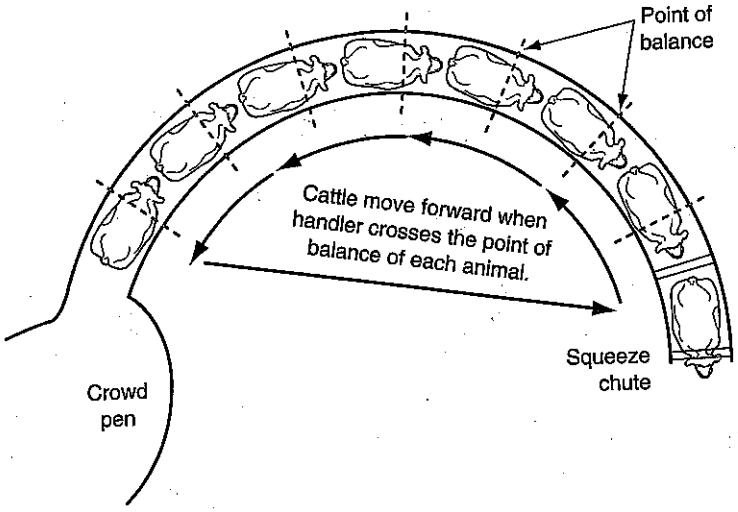

Figure 13–7
Handler movement pattern to keep cattle moving into the squeeze chute in a curved chute system.
Source: Grandin, 1998b. Used with permission.

to move away in the opposite direction. To make the animal move forward, the handler must be behind this point of balance. Animals speed up and move faster when a handler inside their flight zone walks in the direction opposite the desired movement. The same principles apply to other species of animals. Handlers should not put continuous pressure on an animal's flight zone. To induce a cow to walk into a squeeze chute, the handler should stand back out of her flight zone. The cow usually moves forward into the squeeze chute when the handler steps toward her and walks back past the point of balance at the shoulder (Figures 13–7 and 13–8).

Slow is faster. Move pigs and cattle at a slow walk. Fearful animals are more likely to balk and are more difficult to handle. Handlers should move slowly and deliberately. Sudden jerky motions frighten the animals. In the wild, sudden movements are associated with predators.

Use following behavior. When handling cattle and pigs, do not fill the crowd pen until the single-file chute is partially empty because when there is space in the chute a group of animals in the crowd pen will follow the leader into the chute. Cattle and pigs in the crowd pen turn around if the single-file chute is full. It is important to avoid overfilling the crowd pen. Cattle and pigs should be moved in small separate bunches, but sheep can be moved in a large bunch. When sheep are handled, the crowd pen should be continuously full so sheep will follow each other in a continuous flow. This behavior is a species difference between sheep and other hoofed animals.

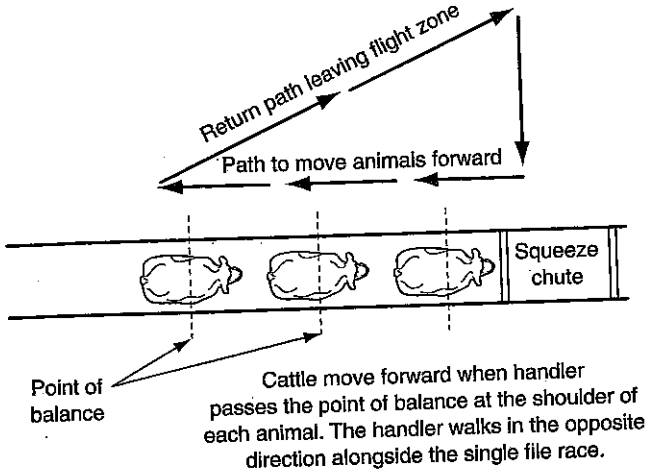

Figure 13–8
Handler movement pattern to keep cattle moving into a squeeze chute or restrainer.
Source: Grandin, 1998b. Used with permission.

Behavioral principles of restraint. Four behavioral principles of restraint can be used to keep animals calm in a squeeze chute or similar restraint device. These are blocking vision; slow, steady movements of the restraint apparatus; optimum pressure; and providing secure footing so animals do not lose their balance and struggle because of slipping. On squeeze chutes, cover the open-barred sides or install angled rubber conveyor belt strips on the side bars to prevent cattle entering the squeeze chute from seeing the operator. Cattle often balk at the entrance to a squeeze chute because they see the operator deep in their flight zone (Figure 13–9). The crowd pen, the lead-up chute, and the squeeze chute should have solid sides. It is most important to cover the back half of the squeeze chute closest to the tailgate. Covering the sides of the squeeze chute also reduces sudden lunging at the headgate. Cattle should enter and exit the squeeze chute at a walk. During restraint, cattle remain calmer if the squeeze chute is closed with steady, strong pressure instead of suddenly bumping the animal. However, sufficient pressure must be applied to provide cattle the feeling of being held. Many people make the mistake of squeezing the animal tighter when it struggles. Remember that if an animal is squeezed too tightly, the pressure should be backed off slowly. A sudden release of pressure may scare the animal.

Training handlers. Quieter livestock handling techniques for loading and unloading trucks and handling animals in alleyways and chutes may take up to 2 weeks for handlers to learn fully. They may have to spend several days learning the most efficient handler movement patterns and making minor changes in the facility to improve livestock movement. Management has to be fully committed to changing handling procedures permanently on a farm, feedlot, or ranch. Top management has to implement the changes and impress on employees how serious they are about stopping rough handling. Most employees can be retrained. However, a few people who have been rough for so many years may not be able to change their ways, and they may need to be reassigned to jobs away from animals.

Objective Scoring of Handling

In feedlots and slaughter plants, quiet handling has a tendency to become rough unless management maintains constant vigilance. Therefore, methods are needed to score handling procedures objectively. The simplest handling procedure to score is electric prod use. The lower the usage, the better. Trained handlers working in well-designed facilities can move large numbers of cattle without an electric prod. In large

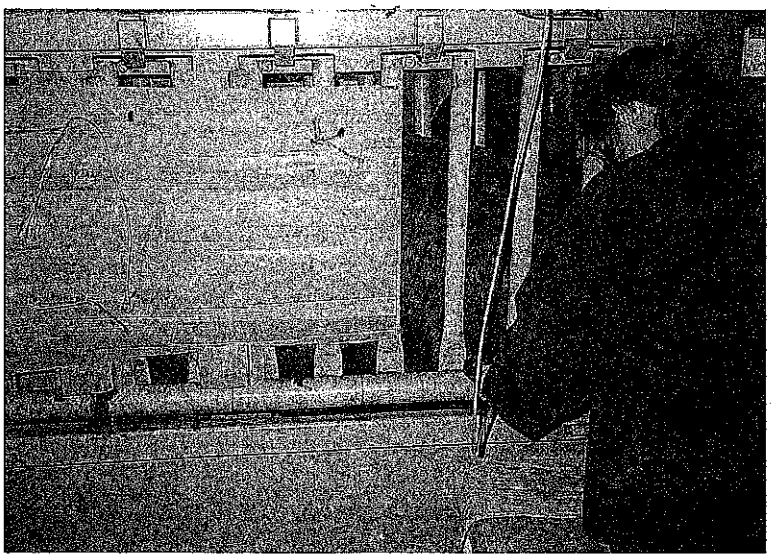

Figure 13–9
To demonstrate the calming effects of solid sides, try fastening cardboard to the open barred sides of a squeeze chute as shown here. An opening can be left at the shoulder for giving injections. (Photo courtesy of Temple Grandin, Grandin Livestock Handling Systems, Inc.)

beef slaughter plants with line speeds of over 250 animals per hour, it is possible to move 95% of the cattle from the truck, unloading all the way through the stunning chute and restrainer without the use of electric prods. In most situations, a single 15-minute lesson in animal handling makes it possible to greatly reduce electric prod usage. An electric prod should never be constantly carried in a person's hand. It should only be picked up to move a stubborn animal. The use of this simple scoring system will enable managers to determine if their handling practices are improving.

Scoring System for Measuring Cattle Handling

Percentage of cattle that exit the squeeze chute faster than a trot. Should be 75% or more of the cattle walking or trotting.
Percentage of cattle vocalizing
Percentage of cattle that fall. Should be 1% or les.
Percentage moved with an electric prod. Should be 10% or less.

The percentage of cattle that vocalize can be used to assess handling stress. In both cattle and pigs, vocalizations are correlated with physiological stress measurements. In a slaughter-plant survey, the percentage of bellowing cattle was significantly higher when a high percentage of cattle were prodded with an electric prod. Bellowing was associated with electric prodding, slipping and losing footing, and when excessive pressure was applied by a restraint device. Work with feedlot personnel has shown that reducing electric prod use also reduces bellowing. Some of Dr. Grandin's work has shown that when cattle are handled quietly in a squeeze chute for vaccinations and implanting, less than 3% of the animals vocalize during handling in the lead-up chute, when catching in the squeeze chute, or during vaccinations. Handling the ears and head for implanting and ear tagging causes some animals to vocalize. Handling of the head appears to be more aversive than carefully applied body restraint and driving cattle without electric prods. Some work suggests that blocking an animal's vision may reduce its resistance to having its head manipulated.

Squeeze chutes can be instrumented with load cells and strain gauges to measure the force exerted on them by the cattle. An instrumented squeeze chute can be connected directly to the feedlot computer system and used to monitor handling. In a feedlot in which cattle are individually identified, the computer could correlate the squeeze chute force scores to weight gains and sickness, and it could measure how hard the animal hits the headgate and the intensity of struggling. Through the use of special software, it would be possible to use the system for both temperament scoring and for assessing how employees are handling the animals. To monitor handling both packing plants and feedlot cattle handling areas are equipped with video cameras that are monitored over the Internet. This has resulted in great improvements.

SUMMARY AND CONCLUSION

Genetics and experience interact to determine how an animal will behave during handling. Quiet, calm handling at an early age helps produce calmer, easier-to-handle adult animals. People working with animals need to understand the behavioral principles of handling. The use of behavioral principles should improve the efficiency of livestock handling and reduce stress on animals. Reducing stress also should help improve weight gain, reproductive performance, and animal health. To avoid agitation and facilitate handling, the handler should move small numbers of animals at a time, not overload the crow pen, eliminate electric prods, open anti-back gates, elim nate visual distractions that make animals balk, reduc noise, and use flight zone and point of balance principle

Restraint devices should be designed so they do n cause pain. In certain research situations, animals can easily trained to enter a restraint device voluntarily. Th practice helps reduce stress. The restraint device shou be gradually introduced and should not cause pain. Fe rewards facilitate training. Training animals to submit

handling procedures voluntarily is especially useful for valuable breeding animals and animals used for research. All areas where animals are crowded such as chutes and crowd pens should have solid sides and diffused lighting with a minimum of shadows. Livestock have wide-angle vision and are easily frightened by shadows or moving distractions outside of chutes. Noise should be kept to a minimum because animals have sensitive hearing. Cattle, pigs, and sheep are herd animals, and isolation of a single individual should be avoided.

An animal's previous experience with handling will affect its reaction to handling in the future. Animals that have had frequent, gentle contact with people are less stressed during handling than animals that have had previous aversive treatment. An animal's first experience with a new corral, person, or pieces of equipment should be made as positive as possible. If a procedure is painful or very aversive the first time it is done, it may be difficult to persuade the animal to reenter the facility.

STUDY QUESTIONS

1. Why has there been an increased interest in the study of animal behavior by veterinarians and animal scientists?
2. Describe the major areas of study in animal behavior and justify the importance of each.
3. What has caused the recent interest in animal handling behavior?
4. What are the benefits to better understanding and practicing improved animal handling techniques? What problems are associated with poor handling techniques?
5. Describe how temperament and handling practices interact. Name some methods for measuring temperament.
6. How does fear affect an animal and how does it influence the animal while it is being handled?
7. What are the advantages of training animals to accept handling and restraint?
8. Describe the general methods of training animals to accept restraint voluntarily.
9. What is the role of temperament in the habituation to handling?
10. What is novelty as it pertains to livestock? Give some examples. How do animals react to novelty?
11. Why is it hard for animals to forget fear memories? What are some examples of ways to prevent fear memories in animals?
12. What does it mean that animals have wide-angle vision? What are some ways to compensate for this in handling?
13. How does depth perception affect an animal's willingness to move? What can be done in a handling facility to compensate for poor depth perception?
14. How can manipulating lighting change an animal's willingness to be handled?
15. How do animals react to noise? How about continuous radio? What are some measures that can be taken to help animals deal better with sounds, or to eliminate them?
16. Describe flight zone. How does it affect an animal's handling? Is a small flight zone a good thing? Explain.
17. How can herd animal instincts be used to move animals and help prevent stress? Explain one way to design a loading chute to take advantage of the herd instinct.
18. Give some examples of how genetics interact with handling procedures to cause specific reactions to handling in livestock.
19. Think of some traits of various species of animals. Do you think selection for certain traits may have gone overboard and produced some traits that are not so desirable?
20. Describe the concept of handler dominance. How practical do you think the practice of handler dominance can become in modern management of livestock for high production?
21. Why is a curved chute effective in moving livestock? What other modifications can be made in chutes to facilitate handling?
22. Describe an effective design for a crowd pen. How is it best used by animal handlers to move livestock?
23. Why should ramps not be excessively steep? What angles are recommended for cattle? For hogs?
24. Describe some methods of improving handling practices.
25. What are the four behavioral principles of restraint? Give a practical use for each principle.
26. How can attention to handler movement patterns facilitate handling?
27. Describe several methods you would use to assess whether or not a group of livestock handlers is doing a good job in handling.

REFERENCES

Beginning with the section on livestock behavior, this chapter is based on two papers published by Dr. Temple Grandin. The material was edited, condensed, and otherwise modified to fit the style and format of this book and used with permission. The articles are Grandin (1989) and Grandin (1997b), which are referenced here and available at www.grandin.com. These are refereed journal articles and thus fully referenced. The citations amount to nearly 200 individual articles by experts in the fields. Those of you interested in the more scientific approach of the original papers are encouraged to read them in their entirety. Dr. Grandin's Web site houses a wealth of information about livestock behavior, facilities design, and humane slaughter. It is highly recommended.

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