Reduce stress of handling to improve productivity of livestock

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STRESS INDUCED BY HANDLING agitates and excites animals, resulting in elevated body temperature, increased heart rate, high glucocorticoid values, and reduced immune function.[1-4]

Common stressful situations for animals include weaning, marketing, and health-care procedures.[1,5] Isolating an animal from its herdmates also induces stress.[6] Researchers have found that rough handling of animals for artificial insemination raises body temperatures and can lower conception rates. An elevated body temperature at the time of insemination also increases risk of early embryonic death.[3] Excitement before insemination depresses secretion of hormones that stimulate contractions of the reproductive tract that move sperm to the site of ovum fertilization.[3]

Stressful handling procedures 24 to 36 hours following removal of implants lowered conception rates when Synchro-Mate B® (Searle) was used to synchronize estrus.[7] Although conception rates were reduced, the cows still displayed estrous behavior. First-service conception rates will also be impaired if the animal is stressed during the surge of luteinizing hormone.[7]

Stress due to handling has reduced cell-mediated immunity.[4] In one study, young pigs were restrained in a narrow box two hours daily for three days. Thymus weights in the tightly confined animals were reduced, serum cortisol values were increased, and cell-mediated immunity reduced.[4]

Initial physiologic reactions caused by stress are minimized when animals become accustomed to routine handling procedures.[8] An animal's reaction to a handling procedure, such as artificial insemination, restraint in a squeeze chute, or transportation, depends on its genetic background,[9] individual differences,[10] past experiences,[6] and familiarity with the environment.[8]

Stress factors

Genetic background

Some breeds of livestock, such as Brahman cattle, are easily agitated. Because these breeds become excited in response to rough handling, the use of an electric prod is not recommended. In another comparison of genetic makeup, Angus cattle had significantly greater cortisol concentrations than Hereford cattle in response to restraint in a squeeze chute.[11]

Individual differences

Within a breed, each animal has individual characteristics or temperament. As a result, some animals have a more intense physiologic response to handling. In one test corticoid values varied greatly among individual steers within a breed when they were restrained in a squeeze chute.[12]

Past experiences

Animals remember painful or frightening experiences. A novel situation can be a strong stress factor if the animal perceives it as threatening. Hogs routinely handled quietly during feeding gained more weight than hogs subjected to stressful handling practices three times per week.[13]

The less familiar the situation, the more likely the animals will be stressed.[14] However, animals do exhibit a degree of curiosity; not all new situations create stress. Feedlot cattle will readily approach a strange object in their pen, such as a coat hanging on a fence, provided that they can approach the object at their own pace. In contrast, if the same animal were forced to walk past the coat hanging on a chute or flapping in the breeze, it would balk and exhibit signs of stress. Force raises the level of stress in any situation.

Animals raised in a non-routine environment are less likely to be stressed when they are confronted with

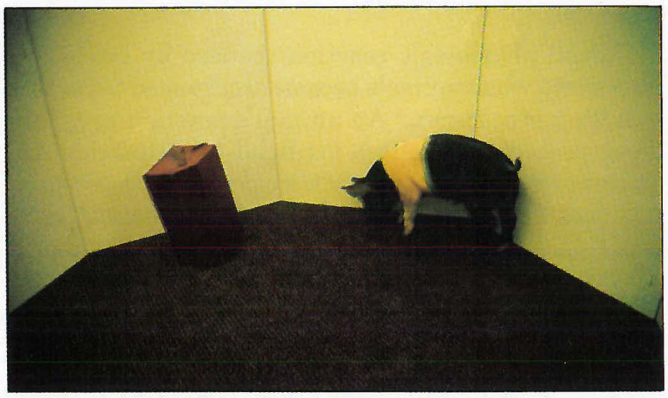

Figure 1. Novelty is a strong stressor only if the animal perceives the situation as threatening. Pigs raised in a pen with varying objects would approach unfamiliar items quickly. During this study,[15] objects in the pig's pen, including cloth strips, newspapers, and boxes, were interchanged daily.

Figure 2. Livestock raised on range with minimal contact with people will be more stressed by handling than livestock raised in a barn and exposed to frequent contact with people.

a novel situation. Pigs exposed to a variety of objects in their pen approach a new object more quickly than animals raised in a stark environment[15] (*Figure 1*).

Familiarity with environment

An animal's environment will also affect its response to stressful handling. Sows wary of people produced fewer piglets as compared with sows that readily approached people.[16] Livestock accustomed to confinement in a barn with proximity to people generally have a less intense physiologic response to stress of handling than do animals raised in a pasture with little human contact[8] (*Figure 2*).

In one study, veal calves were raised in indoor stalls or in outdoor group pens.[14] When the calves reached market weight, both groups were exposed to a new indoor and outdoor environment. Calves raised indoors had higher serum glucocorticoid values when they were put in an outdoor arena. Calves raised outdoors were more highly stressed when they were put in an indoor arena. Both of the new locations were stressful to all calves, but their reactions were influenced to the greatest extent by variance from the type of environment in which they had been reared.

Reducing stress

Gentle handling reduces stress in livestock. Calves that were handled quietly in a well-designed facility had slower heart rates than calves handled roughly in a poorly-planned pen.[2]

Marketing stress can be reduced by preconditioning calves to handling procedures (*Table 1*). Animals can become so accustomed to a particular procedure that there will be no physiologic stress response. Research has shown that livestock shrink less the second time they are transported.[18] Heifers used routinely for demonstrations became accustomed to the squeeze chute[19] (*Figure 3*).

Flight zones

Cattle and sheep maintain a safe distance from perceived threats such as people and dogs. This distance is known as a flight zone (*Figure 4*). Livestock become agitated and stressed if they are cornered in a confined area, and are unable to move away when a person or dog penetrates the flight zone. A major determinant of the size of the flight zone is the animal's past experience with people and handling. Livestock raised in constant contact with people maintain a smaller flight

Figure 3. This heifer was used daily in an educational demonstration. It became so accustomed to the squeeze chute that it appeared to experience almost no stress when the gate closed around its head.

zone than animals raised with minimal human contact.

Attempts to tame an animal will reduce the size of the flight zone. Anyone approaching a wary animal should stand still and allow the animal to make the first move. Kneeling may also encourage an animal to approach a new handler (*Figure 5*).

When cattle or sheep are being moved, handlers should work at a distance approximating the edge of the flight zone.[20] As the flight zone is penetrated, the animal will move away; when the handler is no longer

Figure 4. This photo illustrates clearly the collective flight zone of a large flock of sheep. The clear area around the handler is the flight distance. The sheep circle around the handler, observing the flight zone.

TABLE 1
Techniques For Reducing Stress

- Vary the people and vehicles used when observing and feeding livestock, thus conditioning animals to irregularities in management.
- Accustom cattle to handling by people that are on horseback and on foot, to reduce stress-related injuries at marketing.
- After handling, do not rush cattle out of the corral in an uncontrolled manner. Walk them through the working chute a second time to dissociate memories of painful management practices.
- Install watering facilities in the working corral to condition animals to entering the pens.
- Newly-weaned piglets and calves should remain in their familiar pen or pasture to avoid additional stress.
- To reduce stress during artificial insemination, walk the cows through the corrals and chute a few weeks before insemination to familiarize them with the environment. If possible, use a separate chute for insemination so the cow will not associate breeding with other procedures that may be painful.
- Do not use dogs to work animals in tightly confined spaces. Dogs used to chase and nip at livestock induce stress.
- Do not lean over animals enclosed in chutes; this will cause the animal to rear in panic.
- Avoid high-pitched noises and yelling when handling cattle because they are more sensitive than people to high frequencies.[17]
- Pad steel gates with rubber stops to lessen stressful noises.
- Relocate the motor and the pump on hydraulic squeeze chutes from the top of the chute.

Figure 5. Frequent positive contact with people will reduce the size of an animal's flight zone. In this photo the handler has knelt to encourage the animals to approach.

in the flight zone, the animal will stop moving. If the flight zone is penetrated too deeply, the animal will initiate headlong flight or turn and run past the handler. To prevent further stress, the handler should retreat from inside the flight zone.

Conclusion

Reducing handling stress of animals will improve their weight gain, reproductive performance, and ability to resist disease.[4,7,13] Rough handling, agitation, and excitement during loading for transport, artificial insemination, or health-care procedures can impair the performance of animals.

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Genetic engineering—2: applications for animal health care

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GENETIC ENGINEERING technology is the major scientific revolution of the century. Rapid developments are being made, especially in veterinary medicine. Genetically engineered vaccines and monoclonal antibodies are already in the marketplace for veterinary use. Many other animal health care products are being tested.

In agriculture, genetic engineering is focusing on manipulation of organisms to produce animal vaccines, hormones, amino acids, chemicals, and drugs. These technologies will have the greatest impact on improved livestock production by: 1) reducing animal losses through prevention of infectious diseases, using effective genetically engineered vaccines and antitoxins; 2) increasing production of meat and milk through use of growth promotants; and 3) improving the nutritional values of animal feed.

The technology

Two major developments in genetic engineering, specifically recombinant DNA and monoclonal antibody technology, have been used to address problems in animal health care and production.

Recombinant DNA technology, the essence of genetic engineering, is not a single discipline; it represents a fusion of ideas and techniques from biochemistry, molecular biology, genetics, organic chemistry, immunology, and medicine. This scientific breakthrough involves restructuring and editing genetic information and constructing microorganisms with new genetic information.

The technology allows us to isolate genes from any source (viruses, bacteria, fungi, plants, or animals), and amplify these genes to unlimited quantities. It also allows us to manipulate genes by mutating or rearranging their components to develop hybrid or novel gene products.

The need

In the United States, products from the dairy and beef cattle industries account for approximately one-third of the total farm income derived from livestock.

Each year, the dairy industry increases production, providing more milk from fewer cattle. Costs of production have increased dramatically during the past decade. Therefore, the most serious challenge facing the dairy industry is not how to improve productivity, but rather how to improve efficiency of production.

In well-managed herds using existing technologies of feeding and breeding, the most serious limitation to efficient production is the presence of disease. Control of reproductive, digestive, and respiratory diseases is essential to realize maximum productivity and profitability in the dairy and beef industries.

Limitations

The American Veterinary Medical Association estimates the economic loss of livestock due to infectious diseases to be several billion dollars each year. Of the 45 million calves born annually in the United States, approximately 7% die of infectious diseases in the first six months of life. Approximately 15% of the 100 million pigs born annually die from infectious diseases within the first few months of life. These losses occur despite the availability of hundreds of vaccines, drugs,