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Perspectives on Animal Biosciences

Livestock-handling assessments to improve the welfare of cattle, pigs and sheep

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Abstract. Assessing animal welfare during handling for veterinary procedures or loading onto a truck is simpler than is assessing welfare in housing. The first step is preventing acts of abuse that everybody who is interested in animal welfare would want stopped. Acts of abuse include beating animals, poking sensitive areas, dragging downed animals, deliberate slamming of gates on animals or deliberate driving animals over the top of downed animals. The next step is to implement objective numerical scoring of animal handling. The outcome measures that should be used are percentage of animals that fall, strike fences or gates, vocalise during restraint, are miscaught in the head stanchion or are moved with electric goads. Repeating these measurements over a period of time will make it possible to determine whether practices are improving or deteriorating. Further improvements in handling can be obtained with stockmanship training. Physiological measures of stress such as cortisol, lactate or glucose are useful for assessing handling methods because handling is a short-term stressor.

Additional keywords: acclimation, cattle handling, stockmanship, stress, welfare.

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Introduction

The public has become increasingly concerned about the methods used to handle livestock during routine handling for veterinary procedures, loading trucks, selling in auctions or movement through a slaughter plant. Undercover videos of people abusing animals have shocked viewers. The present paper covers effective ways to assess and monitor livestock-handling practices. It discusses methods to improve animal handling and the detrimental effects of stressful handling practices.

Animal-welfare assessments for use in commercial animal-production units need to be simpler than assessment tools used in research. Some tools that work well for research are too complex for use by producers or commercial auditing companies. The author has trained many auditors from commercial companies and inspectors to evaluate animal handling and welfare at slaughter plants. The commercial reality is that it has to be possible to train people in a 1–2-day workshop. Standards must provide clear guidance for acceptable and unacceptable methods (Grandin 2006). They must never be vague, because vague standards will be interpreted differently by different people (Grandin 2012).

Prevent acts of animal abuse

The first step managers must take to improve animal welfare is to prevent acts of abuse during animal handling. This requires both management supervision of employees and training of employees. Acts of abuse are never acceptable. Examples of acts of abuse that should never be tolerated are dragging downed animals, throwing animals, beating, poking sensitive areas to move animals, deliberate slamming of gate on animals or deliberate running animals over the top of downed animals. The author has had discussions with both meat-plant managers and inspectors about when tapping an animal with a driving aid becomes beating. To train auditors and inspectors, a video has been produced titled *Proper use of livestock driving tools*. Access by typing the title into a search engine. An empty

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cardboard box is whacked with a plastic paddle. When the box starts crushing, tapping has progressed to beating.

Measurements of livestock handling

People manage the things that they measure. Numerical scoring systems have been developed for detecting problems during handling (Grandin 1998*a*; Maria *et al*. 2004; NCBA–BQA Feedlot Audit 2009; Welfare Quality Network 2009; Edwards *et al.* 2010; Hulgren *et al.* 2014). This makes it possible to determine whether handling has improved or become worse. The use of simple outcome-based measurements has been effective for improving animal handling at slaughter plants (Grandin 1998*a*, 2001, 2005). Large customers used a simple numerical scoring system to audit the slaughter plants they purchased beef from (Grandin 1998*a*, 2000, 2005). The five measures were as follows: (1) render 95% or more of the cattle insensible and unconscious with a single shot from a captive bolt, (2) 100% had to be insensible on the bleed rail, (3) 3% or less of the cattle vocalising (moo or bellow) in the stun box or while entering it, (4) 1% or less falling down anywhere in the facility and (5) 25% or less moved with an electric prod. Baseline data indicated that before the customer audits started, only 30% of the plants could correctly stun 95% or more of the cattle with a single shot (Grandin 1998*a*). After 4 years of customer audits, the percentage of plants that achieved this was over 90% (Grandin 2005). To pass an audit, a plant had to achieve the percentages listed above on all five measures.

Numerical scoring can also be used for evaluating handling on feedlots or ranches. It can be used to benchmark animal-handling practices and to establish baselines for acceptable practices (Woiwode *et al.* 2014, 2016*a*; Dalmau *et al.* 2016; Simon *et al.* 2016). This makes it possible to determine whether handling has improved or become worse. Scoring also enables comparisons of handling practices among different facilities. This may help motivate people to improve because they want recognition for being better than the other places.

Livestock handling-outcome measures that can be used on farms, feedlots and stockyards to assess the quality of handling

- Percentage of animals that fall during handling (Grandin 1998*a*, 2012; Welfare Quality Network 2009; NCBA–BQA Feedlot Audit 2009; Woiwode *et al.* 2014; Simon *et al.* 2016).
- Percentage of cattle or pigs that vocalised (moo, bellow or squeal) during handling and restraint). Each animal is scored as either silent or vocalising (Dunn 1990; Grandin 1998*a*, 1998*b*, 2001, 2012; Bourguet *et al.* 2011; Hemsworth *et al.* 2011; Simon *et al.* 2016).
- Percentage of animals moved with an electric goad (Grandin 1998*a*, 2012; Hemsworth *et al.* 2011; Woiwode *et al.* 2014; OIE 2016; Simon *et al.* 2016).
- Percentage of animals running when they exit the squeeze chute (NCBA–BQA Feedlot Audit 2009; Woiwode *et al.* 2014; Barnhardt 2015).
- Percentage of animals caught in the wrong position in the squeeze chute – score as miscaught if the head stanchion catches an animal around the jaw, a leg is caught in the head stanchion or the head stanchion catches the animal around its body or shoulder (NCBA–BQA Feedlot Audit 2009; Woiwode *et al.* 2014; Simon *et al.* 2016).

Additional measures that are useful for detecting problems with handling facilities

- Percentage of animals refusing to move forward balking (Grandin 2001; Welfare Quality Network 2009).
- Percentage of animals turning back during handling (Welfare Quality Network 2009).
- Percentage of animals backing up in a single file race.
- Percentage of animals that jam in a race entrance (Edwards *et al.* 2010).

Surveys of feedlot and ranch cattle handling

Two surveys that used numerical scoring of handling indicated that large feedlots in the US have improved cattle handling (Woiwode *et al*. 2014, 2016*a*; Barnhardt 2015; Table 1). These researchers assessed cattle handling practices in 28 and 56 feedlots in Kansas, Colorado, and Nebraska with the NCBA–BQA Feedlot Assessment (2009). Handling was evaluated while cattle were being handled in a squeeze chute for vaccinations and ear-tagging. Both surveys had very similar results. In the two surveys, the average percentage of cattle falling when exiting the squeeze chute was under 1%, vocalisation in the squeeze chute was under 3%, and electric prods were used on 4% or less of the cattle. The results of a survey on 30 California cow–calf ranches showed that usage of electric prods to move cattle was much higher than with the feedlot data. The mean was 23% of the animals moved with an electric prod and the range was 0–73% (Simon *et al.* 2016). The reduced electric-prod usage in the large feedlots may be due to an increased emphasis on training feedlot employees in beef-quality improvement procedures (BQA). The NCBA–BQA (NCBA–BQA Feedlot Assessment 2009) program emphasises both cattle handling and proper injection methods to prevent damage to the meat. Injections in the muscle will damage the meat (George *et al.* 1995). Meat packers have put increasing pressure on cattle feeders to improve their practices. BQA training did improve the operation of squeeze chutes on ranches. Ranches where BQA training was implemented had a 45% reduction in cattle miscaught in the wrong position in the headgate (Simon *et al.* 2016). An animal was scored as miscaught if it was caught across the jaws in the headgate or a leg or shoulder was stuck in the headgate.

Vocalisation in the squeeze chute

Vocalisation of cattle during handling in a squeeze chute or other restraint device is a good measure of animal-welfare problems

Table 1. Measurement of cattle-handling practices

Parameter	28 feedlots Woiwode *et al.* (2014, 2016*a*)		30 ranches Simon *et al.* (2016)	
	Mean	Worst score	Mean	Worst score
Electric-prod use (% of cattle)	3.6	45	23	73
Vocalisation during catching in squeeze chute (% of cattle)	1.4	6	5.2	20

during handling, because it is associated with obvious aversive events such as electric-prod use or excessive pressure applied by a restraint device (Grandin 1998*b*; Bourguet *et al.* 2011; Hemsworth *et al.* 2011). Reducing the pressure applied by a head restraint reduced the percentage of cattle vocalising from 23% to 0% (Grandin 2001). In the three handling surveys conducted by Woiwode *et al*. (2014), Barnhardt (2015) and Simon *et al*. (2016), each animal was scored as either silent or vocalising in the squeeze chute. Vocalisations that occurred after a procedure was started, such as branding ear-tagging or injections, were not counted.

The ranch survey showed that ranchers that used a hydraulic squeeze chute had a 66% increase in vocalisations compared with ranches with manually operated squeeze chutes (Simon *et al.* 2016). The average vocalisation score for both hydraulic and manual chutes combined was 5.2% with a range of 0–20% (Simon *et al.* 2016). Unfortunately, they did not have separate means for hydraulic and manual squeeze chutes. All the feedlots in Woiwode *et al.* (2014) used hydraulic squeeze chutes. The average vocalisation score was only 1.4%, with a range of 0–6% (Woiwode *et al.* 2014). Cattle that vocalised during handling were more likely to run out of the squeeze chute and had lower average daily gain (Woiwode *et al.* 2016*b*). Possibly BQA training or other stockmanship classes may have bought management's attention to limiting squeeze chute pressure.

Good stockmanship is important

Many studies have shown the benefits of improving stockmanship. People who like animals and have a positive attitude will have more productive animals (Hemsworth *et al.* 2000; Waiblinger *et al.* 2002; Hemsworth and Coleman 2010; Kauppinen *et al.* 2012; Rushen and dePassille 2014). A recent study by Fukasawa *et al*. (2016) also showed that positive attitudes towards dairy cows improved milk yield.

Aversive treatment of young pigs resulted in both lower pregnancy rates in females and smaller testicles in males (Hemsworth *et al.* 1986). Yelling and screaming at animals is stressful (Pajor *et al.* 2003). Hemsworth *et al*. (2011) found that yelling raises cortisol but normal talking has no effect. When cattle are handled quietly, they will have lower plasma cortisol than do cattle that are handled roughly (Petherick *et al.* 2009). Serum cortisol concentrations were lower after Nelore cattle were handled calmly and electric prods were removed (Lima *et al.* 2016).

The author recently visited a feedlot where cattle were handled for vaccinations with 0% electric goads and 0% of the cattle falling. The employees were silent and never yelled at cattle. Re-positioning of one employee in a different position alongside the race, and stopping constant waving of his flag driving aid resulted in quieter cattle and less banging or clanging in the metal races. The entire room became noticeably quieter.

Use of physiological measures to evaluate handling practices

Handling procedures, such as vaccinations, loading trucks and movement through a slaughter plant, take a short period of time. For short-term stressors such as handling, physiological measures of stress may be really useful if the blood is sampled shortly after handling. Physiological measures can easily show differences between low-stress and high-stress handling (Edwards *et al.* 2010; Brandt and Aaslying 2015). At the slaughter plant, when pigs and cattle were moved with electric prods or jammed in the race that leads to the stunner, lactate and glucose concentrations are higher (Edwards *et al.* 2010; Gruber *et al.* 2010). Edwards *et al.* (2010) measured blood lactate in pigs and Gruber *et al*. (2010) measured plasma lactate and plasma glucose in cattle. Benjamin *et al.* (2001) found that both glucose and blood lactate were doubled or tripled immediately after aggressive handling with multiple shocks from an electric prod, compared with calm handling with no prods. When fattened finished feedlot cattle with heavy back fat are forced to run, both plasma lactate and serum cortisol were significantly higher (Frese *et al.* 2016). In cattle, vocalisation (moo or bellow) during handling and restraint is associated with higher cortisol concentration (Dunn 1990; Hemsworth *et al.* 2011). Blood samples were collected after slaughter. Cattle that were handled with good handling practices in the corral had lower plasma cortisol concentration (Petherick *et al.* 2009). For long-term stressors such as comparing the effects of different housing system, physiological measures may be less useful.

Benefits of acclimating animals to handling

An animal's previous experience with handling and restraint will also have an effect on stress levels (Grandin 1997; Grandin and Shivley 2015). Two early studies showed the benefits of training weaners and young cattle to handling procedures. Training produced calmer adult cattle (Binstead 1977; Fordyce 1987). Numerous studies have shown that animals can be acclimated to handling or transport. Ceballos *et al*. (2016) found that cattle that were frequently moved among pastures for rotational grazing had lower flight speed scores out of the squeeze chute, and improved temperament. Another study showed that the first trip on a truck was more stressful than were subsequent trips (Stockman *et al.* 2012). Beef heifers that were carefully acclimated to being moved through a race before artificial insemination had better conception rates (Cooke *et al.* 2009, 2012). Animals can be acclimated to the point where they will voluntarily enter a restraint device for a feed rewards (Grandin 1989). Acclimated animals will have lower plasma cortisol concentrations (Petherick *et al.* 2009). Hutson (1985) found that providing sheep with barley feed rewards when they exited the handling race made them more willing to move through the race in the future.

Acclimating dairy heifers to positive contact with people before calving improves milk letdown, reduces kicking during milking and less time is required to milk them (Bertenshaw *et al.* 2008). In another study, heifers were acclimated to moving through the milking parlor for four sessions before calving (Sutherland and Huddart 2012). During the first eight months of lactation, acclimated heifers had higher milk-flow rates and shorter milking duration. There was an interaction with heifer temperament on both physiological and behavioural responses (Sutherland and Huddart 2012). In buffalos, acclimation to the milking parlor reduced kicking and restless stepping (Polikarpus *et al.* 2014). The latest study conducted at five farms showed that a practice session going through the parlor 10 days before calving

reduces kicking and restless stepping during milking in dairy heifers (Kutzer *et al.* 2015). Training also reduces the probability that cows would have their ears pinned back, tails clamped or be wide-eyed during milking (Kutzer *et al.* 2015).

Acclimating pigs to contact with people and moving them through the alleys makes them easier to move (Abbott *et al*. 1997; Geverink *et al*. (1998). Walking through pens of fattening pigs improves ease of handling at the slaughter plant (Transport Quality Assurance 2010).

Animals remember aversive experiences

Aversive handling experiences may make animals more difficult to handle and less willing to move through a handling system in the future (Grandin 1993; Hutson and Grandin 2014). Sheep are known to remember an aversive experience of being inverted in a restraint device (Rushen 1986). Grandin (1993) reported that cattle that were accidentally caught around the head by a head stanchion were more likely to refuse to put their heads through it when handled 30 days later. Electrical immobilisation is extremely aversive. Cows that were electrically immobilised had higher heart rates when they approached a stanchion where they had previously been immobilised (Pascoe 1986). When given a choice between electro-immobilisation or a tilt table, sheep preferred the tilt table (Grandin *et al.* 1986). Most international guidelines forbid electrical immobilisation (AVMA 2013; OIE 2016). Unfortunately, it is still used in some places.

Conclusions

Animal handling is affected by previous experiences. Carefully acclimating cattle or pigs to handling procedures will make them easier to move in the future. Stressful handling practices are detrimental to both animal welfare and production. The use of numerical scoring can help maintain the quality of handing because people manage the things they measure. Large feedlots where more attention has been paid to handling and animal welfare had lower usage of electric prods and fewer cattle vocalisations in the squeeze chute than did cow–calf ranches.

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