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Developing measures to audit welfare of cattle and pigs at slaughter

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Abstract

Since 1999, animal welfare auditing programmes that utilise five numerically scored core criteria have been used successfully by major restaurant chains to monitor animal welfare in slaughter plants. They had to achieve specific numerical scores in order to remain on the approved supplier list. The five numerically scored criteria (critical control points) are: i) Percentage of animals that fall down during handling; ii) Percentage of animals moved with an electric prod; iii) Percentage of cattle or pigs vocalising in the stunning box or restrainer; iv) Percentage of animals stunned effectively with one application of the stunner; and v) Percentage rendered insensible when hoisted to the bleed rail (has to be 100% to pass the audit). Audit data collected in 2010 by two restaurant companies in 30 beef plants, indicated that 77% of them effectively stunned 100 to 99% of the cattle with a single shot from a captive-bolt gun. All 30 plants passed the audit, which required 95% of more of the cattle stunned with one shot. In eight pork plants with electric stunning, the tongs were placed correctly on 100% of the pigs held in a V-conveyor restrainer. In 95% of the beef plants, and 86% of 25 pork plants, 0% of the animals fell during unloading, movement in the lairage and during handling in the stunning area. In 81% of the beef plants and 77% of the pork plants, 5% or less of the animals were moved with an electric prod. The percentage of cattle vocalising in the stun box and during movement into the stun box was 3% or less in all the plants except one. All scores are per animal, an animal is stunned correctly in the first shot, or not stunned correctly. It either vocalises or it is silent. A passing score is required on all five of the numerically scored core criteria. Due to financial and time constrains, the same auditor assesses both welfare and food safety. Workshops for training auditors last 1.5 days and include two plant visits.

Keywords: *animal welfare, audits, cattle, pigs, slaughter, stunning*

Introduction

Welfare audits of handling and stunning practices in US beef and pork slaughter plants have been conducted by McDonald's Corporation and Wendy's International since 1999. The trend in animal welfare auditing is to use outcome measures (Wray *et al* 2003; Welfare Quality® 2009). The audit has five numerically scored items that are all critical control points or core criteria. A good critical control point measures multiple problems. For example, poor captive-bolt stunning can be caused by many factors such as poor stunner maintenance, agitated animals or poorly trained people (Grandin 2001a). Vocalisation is associated with electric prod use, excessive pressure from a restraint device, stunning problems or slipping on the floor (Grandin 1998a, 2001b). Falling can be caused by a slippery floor, or excessive electric prod use that causes an animal to become highly agitated.

This auditing system uses the same approach as the Hazard Analysis Critical Control Point (HACCP) approach in food safety. The principle is to use a few outcome measures that can detect a variety of problems. Some welfare specialists may object that a welfare audit that formally evaluates just a few points is not complete. In the food industry, there are many practical constraints on both the time that can be devoted to conduct a welfare audit and the amount of time that can be spent training the auditors. To keep auditing costs reasonable, the same auditor can conduct both the food safety audits and the animal welfare audits for the restaurant companies. When the McDonald's and Wendy's programmes first started in 1999, the auditors worked for the companies that provided the hamburger patties. Since some customers viewed this as a conflict of interest, the restaurants gradually switched to third-party auditing companies. By 2005, programmes using third-party auditing firms were implemented. Today, every plant that supplies McDonald's or Wendy's gets a minimum of a yearly third-party audit. Over a ten-year period, the programme has become increasingly formalised. The objective of this paper is to describe the auditing programme and present data from both the last ten years of auditing and baseline data that were collected before the restaurant audit started.

Materials and methods

Description of the audit

The audit system is based on five numerically scored core criteria that are fully described in Grandin (1998b, 2010a,b). It is a voluntary welfare standard, which was developed by the author for the American Meat Institute. The introduction of this document emphasises the importance of managing things you measure. It has been adopted by many large meat-buying customers. This audit does not evaluate the advantages or disadvantages of different stunning methods. The audit evaluates whether or not a stunning method was applied correctly with one attempt and resulted in insensibility: i) Percentage of animals that fall down in any location in the plant. This includes the unloading area, lairage, and stunning race/box. This also includes ritual slaughter restraint devices. Devices that are designed to cause a conscious animal to fall are an automatic audit failure. A fall is scored if the animal's body touches the floor. ii) Percentage of animals moved with an electric prod (goad). Score use of the electrical prod if the electrical device contacts the animal. It is too difficult to determine if the animal was shocked so all touches are counted. iii) Percentage of cattle or pigs vocalising in the stunning area. All cattle and pigs that vocalise in the stun box or restrainer are counted. All vocalisation scores are per animal. If an individual animal vocalises (moos, bellows, squeals) more than once, it is counted as a single animal. Vocalisation is not scored in the lairage. Vocalisation scoring in pigs is more difficult because it is hard to determine which pigs are squealing and which pigs are silent. To solve this problem, only pig squeals in the stun box, restrainer or while entering the CO_2 gondola were scored. Data for vocalisation of pigs in the earlier years are not available because a less accurate room vocalisation method was used up until 2007. (iv) Percentage of animals stunned effectively with one application of a captive bolt or the percentage of animals where an electric stunner is placed in the correct position to pass an electric current through the brain. (v) Percentage of animals rendered completely insensible before hoisting to the bleed rail.

The five numerically scored criteria are scored on a yes/no basis. For example, an animal is either silent or it vocalises, it falls or does not fall. There are also five acts of abuse, which would be an automatic audit failure. Acts of abuse are not limited to this list.

- Dragging downed non-ambulatory animals;
- Beating an animal;
- Poking sensitive areas such as the eyes, nose, anus, or udder;
- Deliberately driving animals over the top of other animals;
- Deliberately slamming gates on animals.

Scoring the audit

Passing or failing of the audit is determined by scoring events that are directly observable by an auditor or inspector. To pass an audit, the following minimum scores are required on all five numerically scored items.

Minimum passing scores

Falling

One percent or less anywhere in the facility. A fall is scored when body touches the floor.

Electric prod use

Twenty-five percent or less of the cattle or pigs moved with an electric prod. An excellent score for cattle and pigs is 5%.

Vocalisation

When no head holder is used, 3% or less of the cattle vocalising in the stun box or while entering the stun box. If there is a head holder, 5%. Pigs: 5% in the restrainer, stun box or stunning pen.

Stunning

Ninety-five percent insensible with one shot captive bolt. Ninety-nine percent correct placement of electric stunner and 1% or less hot wanded. Hot wanding occurs when the pig squeals when the electric stunner is applied. This occurs if the wand or tong is energised before it is in full contact with the pig's head. The stunning score is omitted for CO_2 stunning.

Insensibility

After hoisting to the bleed rail. Must be 100% for 100 animals or during one hour audit.

Determining scores in very small plants

In plants where an hour's worth of production is less than 25 animals, the sample is too small to determine percentages. When a very small number, such as ten animals are observed, the following criteria are used. Insensibility must be 100%. On the other items, one mistake is allowed, such as one fall or one missed stun. They must get a perfect score on three out of four of the critical control points of stunning, falling, vocalisation, or electric prod use. None of the McDonald's or Wendy's audits were conducted in plants this small.

Training of slaughter welfare auditors

When the programme started, all the auditors were trained in workshops that usually lasted for 1.5 days. During training, the auditors visited a beef and pork plant and they were shown how to do the numerical scoring. The training materials were the AMI Guidelines (Grandin 1997a, 2010a). After they were trained, they had to go to three more plants with an experienced auditor before they carried out welfare audits by themselves. In the early years, the author conducted training. Today, training is done by an industry sponsored group called PAACO (Professional Animal Auditor Certification Organization). The course is taught by four instructors from the meat industry. The author is one of the instructors. During this day and-a-half PAACO workshop, the auditors visit a pork and beef plant and have five hours of classroom instruction. At the end of the workshop, they take a closed-book multiple-choice exam on the AMI Guidelines. Before they can be certified, they have to do three additional audits with a highly experienced auditor. They have a total of five plant visits before they can be certified. The experienced auditor fills out an evaluation

during each one of these three additional 'shadow' audits. To maintain the status of being a certified PAACO auditor, auditors are required to attend one conference each year, which covers animal welfare topics. They can attend either industry conferences or conferences of animal science or veterinary associations.

Time constraints and sampling methods

To keep costs reasonable, the auditor either scores 100 animals for each critical control point or one hour of production. In most small plants of under 50 animals, per hour, the auditor can usually audit all the variables simultaneously while remaining in one area. In larger plants, depending on how the plant is constructed, two groups of 100 are scored. One group is scored for insensibility and the other group is scored for stunning, vocalisation, falls, and electric prod use. In many plants, it is easy to observe stunning and handling at the same time. Shortly after the audits started in 1999, most plants banned electric prods in the lairage (stockyards) and crowd pen so it is easy to observe the single electric prod that is used at the stun box or restrainer entrance. In huge plants with line speeds of over 250 per hour, three groups of 100 are scored to collect the data. The locations are: bleed area for insensibility; stun box platform; and lead-up chute/race. In most of these huge plants, handling is not visible from the stunner's station. Auditors are instructed to walk through the lairage to verify that electric prods are not being used there. Auditors are also instructed to find places to stand where they will not be seen by approaching animals.

Results and discussion

Baseline data collected in 1996 before the restaurant audits started indicated that only 30% of the beef plants could stun 95% of the cattle with a single shot from a captive bolt (Grandin 1997b, 1998b). In 2010, all 32 audited beef plants achieved this standard (Table 1). Vocalisation (bellows, moos, and squeals) are associated with physiological measures of stress (Dunn 1990; Warriss *et al* 1994; White *et al* 1995). Baseline data indicated that the worst plant had 32% of the cattle vocalising either in the stun box/restrainer or while entering it (Table 2). Data collected in a French plant that had made no improvements indicated that 25% of the cattle vocalised during handling (Bourquet *et al* 2011). In 2010, data collected from 32 audited beef plants indicated that the highest percentage of cattle vocalising was reduced to 5%. Falling during handling and electric prod (goad) use was also greatly reduced since the audits started. The audits have resulted in great improvements because plants that do not improve are removed from the approved supplier list.

Falling

In 2010, out of 32 plants, 0% of the cattle fell in 30 plants (94%) (Table 3). In 2010, zero percent of the pigs fell in 19 out of 22 plants (Table 4). The worst pork plant and the worst beef plant had 2% of the animals falling in 2010.

Table 1 Percentage of beef plants with an acceptable score of 95% or more of cattle rendered insensible with a single shot.

Date	Number of plants	Percent of plants passing	Number of plants passing
1996 baseline	10	30%	3
2000[1]	49	90%	44
2005[1]	42	100%	42
2010[2]	30	100%	30

[1] No head holding devices were used in 1996, 2000 or 2005 for conventional slaughter.
[2] Two plants were kosher.

Table 2 Percentage of beef plants where 3% or less of the cattle vocalised in the stun box/restrainer or while entering the stun box/restrainer.

Date	Number of plants	Percent of plants passing	Number of plants passing
1996 baseline[1]	7	43%	3
2000	49	80%	39
2005	43	91%	39
2010	32[2]	97%	31

[1] The worst plant in 1996 had 32% of the cattle vocalising due to a poorly designed kosher restraint chute, which was too short for large cattle.
[2] Two kosher plants in the 2010 sample had an upright restrainer. There was a 2% vocalisation score in one plant and a 1% vocalisation score in the other. The worst plant in the entire sample had a 5% vocalisation score.

Table 3 Percentage of beef plants where 1% or less of the cattle fell down either during unloading or handling in the stunning area.

Date	Number of plants	Percent of plants passing	Number of plants passing
1996[1] baseline	5	80%	4
2000		Data not collected	
2005[2]	43	98%	42
2010[3]	32	94%	30

[1] One plant: 8% cattle fell down in stun box.
[2] 2005 The worst plant: 12% falling.
[3] 2010 Worst plant: 2% fell. Thirty plants had 0% falls.

Table 4 Percentage of pork plants where 1% or less of the pigs fell down, either at unloading or during handling in the stunning area.

Date	Number of plants	Percent of plants passing	Number of plants passing
1996 baseline	1	n/a	1
2000		Data not collected	
2005[1]	28	93%	26
2010[2]	22	86%	19

[1] In 2005, two plants had 2% of the pigs fall.
[2] In 2010, zero percent fell in 19 plants and the worst plant had 2%.

Table 5 Percentage of pork plants where 5% or less of the pigs were moved with an electric prod at the restrainer or CO_2 system entrance.

Date	Number of plants	Percent of plants at 5%	Number of plants at 5%
1996[1] baseline	4	0[1]	0
2000		Data not collected	
2005[2]	28	36%	10
2010[3]	22	77%	17

[1] The worst plant had 80% pigs prodded in the crowd pen and 28% prodded in the single file race.
[2] No prods in the crowd pen or yards.
[3] Many group CO_2 systems installed since 2005, which eliminated electric prods in 11 plants. Fourteen plants had group CO_2 stunning. The worst five plants used electric prods in 7, 11, 12, 21 and 23% of the pigs. Four out of five of the worst plants had single-file chutes (races).

Table 6 Percentage of beef plants where 5% or less of the cattle were moved with an electric prod at the stun box or restrainer entrance.

Date	Number of plants	Percent of plants at 5% level[1]	Number of plants at 5% level[1]
1996 baseline	4	25%	1
2000	49	55%	27
2005	43	74%	32
2010[2]	32	81%	26

[1] The 5% score is at the excellent level on the AMI audit. To pass, 25% of the animals prodded with an electric prod is allowed.
[2] Six plants had prod scores that varied from 6 to 16%.

Electric prod use

Tables 5 and 6 show that in 2010, 77% of the pork plants and 81% of the beef plants could achieve an electric prod score of 5% or less of the cattle. The voluntary standard allows 25% for cattle. For pigs, the voluntary standard in 25% for plants that have a single-file chute and 5% for group CO_2 systems (Grandin 2010a). In the early years of the programme, the percentage of beef plants that achieved the 25% standard was 67% (1999), 76% (2000), 76% (2011), and 82% (2002) (Grandin 2005). In 2010, all the beef and pork plants achieved the industry standard of 25% or less (Tables 5 and 6). Data were also averaged for line speed in beef plants. The average electric prod scores for data collected in 1999, 2000, 2001, and 2002 was under 50 cattle per hour: 19.9%, 51 to 100 cattle per hour: 27%, 101 to 200 cattle per hour: 12.5%, and 201 to 300 cattle per hour: 24.1%. In 2010, the two worst pork plants used electric prods on 21 and 23% of the pigs. One reason why the electric prod standard has not been made stricter is that people start abusing animals with non-electric driving aids when they try to totally eliminate electric prods at the entrance to the stun box or restrainer. However, in the future, a reduction in the limits for this parameter and attempts to address the negative effects of alternatives to electric prod, by means of studies, could be considered.

Vocalisation

The data collected during the last 10 years for vocalisation in cattle, either in the stun box or restrainer, or while entering the stun box or restrainer are shown in Table 2. In 1999, the average percentage of cattle vocalising in 22 beef plants was 3.08%. The range was 0.66 to 17% (Grandin 2000). Average vocalisation percentages for compiled data from 1999, 2000, 2001, and 2002 was stun boxes: 2.5%, centre-track conveyor restrainers: 1.1%, and V-conveyor restrainers: 2.5% (Grandin 2005). The line speed in most of the plants with stun boxes was slower than the plants with conveyor restrainers. All the conveyer restrainer plants processed over 200 cattle per hour. Vocalisation in cattle was associated with either equipment problems or an obvious aversive event such as electric prod use, excessive pressure from a restraint device, or sharp edges on a restraint device (Grandin 2001b).

In 2010, ten pork plants were audited. All of the pigs on a 100-head audit had a vocalisation score of 5% or less with the exception of one CO_2 plant with a score of 8%. The other scores ranged from 0 to 5%. Five of the pork plants used cardiac arrest head to back stunning in a V-conveyor restrainer and five plants had a CO_2 back-loader machines with group handling. To be scored as squealing, a pig's rear end had to be past the restrainer entrance. Only ten pork plants could be scored for vocalisation because one of the restaurant companies still uses the less accurate room scoring method. This older method works well within a plant but should not be used to compare vocalisation between plants because different plants have different numbers of pigs in the stunning room.

Stunning

Grandin (2005) showed that the average stunning scores over a four-year period from 1999 through 2002, was 97.2% for stun boxes with no head holder, 97.0% for V-restrainer, and 97.1% for centre-track restrainer. Plants with a variety of line speeds were able to attain this standard (Grandin 2005). The effect of line speed on beef stunning was as follows. Under 50 cattle per hour: 96.2%, 51 to 100 per hour: 98.9%, 101 to 200 per hour: 97.4% and over 200 per hour: 96.7% (Grandin 2005).

For pigs, the electric stunner was placed correctly on 100% of the pigs in 24 different plants in 2005. The plants used either a head to back or head to body cardiac arrest electric stunner. All the electrically stunned pigs were held in a V-conveyor restrainer. In 2010, only eight plants with electric stunning were audited because many plants had switched to CO_2 (Table 7). All eight plants passed. A minimum of 100 pigs were scored for stunning and insensibility in each plant. In conclusion, for both beef and pork, the plants could easily achieve the minimal standard.

Insensibility

Tables 8 and 9 clearly show that 100% of the plants can easily achieve an insensibility score of 100% in both cattle and pigs. In earlier years, the most common cause of return to sensibility in head to back cardiac-arrested electrically stunned pigs was poor bleeding or wrong stunner placement (Grandin 2001a). This problem was corrected by using larger knives for bleeding to create a larger bloodstream. Audit data has also been collected in plants that have the Butina back-loader CO_2 machine. In this machine, the pigs are handled in groups and the single-file chute (race) has been eliminated. Compared to smaller CO_2 machines, return to sensibility has been almost completely eliminated. The author conducted auditor training in plants that have these large machines. Unless there is a major malfunction, return to sensibility problems were abolished. In 2010, fourteen plants with two large Butina back-loader CO_2 machines were audited. All the plants rendered 100% of the pigs insensible. In smaller machines, return to sensibility can be a significant problem if the time exposed to the gas is shorter (Velarde *et al* 2000).

Modifications required to achieve a pass score

To pass the audits, management implemented intensive programmes of employee training. In most plants, the plant's quality assurance staff started carrying out weekly scoring to ensure that they would be able to pass an audit. During the last ten years, only two beef plants had to purchase major pieces of equipment in order to pass their audits. All the other beef plants made simple changes such as non-slip stun-box floors, changes in lighting, adding solid sides on chutes and installing shields so approaching cattle do not see people up ahead (Grandin 1996). In 2010, over half the beef plants had older facilities and they did not have modern curved chutes. To improve captive-bolt stunning, most beef plants improved stunner maintenance. Storing cartridges in a dry location helps to prevent poor stunning due to underpowered 'soft shots' (Grandin 2002). Three beef plants were removed from the approved supplier list in the early part of the programme, and all three were put back on the approved supplier list after they acquired new managers. One of these plants did have to buy expensive equipment to enable them to pass their audits. The improvements in scores made over the ten-year period in most of the plants was due to the plants becoming better and was not due to removal of many plants from the approved supplier lists. The reduction in the number of plants over the years was due to consolidation in the industry and not to removal from approved supplier lists.

Many older pork plants were able to pass their audits after making a series of simple improvements. In pork, the industry was going through a major conversion from electrical stunning where the pigs were handled in single-file chutes (races) to CO_2 systems with group handling. They did this primarily to prevent broken backs and blood spotting in heavy, fast-growing pigs. Conversion to CO_2 definitely lowered electric prod scores because pigs are handled in groups. In 2010, eleven out of fourteen plants with group CO_2 machines had 0% electric prod use. The worst CO_2 plant was 12%. These figures definitely support a 5% electric prod cut-off for group CO_2 systems. The reason why the standard was not lowered to 0% was due to some members on the welfare committee coming from plants that failed to achieve 0% electric prod scores.

Table 7 Percentage of pork plants where the electric stunner was placed correctly on 99% or more of the pigs.

Date	Number of plants	Percent of plants passing	Number of plants passing
1996 baseline	9	67%	6
2000	19	89%	17
2005	24	100%	24
2010	8[1]	100%	8

[1] The number of large plants using electrical stunning decreased due to installation of many CO_2 stunning units.

Table 8 Percentage of beef plants rendering 100% of the cattle insensible before they were hoisted to the rail.

Date	Number of plants	Percent of plants passing	Number of plants passing
1996 baseline	10	90%	9
2000	49	96%	47
2005	43	100%	43
2010	32	100%	32

Table 9 Percentage of pork plants rendering 100% of the pigs insensible before they were hoisted to the rail.

Date	Number of plants	Percent of plants passing	Number of plants passing
1996 baseline	9	89%	8
2000	19[1]	84%	16
2005	28	89%	25
2010	22	100%	22

[1] Three pigs with spontaneous natural blinking.

Factors making the programme successful

The standard was developed before animal welfare had become a major industry issue. The meat industry allowed the author to write and publish the standard in 1997 (Grandin 1997b). In 1999, McDonald's and Wendy's implemented the programme very rapidly. At first, the food safety auditors were sceptical, but when they started doing the scoring, they saw big improvements. The scoring system also worked because it was totally objective (except in the case of the limits, of course). When the author started doing the initial audits, both the plant manager and a restaurant auditor were beside her. The plant was able to either achieve passing numbers or not. Most plants were able to achieve passing scores without having to invest in capital improve-

ments. The three plants that had to make capital improvements did the following. A pork plant, which had 1,000 pigs per hour running on a single CO_2 machine, had to install a second machine. Two beef plants processing 300 cattle per hour had to convert from a V-conveyor restrainer to a centre-track conveyor restrainer.

Information for slaughter-plant managers to fix problems

Plant management has several sources of information to help them improve their operations. When there is failure of an audit, the auditor writes in the comment section why they failed. For example, if they did not pass on stunning, a typical auditor comment would be that the stunner was broken and poorly maintained. *The American Meat Institute Guidelines* contain guides for solving problems and equipment recommendations. Other sources of information are the annual welfare conference that is sponsored by the American Meat Institute, industry consultants, and websites such as www.grandin.com and www.animalhandling.org. Plant managers also receive guidance form restaurant company buyers.

Conclusion

Numerical scoring that utilises outcome-based measures has been successfully used by large beef and pork buyers to improve animal welfare in slaughter plants. However, after 15 years, some of the cut-off points could need revision to continue improving the quality of the plants. The scoring system also worked because it was numerical and totally objective.

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