Special Report: Maintenance of good animal welfare standards in beef slaughter plants by use of auditing programs

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The public has become increasingly concerned poor about farm animal welfare. Although all veterinarians do not work with farm animals, it is important that all can answer questions on that subject from their clients or others. One area of concern is how animals are treated at slaughter plants. Many people are not aware that restaurant companies have been auditing animal welfare in slaughter plants since 1999. This has resulted in great improvements in cattle handling and stunning. The McDonald's Corporation started their animal welfare auditing program in 1999. Wendy's International and Burger King Corporation began their programs in 2000 and 2001, respectively. The author worked with all 3 companies on the implementation of their programs.

Restaurant companies use their own auditors (who visit the plants routinely for food safety audits) to perform their welfare audits. During the last 5 years, the author has worked with McDonald's Corporation, Burger King Corporation, and Wendy's International to train food-safety auditors to score each slaughter plant for animal welfare by use of an objective numerical scoring system. Instead of relying on a subjective assessment, the auditor counts the percentage of cattle that was correctly stunned with 1 shot, percentage moved with an electric prod, and percentage that vocalized (moo or bellow) during handling and stunning. Vocalization is associated with blood cortisol concentrations in cattle. A previous study revealed that 98% of the cattle that vocalized during handling and stunning in a slaughter plant had vocalizations that were associated with an obvious aversive event, such as nonfatal attempts at stunning, slipping, use of electric prods, contact with sharp metal edges, or excessive pressure from a restraint device.

Prior to the start of the audits in 1999, conditions in beef slaughter plants were poor. A survey conducted for the USDA in 1996 indicated that only 3 of 10 plants were able to correctly stun 95% of the cattle with a single shot, which is an industry guideline for animal welfare. In 1999, the percentage of beef plants that could attain this score rose to 90%. The main cause of poor stunning prior to 1999 was failure of slaughter plants to perform factory-specified maintenance on stunners. Only approximately half of the plants maintained and operated their equipment correctly. In some plants, there was little or no supervision of the employees who stunned cattle.
When the first audits started in 1999, they resulted in plant management personnel making cattle welfare a priority. Many plant managers have now implemented their own internal self audits, which occurred after McDonald's Corporation removed a major beef plant from its approved suppliers list in 1999. The purpose of this report was to review 4 years of animal welfare audit data to determine whether improvements in cattle welfare have been maintained since 1999.

**Materials and Methods**

Beef slaughter-plant audit data from McDonald's Corp, Burger King Corp, Wendy's International, and authors were compiled. All auditors were trained by the author at a minimum of 3 slaughter plants each. The auditors had academic degrees in either food science or animal science and were all trained and experienced food safety auditors in beef and pork slaughter plants. The data were collected during 1999, 2000, 2001, and 2002. During the first 2 years, data were collected by McDonald's auditors in 49 beef plants in 12 states. Forty-one plants were audited during 1999 and 49 plants during 2000. During each of the next 2 years, data were collected in 57 beef plants in 17 states during visits by auditors from McDonald's Corporation, Wendy's International, Burger King Corporation, or the author. Overall, 66 different plants were audited during the 4-year period. Some plants were not audited every year because of plant closings, removal from approved suppliers lists, or scheduling problems. There were 28 (42%) beef-fed slaughter plants and 38 (58%) plants that processed cull beef cows or old Holstein dairy cows and bulls. The audited plants constitute approximately 90% of the large and medium-sized slaughter plants in the United States.

Data collected during 1999 (41 audits) and 2000 (49 audits) were from a single audit in each slaughter plant. Data collected during 2001 (79 audits) and 2002 (97 audits) consisted of a single audit or multiple audits of each slaughter plant. The slaughter plants were scored on certain variables. The percentage of cattle stunned correctly (ie, no signs of return to sensibility) with the first attempt was recorded. The percentage of cattle moved with an electric prod and the percentage of cattle that vocalized during handling and stunning were also recorded. In plants that had >1 audit/year, mean data were calculated so that each plant would be evenly represented. During each visit, each plant was also classified as either passing the insensibility audit (i.e., 100% of the cattle rendered completely insensible prior to hoisting on the bleed rail) or failing the insensibility audit. A plant failed on insensibility if any sign of return to sensibility after hoisting, such as eye reflexes, blinking, breathing, or a righting reflex, was observed. Stunning scores and insensibility data were not recorded in 3 kosher plants, although the kosher plants were evaluated for electric prod use and vocalization. Each animal was scored on a yes or no basis for each variable. Stunning and insensibility data were not collected in the kosher plants because slaughter was performed without stunning. Insensibility is not instantaneous after kosher slaughter.

An animal was scored as a vocalizer if it made any vocal sound when it was in the stunning box, restrainer, or lead-up chute leading to the stunning box. Vocalizations of cattle standing
undisturbed in the yards were not counted. The animal was scored as moved by an electric prod if it was touched with an electric prod because it was difficult to determine when a shock was given. Balking and cattle refusing to enter the stunning box or restrainer were subjectively evaluated by noting animals that backed up frequently in the chute.

Each slaughter plant was classified as either a beef-fed plant or a cow-bull plant and placed in 1 of 5 line-speed categories of < 50 cattle/h, 51 to 100 cattle/h, 101 to 200 cattle/h, 201 to 300 cattle/h, and > 300 cattle/h. Slaughter plants were also classified into 3 equipment types regarding the manner of holding the animal during stunning, including conventional stun boxes that held only 1 animal, a centertrack conveyor restrainer, and a V-conveyor restrainer. In the older V-conveyor restrainer system, the cattle are held between 2 moving conveyors that form a V, and in the more modern center-track restrainer, the cattle straddle a moving conveyor.

None of the nonkosher beef slaughter plants used a head restraint device to hold the head during stunning. In the 3 kosher plants, a head restrainer was used and the animal was held in an upright position during kosher slaughter. In plants with line speeds of > 100 cattle/h, 100 cattle were observed for the audit; in plants with lower line speeds, either 50 animals or 1 hour of production was observed. These sample sizes were chosen on the basis of time constraints of the auditors; the auditors had to perform the animal welfare audit and a food-safety audit in 1 day. Descriptive statistics were calculated for all variables.

**Results**

During the 4-year auditing period, a mean ± SD of 97.2 ± 6.21% (mode, 99%; median, 98%) of the cattle were correctly stunned with the first attempt. Animals that were not correctly stunned were immediately restunned before hoisting or bleeding. By year, the mean percentages of cattle that were insensible after the first stunning attempt were 96.2% for 1999, 98.9% for 2000, 97.4% for 2001, and 96.7% for 2002. Thus, the initial improvements noted during the audits in 1999 had been maintained. On the basis of a voluntary industry standard that was adopted by the restaurant companies, a satisfactory score is considered to be 95%. The line speed varied from < 50 to 390 cattle/h. Line speed was < 50 cattle/h in 16 (24%) of the slaughter plants, 51 to 100 cattle/h in 13 (20%) plants, 101 to 200 cattle/h in 10 (15%) plants, 201 to 300 cattle/h in 21 (32%) plants, and > 300 cattle/h in 6 (9%) plants. The mean stunning scores for each line-speed category were 96.2%, 98.9%, 97.4%, and 96.7%, respectively.

The percentages of cattle stunned correctly with 1 attempt in each type of restraint equipment were 97.2% for conventional stunning boxes, 97.1% for center track conveyor restrainers, and 97.0% for V-conveyor restrainers. Forty (61%) plants had conventional stunning boxes that held 1 animal, 20 (30%) plants had a center track conveyor restrainer, and 6 (9%) plants had a V-conveyor restrainer. All plants with a line speed of < 100 cattle/h had conventional single animal stun boxes.

All plants used either a cartridge-fired, hand-held stunner or a pneumatic stunner. Both types of
stunners had a penetrating captive bolt. None of the plants used a nonpenetrating mushroom head stunner. In the year 2000, the use of pneumatic stunners that injected air into the brain was discontinued because of concerns about bovine spongiform encephalopathy and the possibility that such stunners would cause contamination of meat with brain tissue. During 2001 and 2002, specific data on stunner type and brand were not collected. However, observations by the auditors indicated that between 2001 and 2002, many plant maintenance departments started using a testing device to measure bolt velocity to ensure the stunners were operating correctly.

Among all slaughter-plant audits during the 4-year period (n = 266), the insensibility audit failed during 9 (3%) of the audits and passed during 257 (97%) of the audits. In the plants that failed the insensibility audit, only 1 animal with signs of sensibility was found in each slaughter plant. Among the 66 slaughter plants, 60 (91%) passed all of their insensibility audits. The 6 plants that failed consisted of 2 beef-fed plants and 4 cow-bull plants. Three of 4 of these cow-bull plants failed more than 1 audit. Stunning of bulls was the cause of failure in 2 of 4 cow-bull plants. By year, the number of audits in which slaughter plants passed the audit was 40 of 41 (98%) during 1999, 47 of 49 (96%) during 2000, 75 of 79 (95%) during 2001, and 94 of 97 (97%) during 2002.

Mean ± SD vocalization score for all 4 years was 2.14 ± 2.63% of the cattle vocalizing during stunning and handling (mode, 0%; median, 2%). By year, mean vocalization scores were 2.4% for 1999, 1.8% for 2000, 2.2% for 2001, and 1.7% for 2002. On the basis of the accepted industry standard, a vocalization score of < 3% was considered acceptable. The mean vocalization score in 1996 before the audits began was 7.7%. The worst slaughter plant in 1996 had a vocalization score of 32%. The worst vocalization score in 1999 was 17% and in 2002 was 6%. Mean vocalization scores for the different types of cattle holding equipment were 2.5% for conventional stun boxes, 1.1% for center track restrainers, and 2.5% for V-conveyor restrainers.

No data were collected on electric prod type or voltage. During the 4-year period, a mean ± SD of 17.2 ± 25.7% of the cattle were moved with an electric prod (mode, 0%; median, 6%). By year, 28.6% of cattle were prodded during 1999, 19.9% during 2000, 17.1% during 2001, and 21.3% during 2002. The percentages of slaughter plants that met the industry standard of < 25% of cattle prodded were 76% in 1999, 67% in 2000, 76% in 2001, and 82% in 2002. Electric prods were used on 15.2% of the beef-fed cattle and 29% of the cows and bulls. Observations by auditors suggested that Holstein dairy cows balked more than beef-fed cattle (steers and heifers). The percentage of cattle moved with an electric prod for each line-speed category was 19.8%, 27.0%, 12.5%, 24.1%, and 25.1%, respectively. Mean percentage of cattle moved with an electric prod in each restrainer type was 10.1% for conventional stun boxes, 16.0% for center track conveyor restrainers, and 39.1% for V-conveyor restrainers.

Discussion

Evaluation of animal welfare audit data suggested that improvements in stunning and handling...
of cattle that started in 1999 were maintained through 2002. Plant management personnel and equipment suppliers have made many additional improvements that could not be numerically quantified. Some slaughter plants now conduct their own internal weekly or monthly animal welfare audits with the numerical scoring system. The manufacturers of stunners have responded to the increasing concern about animal welfare by developing equipment to help slaughter-plant maintenance departments do a better job of maintaining stunners. At the start of the audits in 1999, only 1 manufacturer of stunners marketed a test stand used to measure bolt velocity. Measuring bolt velocity enables maintenance personnel to determine if a stunner is functioning correctly. Today test stands are commercially available for all 4 of the commonly used stunners. The maintenance of stunners has improved, and many plant managers have implemented documented maintenance programs. Prior to 1999, inadequate stunner maintenance was a major cause of poor stunning. It is the author's opinion that during the last 4 years, stunning of bulls and cows with heavy skulls is still a problem area. Methods to correct stunning problems are outlined in other publications. During 2003, many slaughter plants installed a new, more powerful pneumatic stunner that may reduce problems with stunning bulls and cows with heavy skulls.

Maintenance of chutes, stunning boxes, and restrainers has also improved during the last 4 years. Many slaughter plants have relocated switches and valves that operate gates or restrainers in more convenient locations. Ergonomic handles have been installed on bulky pneumatic stunners. These improvements were made when management personnel began to give higher priority to animal welfare.

Many small changes can yield big improvements in the movement of cattle in slaughter plants. Cattle that move easily without balking are easier to stun because they are less likely to be agitated. Almost every slaughter plant has removed distractions that make cattle balk and refuse to move. They have moved lights to eliminate shiny reflections on wet floors. Lamps have been placed on dark restrainer entrances to facilitate cattle entry because cattle will often refuse to enter a dark place. In plants in which approaching cattle could see people ahead, shields have been installed to block the cattle's view. Some plants have modified their ventilation systems to prevent air drafts from blowing into the faces of approaching cattle because this may cause cattle to balk. Another modification made on several conveyor restrainer systems was to add a false floor to prevent incoming cattle from experiencing the visual cliff effect. These systems are located 2 to 3 m off the floor. If cattle look down and see a steep drop-off, they often refuse to enter. Ruminants have depth perception.

In 2 slaughter plants, data were collected before and after some simple, inexpensive improvements were made. At the first plant, 4 modifications of the stunning box were made, including nonslip flooring and a light over the stun box entrance. The lamp was positioned to provide indirect illumination of the stun box. The third and fourth modifications were rubber stops to prevent gates from banging and a small (2.5 X 15-cm) hole cut at the cow's eye level in the solid stun box entry door to promote following (the hole must not provide a view into the slaughter plant). The plant's scores improved; stunning score was 93% before the changes and
97% after the changes, vocalization caused by electrical prodding was reduced from 4% to 1% of the cattle, and electric prod use decreased from 31% to 7% of the cattle. In the second plant, air blowing toward the cattle through the center track conveyor restrainer entrance was stopped. This resulted in less electric prodding, and vocalization decreased from 4.5% to 1% of the cattle.

Slaughter-plant management personnel have also improved employee training, and the American Meat Institute (the meat packer trade association) sponsors a 3-day animal welfare conference to train managers. Most plant personnel now use alternative nonelectric aids to reduce the use of electric prods. Flags, inflated plastic bags, and plastic paddle sticks are the 3 most popular aids. These should be used quietly to guide cattle and be the primary aids for moving cattle. In most plants, electric prod use is restricted to the stunning box or restrainer entrance. The electric prod is used only when it is needed to move a stubborn animal. One plant maintenance department invented an effective driving aid that produces a strong vibration that is not painful.

Some problem areas were recognized. A few slaughter plants had chronic problems and either barely passed an audit or failed by 1 or 2 percentage points. The main problem in these plants was that management personnel did not give animal welfare high priority. During the last 4 years, 4 plant managers were replaced after audits were failed problems in those plants were eliminated with new management. In 2002, 4 new beef plants entered the restaurant audit system and 3 of 4 failed the audit. One plant had a 19% stunning score; that slaughter plant had an untrained operator, a broken stunner, and no knowledge of what was expected during an audit.

The USDA has also increased enforcement of the Humane Slaughter Act. In 2002, the USDA hired 18 veterinarians whose main responsibility is to travel to slaughter plants to enforce humane slaughter regulations. Discussion with those veterinarians and telephone calls to the author from slaughter plants inspected by those veterinarians indicated that many of the problems occurred in smaller plants that were not audited by a restaurant company. In 2002 and 2003, the USDA increased enforcement of humane handling practices during truck unloading. Until that time, truck unloading at a slaughter plant was not monitored by the USDA.

Audits performed by the restaurant companies have maintained the improvements that were started in 1999. Basing the audits on easily measured performance standards has helped maintain the improvement. Slaughter-plant managers know exactly what is expected and can monitor their own performance and determine whether their operation is improving or getting worse. Some people have criticized numerical scoring because it allows a plant to make a few mistakes absolute perfection is impossible, but high standards can be maintained.

References


