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DESIGN OF UPRIGHT RESTRAINT BOX FOR RITUAL SLAUGHTER OF CATTLE

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Please refer to Folio 35A.

INTRODUCTION

There are welfare concerns about religious slaughter. When religious slaughter is being evaluated, the variable of restraint must be separated from the variable of religious slaughter itself. In the U.S., religious slaughter is exempt from the Humane Slaughter Act and some slaughter plants use very cruel methods of restraint, such as shackling and hoisting a live animal by one hind leg (Grandin, 1990). In Europe, cattle are rotated onto their backs in a device called the Weinberg casting pen. Dunn (1990) found that this restraint method was more stressful than an upright restraining box. Cattle actively resist being turned onto their backs. An animal rotated onto its back will twist its neck in an attempt to right its head. Some upright restraint boxes also cause stress and discomfort because excessive pressure is applied by both the belly lift and the rear pusher gate. A new restraint box and head holder was designed to hold the animal in a comfortable, upright position.

MATERIALS AND METHODS

A modified ASPCA restraint box for cattle was constructed. It was similar to the box described in the Marshall *et al.* (1963) patent, but it has several important modifications to reduce stress on the animal. The basic design is shown in Figure 1. Vertical travel of the belly lift was restricted to 71cm to prevent the animal from being lifted off the floor. Many older restraint boxes lift the animal off its feet. Restricting the belly lift travel reduces excessive pressure on the thoracic area. A pressure-limiting device was installed on the rear pusher gate. A large, strong animal can resist forward travel of the pusher gate. Many older boxes had a pusher which would bend the animal's back into an arched position. This caused great stress and discomfort to the animal. Improved controls were installed which provided more accurate positioning of the belly lift rear pusher gate and head holder. All parts of the system could be stopped in midstroke positions. All control valves were return-to-centre type, and motion stopped when the operator let go of the control handle. The pneumatic and hydraulic controls were equipped with flow controls to provide smooth, steady, slow motion. The head holder design is shown in Figures 1 and 2. The forehead bracket was widened to 20cm and covered with two layers of rubber belting to prevent it from digging into the animal's head. The chin lift was raised into position by a chain attached to a 10cm diameter air cylinder operated at 80PSI. The chain was attached to the chin lift 25cm away from the chin lift pivot point on the front of the box. This design provided the correct amount of pressure to restrain the head. The box was also engineered to reduce noise. To prevent the cattle from seeing people and activities around them, the box had completely solid sides. A solid shield was constructed around the head. Blocking an animal's vision with solid sides and keeping people out of its flight zone helps to keep cattle calm (Grandin, 1987a). Cattle will often struggle and attempt to escape if people enter their flight zone. It is especially important to block the animal's vision until it is completely restrained in a restraint device (Grandin, 1992a).

The modified ASPCA pen was operated for 35 hours by the author in a commercial beef slaughter plant at a speed of 75 cattle per hour. The cattle were crossbreeds of English and European breeds which had been fattened in feedlots. These animals were not completely tame and they were much wilder than cattle raised in intensive European systems. Kosher slaughter was performed by a skilled shochet and the special razor-sharp kosher knives were used.

RESULTS AND DISCUSSION

Quiet handling of the cattle in the lead-up race is essential. Agitated animals were difficult to gently restrain. The restraint box should be operated from the rear towards the front. The animal should be completely restrained by the rear pusher gate and the belly lift before the head is restrained. Sudden, jerky movements of the apparatus caused the cattle to jump and resist. Most animals stood quietly when pressure from the pusher gate, belly lift and head holder was applied slowly. Slow, steady pressure had a calming effect and sudden, jerky motion caused the animal to jump, squirm and fight being restrained. An important principle is the concept of optimum pressure. The cattle stood quietly when sufficient pressure was applied to make the animal "feel restrained," but excessive pressure, which would cause pain and struggling, was avoided. Many animals would calm down and stop struggling if excessive pressure was slowly reduced. Sudden, jerky reductions in pressure caused agitation and squirming. When the animal is fully restrained, its back should be level and its feet should be on the floor of the box. Arching of the back is an indicator of excessive pressure. Most cattle voluntarily placed their heads through the opening in the front of the box. Stubborn animals could be gently urged forward by applying intermittent pressure with the pusher gate.

Head restraint was more aversive than body restraint when a narrow, 8cm forehead bracket was used. Some cattle showed visible signs of agitation after they were held in the head restraint for more than ten seconds. Cattle showed visible signs of distress by squirming, vocalizing and putting their ears back. Changes were made in the forehead bracket to make it more comfortable. Widening the bracket to 20cm and covering it with two layers of heavy rubber belting reduced distress. After the new, wider bracket was installed, cattle could be held for up to a minute in the head holder with very few signs of distress. Three cattle were restrained in the head restraint eight times. These animals remained calm and did not resist successive applications of the head holder.

To facilitate bleed-out and induction of rapid loss of consciousness, the head should be positioned correctly. The operator must not push the animal too far forward in the box. Excessive pressure on the chest slows bleed-out. The cut must be made as close to the jaw as possible to promote rapid bleed-out. Bleed-out can be further facilitated by leaving the chin lift up to hold the incision open. The forehead bracket should be raised immediately after the cut to relieve clamping pressure on the head and allow the animal to relax.

The modified ASPCA restraint box is a humane method of restraint which causes a minimum of discomfort. The operator has to be well trained and closely supervised by management. Observations at several slaughter plants indicated that the attitude of management is the single most important factor which determines how animals are treated.

Good equipment provides the tools which make humane handling possible, but they are useless unless they have the management to go along with them.

The restraint box must be properly installed. Lighting problems can cause a well designed system to function poorly. Lighting affects cattle movement (Grandin, 1987). Poor lighting, excessive noise or smell blowing towards incoming cattle will cause balking.

The variables of kosher slaughter and restraint could now be separated. The animal's reaction to kosher slaughter was no longer masked by an aversive or painful restraint method. Some cattle were held so loosely by the rear pusher gate and the head holder that they could pull their heads out. None of these animals attempted to pull its head away from the knife. The cattle appear to have little or no reaction to the throat cut. Kosher slaughter does not induce instantaneous unconsciousness. The onset of brain death in cattle can vary greatly from 20 seconds to 113 seconds (Daly *et al.*, 1988), but the onset of unconsciousness occurs much sooner. Animals with delayed onset of unconsciousness did not appear to be aware of what had happened. After the cut, they blinked, stood quietly and looked around after the head holder was released until hypoxic spasms of unconsciousness occurred. Problems with delayed onset of unconsciousness can be reduced to 5% by using a faster knife stroke with no sawing motions (Grandin, 1987b).

Further observations of large cattle in a double rail conveyor restrainer system (Grandin, 1992a) equipped with a mechanical head holder indicated that there was little or no reaction of the animal's body during the throat cut. Body movements are more easily observed in the double rail restrainer. The restrainer was equipped with a head holder designed by the author. The forehead bracket and upper neck restraint was the same as shown in Figure 2 (Marshall *et al.*, 1963; Grandin, 1992b). The chin lift was also the same, except it separated into two pieces to allow the dead animal to be discharged from the restrainer. The two sides of the biparting chin lift were attached to two horizontal sliding doors which were mounted on the end of the double rail restrainer. A cow on the restrainer was advanced forward and the doors were closed around its neck. The chin lift, forehead bracket and upper neck restraint operated in the same manner as the system described in this paper. The head holder is an ASPCA restraint box front (Marshall *et al.*, 1963; Grandin, 1992b) mounted on the double rail restrainer. The bottom portion consisted of two sliding doors to allow the dead animal to exit.

CONCLUSION

Kosher slaughter with the special razor-sharp knife can be conducted with a minimum of discomfort to large cattle when the animal is held in a modified ASPCA pen or a double rail restrainer which holds the animal in a comfortable upright position. Strict management supervision of both the shochet and the restraint box operator is required to ensure that the cut is performed correctly and the animal's head is restrained in the correct position. Careless or abusive operation of the restraint device will cause suffering.

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