IMPEDIMENTS OF ANIMAL MOVEMENT IN HANDLING AND RESTRAINT SYSTEMS

GRANDIN T.

Department of Animal Sciences, Colorado State University, Fort Collins, USA

W-2.06

Introduction

Mistakes in lighting, ventilation or a failure to reduce high pitched noise often causes animals to balk and refuse to enter a stunning box or restrainer. Easily correctable problems with lighting, ventilation or noise can ruin the performance of a well designed race or restrainer system. When a handling system is being evaluated from either an efficiency or animal welfare standpoint, the variables of basic system design must be separated from the variables of easily correctable mistakes in lighting, ventilation or a failure to reduce high frequency noise. This paper is going to discuss problems caused by bad lighting, ventilation mistakes and noise. Methods for correcting these problems will be discussed.

Methods

Observations were made in eighteen large beef, veal and pork slaughter plants to determine why animals balk and refuse to enter either a stunning box or conveyor restrainer. There were twelve beef plants operating at speeds ranging from 30 to 275 cattle per hour, five pork plants with hourly production speeds of 750 to 1000 pigs per hour and one veal plant which operated at 75 calves per hour. Some of these plants had modern facilities and others had older facilities. Simple changes in lighting, noise reduction and ventilation air flow patterns were made to improve animal movement. In all plants, the races and restrainers were designed correctly. None of the facilities had serious design mistakes in layout of races. Layout mistakes such as bending a race too sharply at the junction between the forcing (crowd) pen and the single file race will cause balking and refusal to enter. Correct layout is discussed in detail in Grandin (1991, 1993). A system that has serious layout mistakes will not work efficiently and it usually has to be taken out. A good example of a very bad layout mistake of a race is shown in Weeding et al. (1993). This system caused stress. The single file race was bent too sharply at the junction with the forcing pen. Systems with bad design mistakes cannot be improved by changing lighting or ventilation.

Results and Discussion

Lighting

In five plants, changes in lighting significantly improved cattle and pig movement into conveyor restrainers. Both cattle and pigs will often balk and refuse to enter either a conveyor restrainer or a stunning box that is dark. Animals must be able to see where they are going. In two beef plants, lamps aimed at the restrainer entrance were used to attract cattle in. Livestock will move away from a darker place towards a more brightly illuminated place (Grandin, 1993; Lambooij and Van Putten, 1993). People sometimes do not understand where the lamps must be positioned. If the lamps are installed backwards, the animals will refuse to enter. The lamp must be aimed AWAY from approaching animals so that it illuminates the restrainer entrance. If the light is aimed into the eyes of approaching animals, it will impede and slow down animal movement into the restrainer. Animals will not approach a blinding, glaring lamp that is shining directly into their eyes.

In two beef plants, the handing system and restrainer worked very well when lamps in the room were new. Balking and refusal to enter the conveyor restrainer gradually worsened as bulbs on sodium lamps dimmed with age. When the lamps became dim, the animals could no .longer see into the restrainer entrance. Both pigs and cattle need to see where they are going as they enter a conveyor restrainer or stunning box.

However, light must be blocked underneath the conveyor restrainer to prevent the animals from seeing the steep drop-off under the conveyor (Grandin, 1992). Installation of a false floor under the restrainer improves animal movement onto the conveyor.

Seeing Movement

Both cattle and pigs may refuse to enter a race or back out if they see moving people, reflections off water or a moving object up ahead of them. Engineers must look up the races to observe what the animals are seeing. In one plant, cattle refused to enter a single file race because they saw a small hanging chain that wiggled. In two beef plants and two pork plants, moving reflections off of water on the floor or walls impeded animal movement. Cattle refused to enter a stunning box because they saw a moving sparkling reflection on a metal partition. Both pigs and cattle may refuse to walk over a sparkling reflection in a puddle of water on the floor. In three plants, sparkling reflections on the floor which impeded animal movement were eliminated by moving lamps sideways about one meter. In two beef plants and one pork plant, installation of shields to prevent approaching animals from seeing moving people up head facilitated cattle movement through races. At one pork plant, pigs balked in the single file race when they saw a gate jiggling on the side of the race. When the gate stopped jiggling, the pigs moved more easily. It was also observed that white pigs were more likely to balk at their own reflection in shiny metal than black or red pigs. A white pig approaching a piece of shiny metal is more likely to see a reflection. Moving a light will usually eliminate the reflection.

Noise

High frequency noises and sudden banging and clanging of metal will cause animals to balk and refuse to move. The ears of livestock are more sensitive to high frequency sounds than humans (Ames and Arehart, 1972; Kilgour, 1983). Intermittent hissing noises from air valves will cause a large startle reaction. At the veal plant, calves backed out of the race when they heard a loud hissing air exhaust. Air exhausts can be easily silenced with muffler devices or piping the air exhaust outside. In one beef plant, undersized pipes in a hydraulic system created a high frequency sound that caused cattle to balk and refuse to enter a restrainer conveyor. Enlarging the pipes to eliminate the high frequency sound facilitated cattle entry into the conveyor restrainer. Enlarging the diameter of the pipes reduces high frequency sound because hydraulic fluid moving through a large pipe moves at a slower velocity. Observations in many plants indicated that high frequency sounds are very disturbing to animals. A low frequency rumbling sound from a chain conveyor was usually ignored by cattle. Cattle voluntarily entered equipment that made a low frequency rumbling sound.

Ventilation

Smells blowing back into the faces of approaching livestock from a stunning box or restrainer will cause animals to balk and refuse to enter. Ventilation problems will ruin the performance of the best systems. Cattle and pig movement in several plants was improved by designing a ventilation system that created a zone of negative pressure at the stunning box or restrainer conveyor entrance. This sucks smells away from approaching animals. At two beef plants and one pork plant, cattle refused to enter the conveyor restrainer and pigs refused to enter single file races because the ventilation system blew smells from the slaughter hall towards them. Air movement patterns in a plant can also be affected by a change in wind direction outside. At two plants, cattle moved easily through the races when the wind blew from one direction and they refused to move when the wind changed direction. Changes in wind direction caused smells to blow towards the animals. Observations during extremely hot over 30°C temperatures and extremely cold under -10°C temperatures indicated that a large temperature change between the slaughter building and the lairage impeded animal movement. Steam coming out of the entrance to the stunning area on an extremely cold day caused cattle to stop and refuse to enter. Reducing sudden changes in temperature or wind currents improved animal movements.

Animals that refuse to move when they encounter a smell appear to be reacting to the novelty of a sudden change in their environment. A piece of paper thrown in a race causes a similar balking reaction. A smell causes animals to stop when they first smell it. If they are first exposed to slaughtering smells in the lairage, they appear to habituate to them and they will usually walk up the races. Smells cause the worst impediments to animal movement if animals first encounter the smell at a stunning box or restrainer entrance. If animals first smell a slaughter hall smell in the lairage, it may impede movement in the lairage but the animals will usually walk quietly into the stunning box or restrainer.

Conclusions

Movement of cattle and pigs through handling systems can be improved by improving lighting so animals can see where they are going, elimination of sparkling reflections, reduction of high frequency noise and air hissing sounds, and design of ventilation systems to prevent smells from blowing towards approaching livestock. Mistakes in lighting, ventilation, or a failure to eliminate high frequency or sudden sounds will ruin the performance of the best handling equipment. After a new handling system is installed, engineers must be very observant and make adjustments in lighting and ventilation to improve animal movement.

References

Ames, D.R. and Arehart, L.A., (1972). Physiological response of lambs to auditory stimuli. J. Anim. Sci., 34:994-998.

Grandin, T., (1991). Principles of abattoir design to improve animal welfare. In: J. Matthews (Ed.), Progress in Agricultural Physics and Engineering, CAB International, Wallingford, Oxon, UK, pp. 279-303.

Grandin, T., (1992). Double rail restrainer systems for handling large beef cattle during stunning. 38th Int. Congress of Meat Sci. and Technol., pp. 181-184.

Grandin, T., (1993). Handling and welfare of livestock in slaughter plants. In: T. Grandin (Ed.), Livestock Handling and Transport, CAB International, Wallingford, Oxon, UK, pp. 289-311.

Kilgour, R., (1983). Using operant test results for decisions on cattle welfare. Proc. Conf. Human Animal Bond, Minneapolis, MN.

Lambooij, E. and Van Putten, G., (1993). Transport of pigs. In: T. Grandin (Ed.), Livestock Handling and Transport, CAB International, Wallingford, Oxon, UK, pp. 213-231.

Weeding, C.M. et al., (1993). Effects of abattoir and slaughter handling systems on stress indicators in pig blood. Veterinary Record, 133:10-13.