

REACTIONS OF CATTLE TO HEAD-RESTRAINT AT STUNNING: A PRACTICAL DILEMMA

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Abstract

The behavioural reactions and blood cortisol levels of cattle stunned using a penetrating captive-bolt pistol whilst standing free in a stunning box were compared with those obtained from cattle similarly stunned but with their heads held in a hydraulically operated chin-lift type of head restrainer. Few (8 out of 55) animals voluntarily put their heads into the restrainer, most had to be 'persuaded' to use the head-restrainer; some (5 out of 24) could not be. The mean time between entry into the stunning pen and the stun for 23 free standing animals was 5.6s and for 19 animals which could be persuaded to use the head restrainer was 34.2s. The cortisol levels in the blood taken at the stick, from 30 animals stunned while standing free was 67.6 nmol/litre while that from 30 stunned while head-restrained was 143.1 nmol/litre. The behaviour and cortisol results suggest that enforced usage of this type of head restrainer could be a cause of distress to the cattle involved.

Keywords: *animal welfare, cattle, head-restraint, slaughter, stunning*

Introduction

In UK slaughterhouses all animals, by law, have to be stunned before having their throats cut. The only exception allowed to this requirement is when animals are slaughtered by Jewish and Muslim methods.

In cattle, stunning is usually carried out by firing a penetrating captive-bolt into their foreheads. This is currently done while the animal is standing free in a solid-sided stunning pen.

New legislation - *the Slaughter of Animals (Humane Conditions) Regulations 1990* - has been introduced with the intent of improving the welfare of slaughter stock. This demands, amongst other things, that a cattle stunning pen should be so constructed that it '- (iii) restricts the movement of the head of the animal confined in it so as to permit accurate stunning and allows the head of an animal to be released immediately after the animal has been stunned, and (iv) allows unimpeded access to the forehead of an animal confined in it.'

There is little doubt that cattle could be more accurately and thus humanely stunned if their heads are restrained in some way at the time of firing the bolt. However this mandatory requirement for head-restraint comes into force on 5 July 1992 but as yet there are few slaughterhouses which have installed or have had experience of the use of such equipment.

This presently reported investigation¹ was carried out to confirm or contradict the belief of the authors that the restricted head movement requirement might, in some circumstances, be a cause of distress to cattle.

Observations were carried out on three occasions at a commercial slaughterhouse which had installed a solid-sided stunning pen² incorporating a chin-lift type of head holder in its front end (Figure 1). This chin-lift mechanism is a modified version of the device found on the front of certain designs of upright religious slaughter pens, eg ASPCA/Cincinatti.

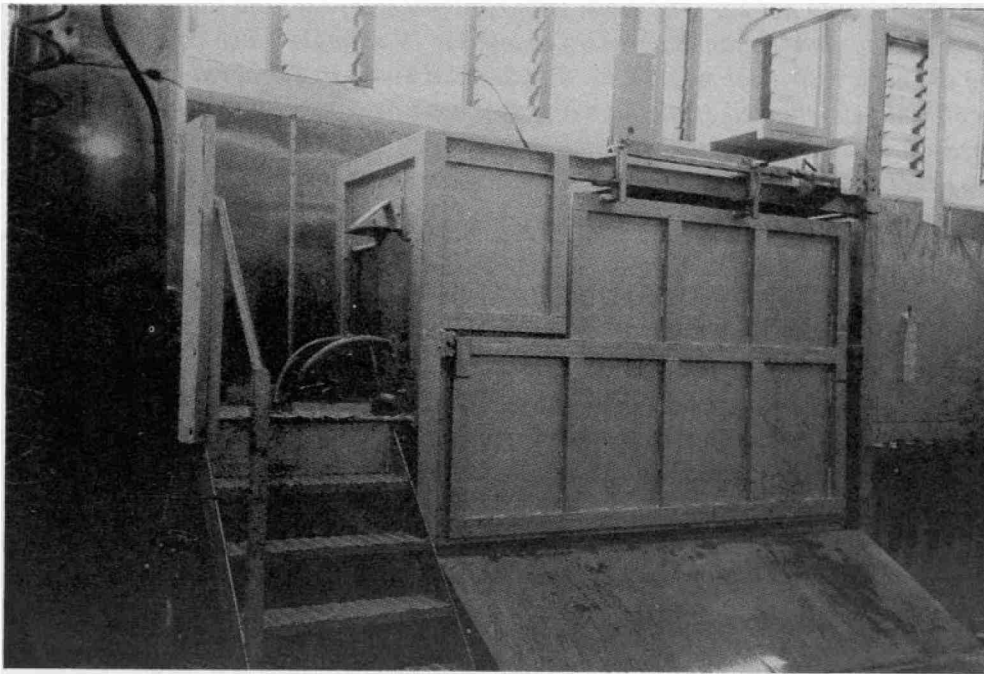


Figure 1 Stunning pen showing chin-lift device.

¹A brief account of part of this work, entitled 'The behaviour of cattle in a head-restraint stunning pen' was presented by one of the authors (RE) at the Society for Veterinary Ethology meeting held in Edinburgh in July 1991.

²John Kehoe and Sons Ltd, Tipperary, Eire.

The normal stunning and slaughter routine at the slaughterhouse

For stunning the slaughterman normally stands in an elevated position to one side of the stunning pen. He raises the guillotine entry-gate to allow the animal at the front of the queue in the approach race to enter the pen. Some cattle enter voluntarily; some have to be encouraged for example by shouting and/or the use of an electric goad and/or by an assistant pushing behind the queue of animals.

On entering the pen, the animal sees the opening ahead of it (Figure 2). It should move forward and place its head through this opening, whereupon the slaughterman operates the hydraulic chin-lift mechanism and traps the beast's head (Figure 3).

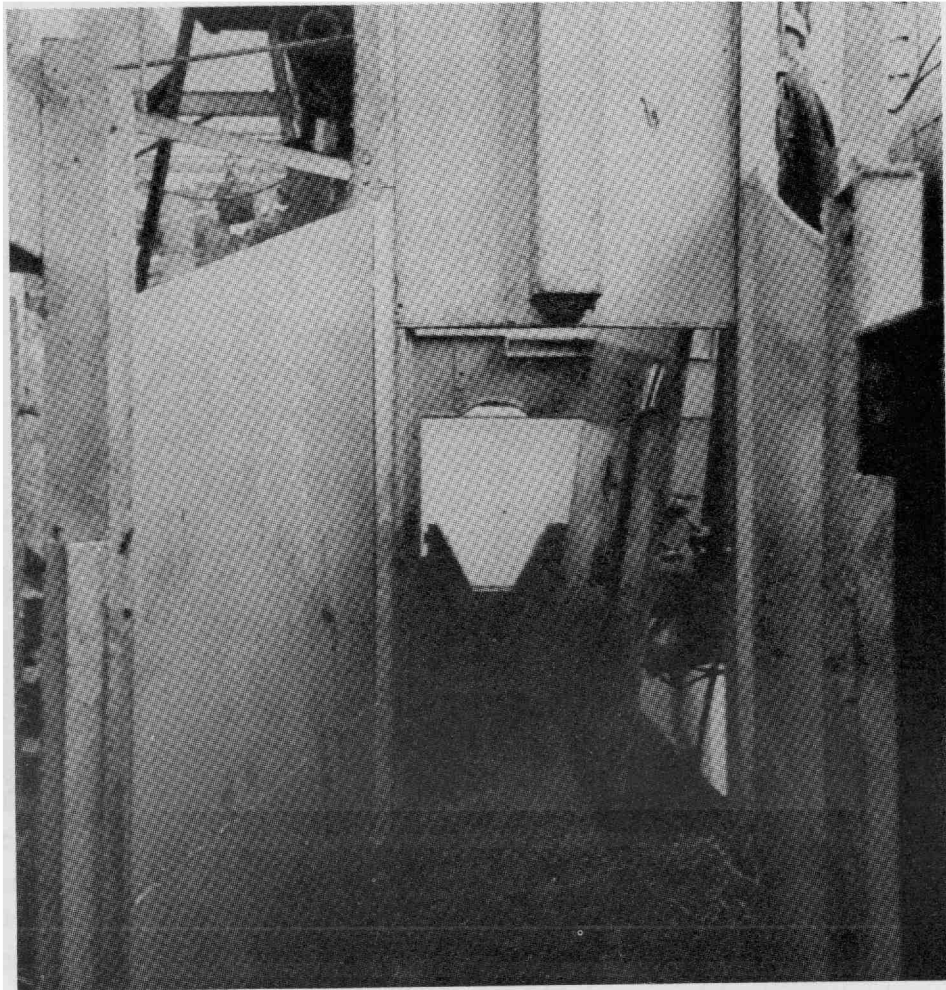


Figure 3 Opening in stunning pen as viewed by cattle.

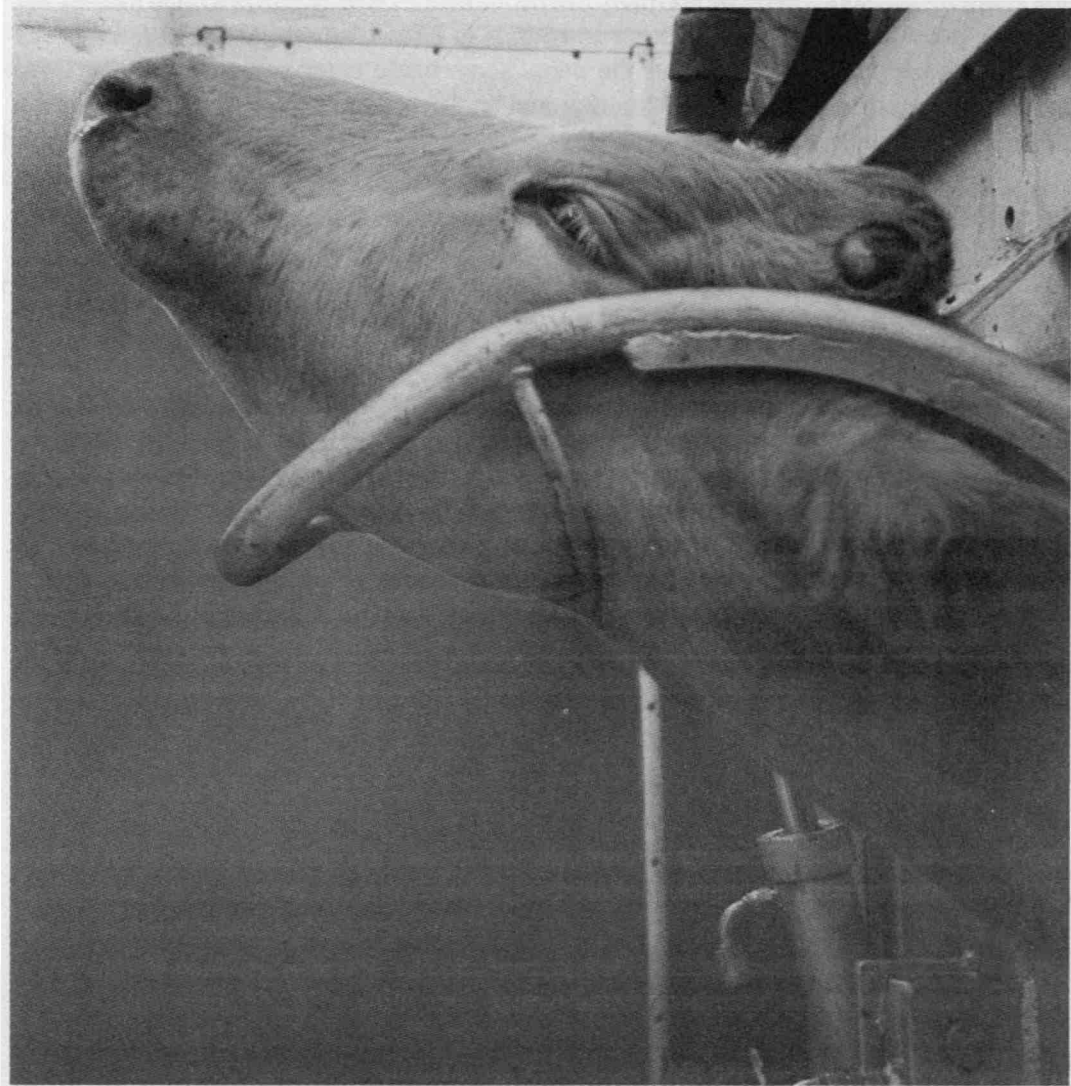


Figure 3 Chin-lift in use.

In routine use however most cattle are stunned as they stand free in the pen and the slaughterman uses the head-restrainer only if the animal voluntarily put its head through the gap. Activation of the chin lifting device causes some 'volunteering' animals to quickly withdraw their heads.

The animals are stunned using a Cash Special captive-bolt pistol (3 grain cartridges) once they are standing quietly in the pen or as soon as their heads are held in the head-restrainer.

After the animal is stunned the pivoted side of the pen is unlocked and the unconscious beast slides out on to the dry landing area of the killing floor where it is pithed, ie has a flexible metal rod inserted into its brain via the hole made by the captive bolt. This rod is moved about so that the brain is largely destroyed. The animal is then shackled, and hoisted free of the floor and hung in a head-down position from a roller on an overhead rail; it is moved to the bleeding area and then stuck, ie the large blood vessels in the throat region are cut and the animal bleeds to death.

Investigatory programme; materials and methods

First visit to the slaughterhouse

On the first visit some 50 cattle were observed as they were being stunned. These animals, as were the animals seen on the other visits, were the normal slaughter stock being presented to the slaughterhouse that day. They were healthy 1½ to 2½ year old beef crosses and were largely from some mixture of Friesian, Hereford, Charolais and Limousin breeds. About half of the 50 were stunned standing free in the pen, the others with their heads held in the restrainer. Of these latter animals some voluntarily put their heads into the head-restrainer, but the rest had to be persuaded to do so.

The purpose of this first day's work was to develop an observation and recording routine which could be used in the further studies. At no time could the speed of operation of the slaughter line be slowed down and the observational work had to be fitted into the normal routine of the slaughterhouse. It was soon realised that a number of individual observations might later have to be disregarded as they could not always be matched to those taken further along the slaughter line. It was decided that only fully recorded sequences would be used in any analysis of observations.

Second visit to the slaughterhouse

On the second visit an effort was made to get full records of:

- a. the timed behaviour of some 50 or so cattle being stunned with or without the use of the head-restrainer;
- b. the interval between the stunning and the sticking times of a further 20 or so cattle.

For the first series of observations on this second visit, one member of the observational team worked alongside the gathering race and tried to ensure that the cattle were presented at the guillotine-gate of the stunning pen in a calm and consistent manner. The other two members worked near the slaughterman doing the stunning and recorded

the time of entry of the cattle into the pen, the behaviour of the cattle towards the opening in the front of the pen, the time of trapping the head of those animals which had either volunteered or had been persuaded to put their heads into the head restrainer, the behavioural reactions of the cattle to the persuasion techniques and the time of the stun.

The slaughterman, when requested, would attempt to persuade non-volunteering cattle to put their heads into the gap by either slapping them on the back or by the use of an electric goad. Some cattle would not, without use of undue force, put their heads into the head-restrainer - these animals were stunned as they stood free in the pen.

For the second series of observations, one member of the team again ensured that the cattle were presented at the guillotine-gate in as calm and consistent a manner as possible, a second stood by the slaughterman and timed the stun and the pithing and the third member of the team worked in the bleeding area and timed the stick.

Third visit to the slaughterhouse

On the third visit blood samples were taken in the bleeding area from 30 cattle which had been persuaded to put their heads into the head restrainer. A matching group of 30 animals, stunned as they stood free in the pen, were also blood sampled.

For this series of observations one member of the team worked alongside the gathering race, one member observed the behaviour of the cattle in the stunning pen and the third member collected blood samples from the probably mixed arterial and venous blood gushing from the cut major blood vessels in the throat region.

The blood was collected into a plastic jar, transferred immediately into both heparinised and plain syringes; spun down within the hour and stored at -20°C . The serum cortisol levels were later measured by a radioimmunoassay method using antibody coated tubes (Cat. 4302 T, Immunodiagnosics, Boldon, Tyne & Wear, UK).

Results

Behaviour and timing from entry into pen to stun

Fully recorded sequences of behaviour of timing for animals being stunned with or without the use of the head restrainer were obtained from 55 cattle on the second visit to the slaughterhouse. An overview of the fate of these animals is laid out in Figure 4.

Eight animals (14.5% of total) voluntarily put their heads into the gap of the head-restrainer at an average of 11.1 secs after they had entered the stunning pen. Six of them however pulled their heads back when the head restraining mechanism (the chin-lift) was activated. They could not be persuaded to re-enter their heads into the head restrainer and had to be stunned standing free in the pen. Forty seven cattle (85.5% of total) did not voluntarily use the head-restrainer. Twenty-three of these were stunned standing free in the pen. Attempts were made to persuade the other 24 animals to put their heads into the restrainer long enough for their heads to be trapped. It was not easy to get some of the animals to use the head-restrainer; they baulked, and showed signs of distress (jumping, bellowing, trembling). In the end nineteen animals (79% of the 24) did have

their heads held and were then stunned. It proved impossible, using reasonable persuasion, to get the other 5 (21% of the 24) to enter their heads; they had to be stunned standing free in the pen. The mean time between entry into the pen, as measured from the closure of the guillotine-gate to the stun, for the 23 free standing animals was 5.6 seconds (range 3.3 - 9.1, SD 1.506), and for the 19 which could be persuaded to use the head-restrainer was 34.2 seconds (range 13.6 - 48.6, SD 10.12). A modified t test, applicable to assessing the difference between the means of two samples whose population variance cannot be assumed to be equal, was carried out. The probability of a real difference between the means was found to be not significant.

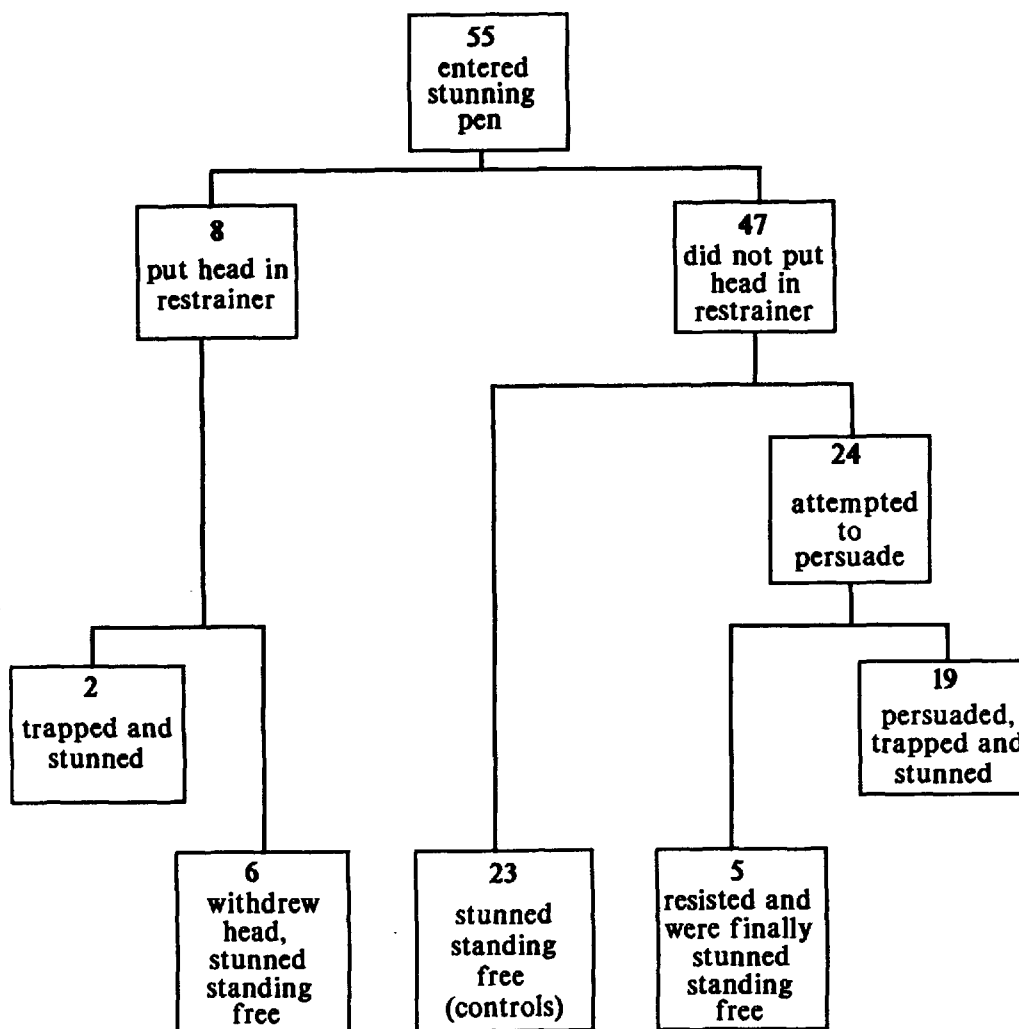


Figure 4 Fate of the cattle observed and recorded.

Timing of stun to stick

Timings were made on 20 cattle for the interval between the stun and the stick. This mean was 97 seconds (range 71-115, SD 10.92). The animals were pithed a relatively short time after the stun and hung unconscious on the overhead rail until stuck. The destruction of the brain by the pith ensured that they would not regain consciousness even though there was a somewhat long, time delay to the stick.

Cortisol levels

Blood samples were obtained on the third visit to the slaughterhouse from 30 cattle which had been stunned standing free in the pen and from 30 other animals which had their heads held in the restrainer. The mean level of cortisol in the bloods of the free-standing animals was 67.6 nmol/litre (range 23.2 - 117.0 SD 24.97) and for the head restrained animals 143.1 nmol/litre (range 101.5 - 270.0, SD 36.68). A t test comparison between the two means gave a result just significant at the 0.05 probability level.

Discussion

The results suggest that there could be animal behaviour/welfare problems using a head restraint in a commercial situation, especially the following:-

- the small number of animals (2 out of 55, ie 3.6%) which voluntarily allowed themselves to be trapped and stunned with their heads held in the head restrainer;
- the large difference (5.6s mean cp with 34.2s mean) between time from entry into pen to the stun for animals standing free in the pen, compared with those which were persuaded to put their heads into the head restraint and be trapped ;
- the behavioural reactions (struggling, bellowing, total refusal to put head into restrainer) shown by some of the 'persuaded' animals.

These differences in time and behaviour were mirrored by the levels of cortisol in the blood taken from the animals as they were stuck. The mean for the free standing cattle was 67.6 nmol/litre while the mean for the head restrained animals was 143.1 nmol/litre. The results for the free standing animals are slightly below the level (82.6 nmol/litre) found for conventionally slaughtered stock by Mitchell *et al* (1988) and well below the mean of 124.8 nmol/litre given by Dunn (1990) and the median reading of 175 nmol/litre quoted by Cockram & Corley (1991) for their conventionally slaughtered stock.

The results for the head-restrained animals obtained in the present study are slightly above Dunn's conventional slaughter figure but below that given by Cockram and Corley. Dunn also reports results of 143.2 nmol/litre of cortisol in blood from cattle slaughtered by religious methods in an upright ASPCA pen. This type of slaughter pen has a hydraulically operated chin-lift head holder similar to the one used in the present study but, of course, in religious slaughter the animals have their throats cut while still conscious - in Dunn's study within 11.1 seconds of being restrained.

Complicating factors when comparing the present cortisol results to those reported in the various papers are: the possible effects of stunning compared to non-stunning before the stick, the differences in timing between stun and collection of the blood (Mitchell *et al* quote 45 seconds, Cockram & Corley 171 seconds, present study 97 seconds) and the use and non-use of a pithing rod (used in the present study but not mentioned as being employed in Mitchell *et al*, Dunn, or Cockram & Corley).

Animal welfare implications

The behavioural reactions and the blood cortisol levels suggest that the enforced usage of this particular type of head-restraint could be a source of distress to the cattle involved. It may be that other designs are less stress inducing. There is little doubt, however, that once the head is held (restrained) a very precise and therefore humane stun can be carried out.

This is the practical dilemma: improvements in one aspect of slaughter, ie accuracy of stunning might have been obtained through deterioration in another, ie forced use of head-restraint.

The new legislation, which comes into force in July 1992, makes it obligatory that some form of head-restraint is used. Great care is going to have to be taken in the design and use of whatever forms of head-restraint are installed. Otherwise there is a danger that the distress caused by the enforced head-restraint of cattle being stunned may be greater than the benefit resulting from more accurate stunning.

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