

## Cattle behaviours and stockperson actions related to impaired animal welfare at Swedish slaughter plants



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### ABSTRACT

At a slaughter plant, cattle are sometimes exposed to rough handling which may reduce animal welfare (AW). In an observational study at four Swedish commercial slaughter plants, AW-related behaviours of cattle and actions of abattoir stockpersons handling the same animals were recorded simultaneously. The objective was to estimate the occurrence of different behaviours and actions related to negative AW during driving and stunning at large-scale cattle abattoirs, assess associations between such behaviours and actions, and analyse differences between plants and animal categories (dairy cows, beef cows, adult bulls and heifers/bullocks). Direct continuous observations of focal animals were made using laptops either in a section of the driving race to the stun box (132 animals) or in the stun box (313 animals), generating a total of 14.5 h of observations. The animals were stunned using a penetrating captive bolt gun or a rifle. Counts per animal of 14 behaviours and 16 stockperson actions were calculated. Sixteen percent of the observed animals displayed total behaviour counts >5 in the driving race, and 2% did so in the stun box; 32 and 8% of the observed animals received total counts >5 of stockperson actions in the race and stun box, respectively. We estimated that two-thirds of the animals were processed without displaying/receiving any of the behaviours/actions associated with severely negative AW. AW scores were acquired by adding together all observed behaviour counts (and action counts, separately) weighted by expert-assessed ratings denoting the degree of impaired AW. Spearman rank correlation was used to analyse associations between behaviour counts, action counts and AW scores. Only three moderate to strong correlations ( $\rho \geq 0.4$ ,  $P \leq 0.001$ ) between single behaviours/actions were found (“slapping rear” and “slapping front”; “prodding” and “shouting”; and “prodding” and “beating rear” in the driving race). The correlation between AW scores based on behaviours and actions was statistically significant but rather weak both in the driving race ( $\rho = 0.37$ ,  $P < 0.0001$ ) and stun box ( $\rho = 0.22$ ,  $P = 0.0002$ ). The effects of slaughter plant and animal category on behaviour counts and AW scores were estimated using standard or zero-inflated negative-binomial regression. The risks of most behaviours related to negative AW differed considerably between plants. In the stun box, adult bulls had a 2.5 times higher risk of “struggling-kicking” ( $P = 0.016$ ) and a 2.0 times higher risk of displaying “backing-turning” ( $P = 0.016$ ) than had dairy cows, indicating poorer welfare for the bulls.

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## 1. Introduction

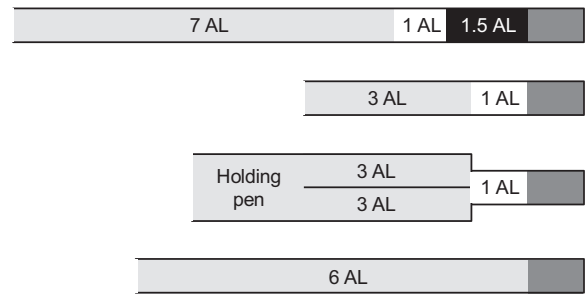
Cattle destined for meat production usually spend either a few hours or a whole night at a slaughter plant before they are killed. Although this is a comparatively short period of their lives, it can have a large influence on animal welfare (AW), which draws attention from the public and competent authorities. At a slaughter plant, cattle are exposed to a number of stressful factors, such as contact with unfamiliar conspecifics, loud noise, odours, painful shocks from electric goads, and hard blows from other animals, stockpersons or equipment. How an animal reacts to such stressors depends on a number of different internal and external determinants, for example breed, age and previous experiences of human handling (Probst et al., 2012, 2013). Stockperson attitudes and actions will influence the animals' pre-slaughter stress levels and welfare (Coleman et al., 2003; Hemsworth, 2003; Hemsworth and Coleman, 1998; Hemsworth et al., 2011). Animal stress in connection with slaughter can also reduce meat quality (Warner et al., 2007), thus causing direct costs to the industry. There are only a few previous studies of animal and stockperson interactions at Swedish slaughter plants, the most recent by Atkinson et al. (2013).

In Sweden, about 450,000 cattle are slaughtered annually (Swedish Board of Agriculture, 2013). The slaughter plants vary considerably in size and throughput. Of a total of approximately 60 Swedish cattle abattoirs in 2011, 16 major plants each processed 6100 to 109,000 head per year, representing 93% of all Swedish slaughter cattle (pers. comm., Å. Rutegård, Swedish Meat Industry Association, 2012). The facilities also vary in the design of lairage areas, driving races and stun boxes, as well as in the stunning methods applied—all possible determinants of AW. Several large plants are relatively old and some basic designs are problematic. Poor lighting, slippery floors or steep slopes in the driving races have direct negative effects on the animals (Grandin, 2007). The design of a slaughter plant can also have an indirect effect on AW, by counteracting or discouraging the stockpersons from optimal actions towards the animals. For instance, some constructions make it difficult or even impossible to use the animal's flight zones for driving them (Grandin, 1997). Suboptimal design of driveways can also make the animals unwilling to enter the stun box, demanding forceful driving (Bourguet et al., 2011; Grandin, 2007).

The objective of the present study was to describe cattle behaviours and stockperson actions commonly related to poor AW at commercial slaughter plants in Sweden. We aimed to estimate the occurrence of different behaviours/actions during driving and stunning, to assess associations between them, and to analyse differences between plants and between animal categories.

## 2. Material and methods

This study was approved by the Swedish Regional Ethical Review Board for studies involving humans and the Swedish Regional Ethics Committee for animal experiments. For ethical and confidentiality reasons, the slaughter plants are not described in detail. The study was



**Fig. 1.** Schematic representation of observed sections of the driving races (light grey) and stun boxes (dark grey, and black in one plant equipped with a forcing gate), as well as unobservable sections (white), at four studied Swedish cattle slaughter plants; length of each section is expressed as number of animal lengths (1 AL = 2.4 m).

part of a Swedish project with the overall aim to investigate relationships between AW and staff well-being at the slaughter of cattle, compared with euthanasia of laboratory rats. Project data collection also included questionnaires and interviews.

### 2.1. Studied slaughter plants and stockpersons

Of 63 Swedish cattle slaughter plants registered by the Swedish National Food Agency in 2009, all 16 plants processing more than 4600 cattle per year were asked about their interest in joining the study. Initially, four plants suitable for the study, as judged by size, location and willingness to participate, were approached and visited. Two of them chose to participate. Using the same size criterion, two additional plants were contacted and agreed to participate, resulting in four studied plants with a wide geographical spread in Sweden.

All animals were unloaded from the transport vehicle at arrival and kept in indoor lairage before slaughter. Lairage consisted of either group pens for two to 10 animals or individual pens arranged as sections of the driving race with vertical sliding doors between them. Three of the plants routinely kept cattle in lairage overnight.

Driving race design and length varied between abattoirs. Two plants had a single file race all the way from lairage to the stun box. At a third plant the first part of the driving race was wider, with a single file race in the last 10 m before the stun box. At the fourth plant, the race consisted of an old cattle housing facility, a holding pen for five or six animals and two parallel single file races leading to the stun box (Fig. 1). The floors were solid or slatted concrete, in one case with a textured rubber mat in the last part before the stun box, and in another case with sawdust litter. The floor in the last part of the race sloped slightly upwards in three of the plants. Three plants had solid walls 1.5 m high (one starting 0.15 m above floor level) in the driving races. One plant had metal bars, but with solid walls up to 0.6 m above floor level.

Three plants had fixed walls in the stun box and a stockperson drove the animals manually all the way into the stun box using his body, hands and various tools. The fourth plant had a hydraulic forcing gate, entering the race from one side and moving horizontally behind the animal to

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