Stress at slaughter in cattle: role of reactivity profile and environmental factors

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Abstract

During slaughter, cattle may be exposed to many potentially stress-inducing factors, of emotional and physical nature. A series of studies aimed to identify factors that may contribute to slaughter stress. During reactivity tests testing emotional stressors, Blond d'Aquitaine bulls were more reactive than Angus and Limousin bulls. However, no breed differences were found for stress indicators at slaughter. Indicators of post mortem (PM) muscle metabolism were correlated with stress reactions at slaughter, and with behavioural reactions and heart rates during the reactivity tests, including a sudden event and handling. Similarly, in Normand cull cows, stronger behavioural and physiological reactions during the slaughter procedure were associated with faster PM muscle metabolism. Reactions during the reactivity tests were also correlated with stress indicators at slaughter. A Principal Component Analysis indicated that the first and second axes were correlated with reactions to non-familiarity and to social isolation, respectively. Both axes were correlated with stress indicators at slaughter, suggesting that these two aspects contribute significantly to the emotional stress at slaughter. These experiments indicate that stress reactivity at slaughter may be predicted from behavioural and emotional stress reactions during reactivity tests. A third experiment found that compared with normally fed cows, 30-h food-deprived cows showed stronger startle and fear responses in response to a sudden event. Within a group subjected to a physical-effort treatment, compared to normally fed heifers, food-deprived heifers were more reactive to human exposure. This shows that the reactions to a given stressor may increase due to the presence of other stressors. Thus, in cattle, novelty, social disturbances and sudden events may contribute to slaughter stress and the simultaneous presence of several stressors during the slaughter period may exacerbate stress reactions.

Keywords: animal welfare, cattle, emotional stress, meat quality, physiology, slaughter

Introduction

Ethical questions

Throughout the pre-slaughter period, animals may show stress reactions. Stress has often been described in terms of the capacity of the animal to adapt, behaviourally and physiologically, to environmental challenges (Fraser et al 1975; Broom 1987). Accordingly, in the slaughter context, the effects of transport duration and food deprivation have been much studied (Warriss et al 1984; Cockram et al 1997; Knowles et al 1999). While it is important to understand the impact of physical challenges on the physiological and behavioural adaptive capacity of the animal, scientists have repeatedly reminded that animals are capable of emotional experiences (Dawkins 1980; Duncan 1996; Dantzer 2002; Désiré et al 2002). (NB In this paper by ‘emotional experiences’ and ‘emotions’ we mean subjectively experienced feelings). For example, many behavioural reactions and patterns in non-human mammals are related to brain systems known to be involved in emotions in humans (Panksepp et al 2002; Damasio 2003). Therefore, there is little reason to doubt that in non-human mammals, stress has a psychological or emotional dimension as it does in humans (Mason 1974; Terlouw 2005). We may consider that a farm animal is stressed if it experiences negative emotions (Veissier & Boissy 2007). There are two consequences to the acceptance that animal stress has an emotional dimension. First, stress in farm animals should be avoided as much as possible for ethical reasons. Without the emotional dimension, animals could be considered as objects, for example, cars; if a sports car has difficulties to adapt to a sand track, there is no welfare or ethical problem for the car. Second, the stress status of an animal is subjective: it depends on the way the animal evaluates its environment. These two points suggest that we need to avoid stress at slaughter as much as possible, by taking into account the animal’s evaluation of its environment.

Possible causes of stress at slaughter

To reduce animal stress at slaughter, we need to understand its causes. The pre-slaughter period is a complex period with various stages (Terlouw et al 2008). Before leaving for the abattoir, animals may be gathered on a loading platform or in a pen to facilitate subsequent loading. Pigs, but also