Stress measures in tail biters and bitten pigs in a matched case-control study

C Munsterhjelm*†‡, E Brunberg‡, M Heinonen§, L Keeling‡ and A Valros§

† PB 57, FIN-00014 University of Helsinki, Finland
‡ Department of Animal Environment and Health, Swedish University of Agricultural Sciences, Uppsala, Sweden
§ University of Helsinki, Faculty of Veterinary Medicine, Department of Production Animal Medicine, Helsinki, Finland
* Contact for correspondence and requests for reprints: camilla.munsterhjelm@helsinki.fi

Abstract

This study aimed to identify differences in stress measures in pigs (Sus scrofa) with different roles during a tail-biting outbreak. Quartets (n = 16) of age- and gender-matched fattening pigs including a tail biter (TB; n = 16), a victim (V; n = 16), a control in the same pen (Ctb; n = 10), and one in a pen without tail biting (Cno; n = 14) were chosen by direct behavioural observation. Stress measures used were behaviour (dog-sitting, sniffing of pen-mates and aggression), thyroid hormone concentration, morphology of adrenal and thyroid glands and salivary cortisol concentration sampled at 0700, 1000, 1600 and 1900h. Category (TB, V, Ctb, Cno) effects were investigated using a mixed model with replicate as subject and category as repeated effect. Category had a significant effect on adrenal total (cortex + medulla) and cortical area, salivary cortisol at 1900h, serum triiodothyronine (T3) and the behaviours performing and receiving sniffing. Victims suffered from a triad of chronic stress, pathology and suppressed T3 secretion. Evidence for stress in tail biters, a possible cause of the behaviour, consisted of a slightly flattened day-time cortisol pattern and more performed sniffing than all other categories. Differences in evening cortisol concentration and T3 levels between the categories in the pen with ongoing tail biting emphasise the qualities of the control animal. It supports the view that neutral pigs represent a phenotype that adopts a coping strategy leading to lower stress levels than in tail biters and victims, despite being housed in the same pen.

Keywords: adrenal, animal welfare, injurious behaviour, physiology, swine, thyroid

Introduction

Tail biting is a widespread abnormal behaviour in pigs (Sus scrofa) with serious consequences for the victims’ well-being, economics of production and microbiological hygiene of pig carcasses. Although the behaviour is thought to be an expression of distress in the group (Broom 1996; Schroeder-Petersen & Simonsen 2001), attempts to measure stress in relation to tail-biting activity have been few. A number of environmental shortcomings have repeatedly been associated with tail biting on farm level. This knowledge has, however, proven not to be reliable for predicting outbreaks in practice or inducing the behaviour under experimental settings. Clearly, the underlying motivational basis is poorly understood (Edwards 2006).

Edwards (2006) emphasises the need to identify characteristics that differ between pigs initiating tail-biting behaviour and similar pigs under equal circumstances that do not express the activity. One of these factors may be stress susceptibility (Schroder-Petersen & Simonsen 2001).

Stress is a physiological response to any stimulus perceived as a threat to internal homeostasis, evident as a number of changes in physiology and behaviour (for a review, see Salposky et al 2000). Different systems are altered in different types of challenging situations, and individual differences in stress susceptibility are striking (Ingram et al 1980). Thus, assessment of stress should involve monitoring of several response systems and secondary signs, including behaviour, immunity, endocrinology and pathology (Squires 2003).

Behaviour is considered a more sensitive stress measure than physiology, as it reflects an animal’s first attempts to cope with a stressor (Dawkins 2004). Generally, acute stressors elicit a range of conflict behaviours (Salzen 1991). If the stressor persists, abnormal behaviours such as tail biting may emerge (Wiepkema & Koolhaas 1993).

The hypothalamic-pituitary-adrenocortical (HPA) axis is the main system responsible for maintaining internal homeostasis after the very first sympatho-adrenal stress response (Moberg 1985). The adrenal cortex secretes glucocorticoids (GCs), in pigs; mainly cortisol (Bottoms et al 1972). The salivary concentration of cortisol is a good indicator of the amount of the biologically active form in plasma (Cook et al 1996).

Increases in (relative) adrenal mass and/or cortical area are considered reliable indices of chronic adrenal hyperactivity

© 2013 Universities Federation for Animal Welfare
The Old School, Brewhouse Hill, Wheathampstead,
Hertfordshire AL4 8AN, UK
www.ufaw.org.uk

Animal Welfare 2013, 22: 331-338
ISSN 0962-7286
doi: 10.7120/09627286.22.3.331