

Oral presentation

## Animal Welfare Aspects of Preventing Boar Taint

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### Introduction

Since boar taint is connected to testicular hormones and sexual maturity, surgical castration has for centuries been the method employed to prevent taint in meat from male pigs, as well as to obtain more docile pigs. However, since the castration is performed without anaesthesia, it is painful for the pig and therefore poses a serious welfare problem. With growing focus on animal welfare in animal production, surgical castration without anaesthesia and some form of analgesia is now increasingly regarded as unacceptable.

The options, singly or combined, are:

- castrating the pigs by methods that do not entail suffering, either surgically or non-surgically
- raising entire male pigs by methods that limit the development of boar taint
- selecting pigs with low levels of taint
- producing only female pigs for consumption.

This presentation focuses on the animal welfare concerns of these different ways of preventing or reducing boar taint.

The welfare aspects of castration have recently been reviewed by a working group under European Food Safety Authority [1], by Bonneau & Prunier [2] and by Prunier et al.[3]. We wish to acknowledge the many involved authors, as these reviews provide a significant basis and the references for this presentation – supplemented by references that have since come to light.

### Surgical castration

Surgical castration without anaesthesia is painful, as shown by the acute physiological responses (increased Hypothalamic-Pituitary-Adrenal-responses and protein c-fos expression in spinal neurons), as well as by vocalisation and behaviour during and immediately after the operation. The frequency and duration of high-frequency calls points towards the extraction of the testes and the severing of the spermatic cords as being the most painful in the procedure. Behavioural changes include disturbed massaging/suckling, activity, play and behavioural synchronisation. Some behavioural changes may persist for more than 24 hours after the operation, e.g. tail-wagging and rump-scratching, behaviours that may be related to wound-healing. It appears that the assumption, that pigs under the age of 7 days experience castration as less painful than older pigs, is not substantiated. The incomplete neural development of young animals may render them more, rather than less, sensitive to painful stimuli.

The effect of surgical castration on immune response varies with the type of challenge, with the age at castration, and is modified by the use of anaesthesia [4]. The different results are, however, open to interpretation in terms of pig welfare.

Reports that castration compromises the health of the pigs in that the prevalence of pneumonia and other diseases was higher in castrates compared to gilts, and castrates compared to boars and gilts, are not confirmed by a review of data from Danish abattoirs. Here the opposite was found with regard to *Mycoplasma hyopneumoniae* infection, with boars having the highest risk, females the lowest and castrates intermediate [5].

Possible long-term effects on disease susceptibility need further investigation – with regard to effects of the castration procedure as well as the absence of male steroids.

Local anaesthesia (commonly lidocaine plus adrenalin in a pH-buffered vehicle) effectively reduces the pain and stress symptoms of castration- most effectively when injected both into the testes and in the funicular area of the scrotum [1]. This happens in spite of the additional handling involved, as the response to intratesticular injection is much lower than to castration without anaesthesia. Prunier [6] recently confirmed the effect of anaesthesia, but found no further effect of pre-emptive analgesia with flunixin.

General anaesthesia of piglets, both injection and inhalation, has been regarded as unrealistic (time, cost and forced veterinary assistance) under practical conditions. It has moreover been associated with high piglet mortality as well as risks in the post-operative period of sedation. Although CO<sub>2</sub> inhalation has been regarded as too aversive to pigs, new research indicates that CO<sub>2</sub> anaesthesia, in the right gas proportions and with the right equipment, may be effective and practicable at farm level [7]. The whole procedure is very fast: 15 seconds to unconsciousness, 1–2 minutes to total anaesthesia, 15 seconds for castration and 30–40 seconds for full recovery. Anaesthetic as well as analgesic properties of the procedure are under further investigation, as is the significance of the pig's initial aversion responses to the gas in relation to welfare. However, more recent results concerning anaesthesia of piglets prior to castration are discussed in another paper of this volume.

### **Non-surgical castration**

Methods of non-surgical castration include immunocastration, by which male pigs are actively immunised against GnRH, thus inhibiting testicular development. Currently this method is used in Australia and New Zealand. When effective, the behaviour, production and boar taint level of the immunocastrates are similar to surgically castrated pigs. The procedure must be repeated twice to be effective, which means twice capture, restraint and injection of relatively large pigs because, in order to retain the production advantages of entire males, the pigs are immunocastrated as late as possible (14 and 18 weeks of age). Stress or trauma from capture, restraint and injection could probably be minimised by correct handling procedures. Lesions in the hypothalamus, the target site of the vaccine, were initially reported, but a subsequent report by the same group of scientists concludes that immunisation against GnRH does not induce either morphological or pathological abnormalities in the brain [8]. The welfare consequences of this vaccination still need further investigation.

Another method of non-surgical castration is local destruction of testicular tissue by chemical compounds such as formaldehyde, acetic acid, or salt from silver or zinc. No thorough welfare evaluation has been made. Swelling of the testes or scrotum has been observed which indicates inflammation and, although not proven, is likely to cause pain.

The use of exogenous steroid hormones or steroid agonists, to down-regulate the HPG axis, is not a method which would be acceptable to EU-consumers.

### **Raising entire male pigs**

Producing entire males for meat consumption calls for particular management procedures to minimise boar taint and to promote pig welfare. The one main boar taint substance, skatole, can to a large extent be controlled by feeding and by keeping the pigs clean. The latter may lead to extensive use of slatted floors, which is not conducive to pig welfare. An alternative, and more welfare friendly approach, is to control the climatic environment and provide pigs with possibilities for thermoregulation, e.g. showers, instead of leaving them to wallow in their own excreta. To reduce skatole development it is moreover recommended that feed be withheld from entire males from 26 hours before slaughter. This may be a welfare problem, as modern pigs have large appetites, but the harm to the welfare this might cause has not been investigated.

The remainder of this section is devoted to effects of – and on – androstenone.

Entire males are more aggressive than females and castrates – this applies also to play fighting behaviour in young pigs. Both aggression/fighting and sexual behaviour/mounting which takes place in groups with male pigs, compromise animal welfare as well as meat and carcass quality through skin damage and leg injuries. Recently, agonistic behaviour at feeding and sexual (mounting) behaviour was found to be significantly higher in entire male groups and mixed male and female groups compared to females alone [9]. In earlier studies [1] it has been shown that boars in mixed sex groups had higher fat androstenone levels and were more sexually mature than those in single sex groups when slaughtered at over 100 kg live weight.

Dominance and aggression are related to increased levels of androstenone, with dominant animals having the highest levels. High level of androstenone in a group has an enhancing effect on androstenone levels of that group. Salmon [10] found the highest level of aggression, sexual (mounting) behaviour and the highest testes weight in a male-only environment, compared to rooms with both male and female groups, which could confirm that strong

boar pheromone odour has a stimulating effect on other boars. This is perhaps not surprising, considering that boars in nature live in bachelor groups when reaching sexual maturity. Aggressive behaviour as well as sexual behaviour has been shown to be associated with increases in testosterone and androstenone levels in plasma, whereas corresponding increases in fat levels have only been measured after HCG challenge.

Mixing unacquainted pigs will always lead to aggression/fighting until a new dominance order has been established. Mixing entire males will therefore not only be stressful and injurious, but increase the risk of higher androstenone levels. 'Birth to slaughter' systems, where litters of pigs are kept together from birth to slaughter, including transport and preslaughter lairage, not only minimises skin damage (fighting), but also reduces the level of androstenone in entire males [11]. Whether litter rearing and minimal mixing influences the development of sexual maturity and mounting behaviour is not yet clear. It is likely that mixing of strangers and establishment of new hierarchies will provoke testicular activity and accelerate the initiation of puberty, whereas the initiation of puberty may be inhibited in stable sibling groups

Because of increased aggressiveness and activity levels, it is likely that rearing environments and handling facilities for entire males should contain more resources (space, facilities, including devices for thermoregulatory behaviour) than normally provided for castrates in order to minimise competition and aggression. If adequate facilities are not given, effects of behaviour on skin and leg injuries, as well as the general stress level, may be increased if pigs cannot escape or avoid harassment from particularly active males. Effects of these factors on boar taint are not documented. High levels of received aggression or levels of cortisol have not been associated with either skatole or androstenone levels.

### Genetic selection

It is not known whether selecting or breeding animals for low skatole and androstenone production or for high skatole and androstenone metabolism has any consequences for animal welfare, but this seems unlikely.

### Sperm sorting

The current technique for sperm sorting in pigs, in order to produce only female pigs for meat consumption, necessitates intrauterine insemination of the sows, which could increase the risk of discomfort, injury and pain and thus compromise the welfare of the sows. This may change with the development of new techniques.

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